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BOOK OF ABSTRACTS

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BOOK OF ABSTRACTS

SECTION 1. Computers and information technology; Systems engineering

THE MULTI-SENSORY EXPERIENCE ENABLED BY USING STATE-OF-THE-ART TECHNOLOGY IN LUMINAIRES

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Abstract:

In the last decade, the definition of the product design has started to change, acquiring new valences, migrating from an obsessive focus on the functional to a focus on the product user experience. Thus, the classic principle "Form follows function" became "Form follows experience", as the new slogan of product design. The experience with the product has grown, reaching new values, and now is seen as an essential part of the design process and even as part of the function itself. As a result, products based on sensory and multisensory experiences have begun to develop.
This paper aims at a detailed study on the multisensory experience with the product, within the user experience. Therefore, the five human senses are analyzed to determine the connections between them and the user, through the implementation at a product level, in which the sensory design and emerging technologies are highlighted. Thanks to new technologies, sensory design has developed new horizons in the field of multisensory experience, which has led to the focus on the user and the user experience. In order to implement emerging technologies for generating sensory and multisensory experiences, a multidisciplinary approach is needed, including, on the one hand, technologies and, on the other hand, human sensory perception. These two parts, unitary understood in the design process, can lead to the digitization of sensory experiences and their reproduction through technological products. Thus, it can develop into an experience simulacrum, often multisensory, in which the user, as the final consignee of design products, becomes immersed into the multisensory experience. Following the sensory-technological study, implementations of luminaires will be proposed, as design products.
In order to visualize a spectrum of possible implementations, linked to the latest technological innovation, it will be seen how the application of the latter, in the field of product design, applied to luminaires, will give the sensory and multisensory new definitions and new experiences that overcome the condition of the classic product, the strictly functional one, reaching a unique experience, perceived in a Gestalt way.

Keywords: senses, multisensor, sensory design, technology, user experience

ASSESSMENT OF SECURITY FOR MOST VISITED E-COMMERCE SITES IN ROMANIA

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Abstract:

The growth of internet hosting is impressive. Every company wants to make a lasting impression using a well designed website. But its security should be a priority because it is open to public. Since the advancement in cyber attacks are an imminent threat vector, it is a necessity to implement a defensive mechanism. Best security practices are shared by security research community through experiences and case studies to improve security. Some authors mentioned the importance of penetration testing, which should be done intermittently. Penetrationn testing is a security strategy that can be used to find vulnerabilities through simulated controlled attacks. Some proposed open-source tools that automate the process of detecting and exploiting flaws. Some created pentesting frameworks which are sets of tools and scripts that an organization can use to easily identify existing data breaches. And many authors describe methods like Brute Force, Guessing Login Info, Cross-site Scripting, SQL-Injection and Insufficient Supervising. Frameworks, methods and tools that security professionals use to evaluate websites, applications, networks and systems breaches are described in literature.

This paper presents a study on penetration testing and its standard, the tools used to discover vulnerabilities before someone with malicious intents does and defensive strategies that can be implemented to protect systems and information. In this work 7 e-commerce sites from Romania were scanned to consider an assessment of the general situation of the websites. In the process we used scanner programs from Kali Linux which is an open-source, Debian-based Linux distribution geared towards various information security tasks, such as Penetration Testing, Security Research, Computer Forensics and Reverse Engineering. We presented information gathered about the technologies and infrastructure like host’s operating system for determined websites, their choosing as web server, the platform they work on, security equipment used and Web Tracers. The study shows what kind of information can be collected on a public website and what kind of vulnerability scanning can be done by an ordinary user.

Keywords: Penetration testing, website, cybersecurity, vulnerabilities, countermeasures

EVALUATING THE PERFORMANCE OF A LINEAR MODEL USED IN REGRESSION

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Abstract:

The possibility of making predictions has an important role in machine learning. Even though perfect relations cannot be found in the real world, predictions of a new variable depending on another one’s value, can be made by using regression. In regression, there are two types of variables: a dependent variable and one or more independent variables. The dependent variable is called “target” and it will be predicted knowing one or more independent variables (causes).
The purpose of the research is to show the way in which variables (characteristics) are chosen, variables which are representative for obtaining the regression model and for calculating the accuracy of the model. I have used the data set: https://s3-api.us-geo.objectstorage.softlayer.net/cf-courses-data/CognitiveClass/ML0101ENv3/labs/FuelConsumptionCo2.csv. Since this model will produce an output given any input or set of inputs, we can then check these estimated outputs against the actual values that we tried to predict. The relation between carbon emission and fuel consumption or the size of the engine is a relation that can be linearly approximated. For modelling and evaluation I used Python, together with scikit-learn and stats models library. In the first part, I used a simple linear regression model, then I used a multiple regression model. It is very important to choose a characteristic from the p-characteristics of the object that respects the 5 assumptions for a correct regression model: linearity, no endogeneity, normality and homoscedasticity, no autocorrelation, no multicolliniarity. Because a predictive regression model predicts a dependent value, we must calculate the model’s ability as an error. There are many ways of estimating the ability of the predictive regression model, but most frequently we calculate the Root-Mean-Square Error (RMSE). I applied the models. In the end, I compared the values obtained for: Mean absolute error, Residual sum of squares, R2-score. The results obtained are acceptable, which shows that the characteristics are chosen correctly. Model evaluation leads a Data Scientist in the right direction to select or tune an appropriate model.

Keywords: accuracy, linearity, model, regression, residual error

CARBON OFFSET CALCULATORS

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Abstract:

The Earth's climate has changed along history. We had, in the last 650,000 years, seven cycles of glacial advances and retreats, with the abrupt end of the last ice age about 11,700 years ago marking the beginning of the modern climate era and of human civilization. Most of these climate changes were provoked by very small variations in Earth’s orbit, changing such way the amount of solar energy received by the Earth.
The current warming trend is of significance, because it is related with the human activity since the mid-20th century.
The nowadays climate warming coincides with the increasing of the greenhouse gases concentration in the atmosphere, especially carbon dioxide. Some solutions, like urban agriculture, are investigated with the purpose to oppose this phenomenon. The carbon sequestration capacity measures the carbon offset’s intensity. We aim to study the factors that influence the carbon sequestration in urban environments and this paper introduces a basic tool, namely a fuzzy expert carbon offset calculator, realized in MATLAB.

Keywords: carbon sequestration, fuzzy system, neural network, modeling and simulation

MODERNIZATION SYSTEM OF THE ELECTROFILTERS FROM THE STEAM BOILER REGARDING THE INCREASE OF THE DUSTING PERFORMANCES

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Abstract:

The modernization system is located behind the steam boiler that includes connections between the boiler components and will be achieved by partial reuse of the mechanical part of the existing electrofilters, the same design for the housing and support structure will be kept, with the interior installation rehabilitated and modernized, with the replacement of the existing energization, with electrical equipment and modern automation with a control system and the functional monitoring of the electrofilter. The rehabilitated and modernized dust removal installation will ensure an efficient dust removal and will ensure the retention of the ash from the flue gases at max. 50mg/Nm^3. Each component must allow manual operation, and the control unit must allow individual operation. For the sequential program it is necessary to observe the respective waiting times of the individual actions, for example the pumping time, the operating time of the shock absorber. These waiting times are relevant to the process. The waiting time is a monitoring time. If the monitoring time is exceeded it will generate a relative delay error. Relative delay errors downgrade a switching.

In order to optimize the operation of the electrofilter in terms of dust emissions and energy consumption, the dust measurement signal downstream of the electrofilter will be used to regulate high voltage units. The energy control system regulates the energy consumption of the electrofilter, so that the concentration of gas dust after the electrofilter remains constant. The concentration of clean gas dust can be set as a control value by means of the control system, as well as the maximum concentration of clean gas dust, which cannot be exceeded at all.The data necessary for the installation of the control and instrumentation system are contained in the document Detail Design Control process and instrumentation. The system consists of a rotoformer control system, a transport control system, a mixture of components, an ESD system and a communication system between the two control systems.

Keywords: boiler, dust removal system, electrofilters, modern automation

INFLUENCE OF THE CHOICE OF PARAMETERS ON THE QUALITY OF THE KERF ON A OXYTOME PLASMATOME HPI

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Abstract:

We made three mild steel samples that were cut with O_2 on a OXYTOME PLASMATOME HPi using 3 type of cutting: "fuchsia", "blue" and "cian". The input data of the process parameters (gas pressure, cutting speed, power and cutting type) affect the cutting quality we studied about. From the study we found that gas pressure and cutting speed had a pronounced effect on quality cutting. The lower gas pressure produces a smaller width of the kerf, and the higher gas pressure produces a larger width of the kerf which affects the quality of the material, but also the type of cutting defines the quality of holes of a certain thickness of material. This paper investigates the influence of the choice of parameters on the quality of Kerf, the thickness of the workpiece, the cutting speed and the auxiliary gas pressure on the cutting quality in the industrial plasma cutting of stainless steel.
The quality of the cut is of the most importance when a high degree of precision and precision is required. Checking the quality of the cut was based on kerf geometry (kerf width and perpendicularity deviation), surface hardness and quality of the cut edge. The materials used in this experimental investigation were selected to represent the most frequently used materials in many relevant industrial fields, the objective being to find general criteria and well-optimized sets of process parameters. A factorial design was developed and tested by different process parameters. The width of the arc, the conical angle and the roughness of the surface were measured and analyzed. The analysis was applied and discussed to study the combined effects of the cutting plasma and workpiece parameters, quality output parameters. Finally, a visual inspection of the milling sections in order was performed to exclude slag formation, uncut area and irregularities on cut faces.

Keywords: cutting, kerf, plasma, pressure, oxigaz, steel

SHORT LITERATURE REVIEW FOR VISUAL SCENE UNDERSTANDING

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Abstract:

Individuals are highly accurate for visually understanding natural scenes. As humans, we are able to interpret multiple levels of a scene. By extracting and extrapolating information we reach the highest stage of scene understanding. In the past few years, scene understanding proved to be an essential part in computer vision applications. It goes further than object detection by bringing machine perceiving closer to the human one: scene understanding integrates meaningful information and extracts semantic relationships and patterns.
It is a very demanding task and the most important problem in systems involving computer vision solutions. A real time perceiving, evaluating and elaborating a description of a dynamic scene which is extracted from the real world environment can lead to unlimited discoveries and improve applications like autonomous vehicles, mobile robots and ambiental assistive systems.
An image is certainly worth 1000 words, each picture outlines a story. The information within it can be in different forms and features like: color, luminance, contour, shape, edges or texture. Images incorporate substantial information consisting of objects, subjects, their features and the relationships between them; all of these creates a scene. The universal functionality of computer vision in order to understand a scene starts with detection, localizing, recognizing and, in the end, understanding it.
To accelerate the state-of-the-art in mobile device perception, in the past few years, the researchers in computer vision focused on scene understanding algorithms with the purpose of giving full semantic understanding to mobile systems. The aim of such algorithms is to obtain semantic knowledge from the environment and to determine the properties of objects and the relations between them. For applicationsin robotics, gaming, assisted living, augmented reality, etc a fundamental task is to be aware of spatial position and capture depth information.
The first part of this paper focuses on deep learning solutions for scene recognition following the main leads: low-level features and object detection.
We take into consideration both directions having in mind future applications. In the end we conclude balancing their advantages and limitations.

Keywords: visual understanding, object detection, relationship detection, classification

COMPARATIVE ANALYSIS OF INTELLIGENT PID CONTROLLERS FOR A MECHATRONIC SYSTEM APPLICATION

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Abstract:

Applications of systems engineering in automotive field increased in the last two decades, when electronic control units become numerous inside a car. Nowadays, control systems are classically implemented or using advanced control algorithms, both being in a much more general control category named Model Based Control (MBC) methods. This paper wants to have a different approach with a method from a Data Driven Control (DDC) category. Model-Free Control (MFC) is a control method from DDC category, which creates its own ultralocal model based on input and output data from the process, the model resulted being updated at every set of measurements. The method is suitable for systems with complex dynamics, uncertainties or dynamics which are difficult to be modelled or with unavailable model. Taking into account these reasons, MFC is an appropriate control method applicable for complex dynamics of the automotive systems.
This paper presents a comparative analysis of two types of MFC controllers: intelligent proportional (iP) and intelligent Proportional Derivative (iPD) for a mechatronic system application. Both algorithms were pretuned with a pole placement procedure and then to improve the control performances, a “trial and error” method was applied for tuning the controllers taking into account the stability domains for the roots of the control error equations. As a mechatronic system, the longitudinal vehicle control speed was considered. The tuned intelligent controllers were tested in simulation in view of the requirement to maintain the desired speed of the vehicle in various traffic conditions such as urban and extra-urban driving cycles. The control performances of iP and iPD controllers were comparatively analyzed using different performance indices. Moreover, the performances of the intelligent PID controllers were also compared with those obtained with a classic PID controller.

Keywords: Model-Free Control, Data Driven Control, Intelligent PID Controllers, Longitudinal Speed Control

PREREQUISITES TO DESIGN A COLLISION FREE TRAJECTORY IN A 3D DYNAMIC ENVIRONMENT FOR AN UAV

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Abstract:

An open problem in the area of drone application is represented by the safe motion planning in a dynamic environment. This research presents the main steps needed for designing a piece-wise trajectory which grants an unmanned aerial vehicle (UAV) to reach a destination pose in a workspace with dynamic obstacles.
The first objective is characterized by the examination of kinematics and dynamics of a quadcopter. From a theoretical point of view, we build a nonlinear mathematical model based on Newton-Euler equation. In order to certify the accuracy of the designed model, we choose as system of interest the Crazyflie 2.0 nano-drone. After we investigated the internal architecture structure of this system, the validation of the mathematical model was confirmed by MATLAB simulations by considering the 4 fundamental movements for a quadcopter: roll, pitch, yaw and thrust. Also, an open loop real-time experiment was conducted for this purpose.
The second step aims to properly map the 3D environment. For this objective, we focus on a 3D rectangular cuboid decomposition of the static environment, method which was obtained by extending the 2D rectangular cell decomposition. With this technique, the free space of the workspace is divided into rectangular cuboids (cells) labelled as free, while the cells intersecting the obstacles are labelled as mixed or occupied. This representation follows the octree structure data, where each node is represented by a cell. For a better understanding of this iterative procedure used for cell decomposition, a pseudocode is included in the paper.
Based on the described preconditions, an algorithm for a collision free trajectory for a quadcopter was developed. The evaluation of the proposed path planning algorithm occurred for different scenarios and the validation of the results was established through numerical simulations. In the end, a comparison for 2 path planning scenarios is shown: for a 3D static environment and for a 3D dynamic environment, where the movement of the dynamic obstacle is known.

Keywords: cell decomposition, dynamic environment, path planning, unmanned aerial vehicle

PERFORMANCE EVALUATION OF RAPIDLY EXPLORING RANDOM TREES FOR AUTONOMOUS ROBOTS PATH PLANNING

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Abstract:

This work aims to evaluate an approach for planning trajectories free of collision for autonomous entities in 3D environments. The main goal is to propose a method for guiding a robot in a 3D space with static obstacles to freely finalize its tasks. To fulfil this goal the method starts from an existing 2D pathfinding algorithm, and extend it to 3D environment. The chosen algorithm is the Rapidly Exploring Random Trees (RRT), which can be used to efficiently search in a nonconvex and high dimensional space. This algorithm has the advantage of minimum required information for computing the free of collision trajectory. Furthermore, RRT can build a space-filling tree with only information about the depth which is a big improvement regarding runtime of the application. Another key point of RRT is that due to it small input data, it can run in a loop, in order to estimate iteratively trajectory in an environment with dynamic obstacles.
From theory to practice: a 3D environment is built using an RGB-D sensor, Kinect V2, which is capable of returning a point cloud of working scene containing both depth and colour frames. Based on depth and colour information, free space can be identifyied for future robot trajectories. Moreover, information from colour frames are used to differentiate and classify the objects from working scene into categories such as: obstacles and task elements. This step ensures decomposition of the working scene, in order to minimize the amount of information that needs to be processed. As a result, only relevant information related to the 3D environment is saved and used afterwards by the pathfinding algorithm.
Testing and evaluation of the proposed algorithm was done through numerical simulation using 3D environment model in the loop. Results revealed the performance of the proposed solution for trajectory estimation in an indoor setup with static obstacles.

Keywords: pathplanning, rapidly exploring random trees, robotics

EYE IMAGE SEGMENTATION METHOD BASED ON THE MODIFIED U-NET CNN ARCHITECTURE

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Abstract:

The paper presents a new eye image segmentation method used to extract the pupil contour based on the modified U-net CNN architecture. The analysis was performed using two databases which contain IR images with a spatial resolution of 640x480 pixels. The first database was acquired in our laboratory and contains 400 eye images and the second database is a selection of 400 images from the publicly available CASIA Iris Lamp database. The results obtained by applying the segmentation based on the CNN architecture were compared to ground truth data manually annotated. The results obtained are comparable to the state of the art.

The purpose of the paper is to present the implementation of a robust segmentation algorithm based on the U-net convolutional neural network that can be used in eye tracking applications such as human computer interface, communication devices for people with disabilities, marketing research or clinical studies.

The eye image segmentation is usually performed using either a model based or feature based algorithm, which can be influenced by image artifacts caused by lighting conditions, corneal, eyeglasses or contact lenses reflections, physiological eye characteristics or the presence of eyelashes or eyebrows. This requires a more robust and adaptive algorithm that can be used in order to accurately determine the pupil contour in eye images, such as in the case of the U-net convolutional neural network. Eye image segmentation using different methods such as quantitative segmentation threshold, Bradley method, Kittler method, characteristics separation method was performed in Pasarica et al. 2017. This paper presents a comprehensive comparative study of these methods analyzing the same databases proposed in our current work.

Keywords: convolutional neural networks, deep learning, eye dataset, segmentation, U-Net

CONTROL ARCHITECTURE FOR AUTOMATED VEHICLES TO ENSURE OBSTACLE AVOIDANCE

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Abstract:

The automated vehicle concept is of great interest nowadays for researchers in both academia and industry. These intelligent vehicles can contribute to increase people’s safety, reduce travel cost and travel time, improve the comfort of the driver, reduce traffic jams, and maximize the traffic flow by maintaining a minimal safety gap between vehicles. Taking these into account, this paper proposes a control architecture for an automated vehicle that incorporates a trajectory planner and a trajectory follower for the lateral dynamics and a predictive controller for the longitudinal dynamics. The aim of the proposed solution is twofold: *i)* to plan and follow a path, both in the longitudinal and lateral directions and *ii)* to avoid possible collisions with fixed obstacles on the road. The obtained results illustrate that the trajectory planner succeeds to compute an obstacle free path for the automated vehicle, and the trajectory follower controls the vehicle to track the generated path.

Keywords: automated vehicle, lateral control, longitudinal control, obstacle collision avoidance, trajectory planner, vehicle dynamics

IMPLEMENTATION OF THE THE BERNSTEIN-VAZIRANI QUANTUM ALGORITHM USING THE QISKIT FRAMEWORK

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Abstract:

The quantum computing universe is one of the most exciting subjects in the “information technology” field, especially with the latest physical innovations, such as the creation of D-Wave, IBM Q System One (a 20-qubit quantum computer) and Google’s quantum computer, which recently claimed “quantum supremacy”, by performing a calculation in 200 seconds instead of 10,000 years, as it world have taken on a classical computer (they use a 54-qubit Sycamore processor). Now it is possible not only to simulate the circuits on classical computers, but to also run them and measure the results on real platforms. The starting point in quantum processing is the qubit (quantum bit), which, unlike the classical bit, that can either be 0 or 1, can simultaneously be in multiple states (superposition) with different probabilities $|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$, where α and β are complex numbers, that verify $|\alpha|^2+|\beta|^2 = 1$.

This paper describes the basics of quantum computing and then focuses on the implementation of the Bernstein-Vazirani algorithm, which can be seen as an extension of the Deutsch-Josza problem (that solves the question on whether a function is balanced or not). The idea behind the B-V algorithm is that one can find a secret number (sequence of qubits) using only one measurement, unlike the classical counter-part, that requires n measurements, where n is the number of bits of the secret number. The implementation of this algorithm, using the Python programming language, along with the Qiskit framework (an open-source library for quantum operations from IBM), illustrates how to create and simulate a circuit for such an algorithm. It is based on the “phase kick-back” quantum effect, which allows the CNOT gate to change the state of the control qubit, if the target qubit is in an eigenstate. The circuit is dynamically generated for the required number (which in practice is received from a different source) and is used to measure the probability of each qubit. The algorithm can also be extended for different types of data and can be used for signal or image processing, as well as applications in cryptography.

Keywords: Bernstein-Vazirani, quantum computing, quantum algorithm, Qiskit

TOWARDS REAL-TIME SEMANTIC INSTANCE SEGMENTATION

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Abstract:

Environment understanding plays an important role in different computer vision-based applications, including autonomous vehicles, mobile robots and assistive systems. Usually, humans are able to solve this task by using their visual system. Whether humans look at images, videos or find themselves in real-life scenarios, they can easily locate and recognize objects of interest. The main goal in the development of intelligent mobile systems is to replicate this intelligence using a computer. Remarkable results for semantic segmentation and object detection have been obtained recently based on deep neural networks, especially in the automotive field. Still, the semantic instance segmentation remains a challenge, but a highly required output of the computer vision component of an intelligent mobile system such as an autonomous car.
The development of intelligent mobile systems implies, among other things, faster execution of the pipeline as sometimes a critical decision has to be made (e.g., avoiding and obstacle). Therefore, these types of systems require neural networks that are able to make predictions that are both fast and accurate. Preliminary tests performed for the Mask RCNN neural network showed that the inference time for an image using the best-pretrained model was 19 seconds per image. The second-best model needed around 0.54 seconds per image to output the semantic instance segmentation results (around 2 frames per second), which is not real-time execution for an intelligent mobile system. Therefore, the scope of the experiments we have performed is to determine which network parameters could be fine-tuned in order to jointly maintain prediction accuracy and improve prediction speed.
Two parameters were identified as having a greater impact on the inference time: the scale factor and the number of the region proposals. We designed two experiments in which we varied the value of these parameters in order to determine the influence on the inference speed and prediction accuracy.
In this paper, we present the experiments we developed in order to evaluate the performance of Mask RCNN solution, emphasizing its accuracy and real-time operation capability, correlated with the requirements of the envisioned applications. We then conclude on its advantages and limitations and propose several approaches for improvement.

Keywords: intelligent mobile systems, Mask RCNN, semantic instance segmenatation, real-time, vision-based applications

BOOK OF ABSTRACTS

SECTION 2. Chemistry; Chemical engineering; Environmental engineering

Corythycha ciliata (Say, 1832) – INVAZIVE INSECT FROM GREEN AREAS IN THE CHIŞINĂU, REPUBLIC OF MOLDOVA

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Abstract:

The paper is dedicated to familiarization of the sycamore lace bug *Corythucha ciliata* (Say, 1832) and present data about biological features, detection of outbreaks, pest manifestation in the green spaces of Chisinau during the vegetation period of 2019 and methods of its control. This species is alien invasive in Europe, detected in green areas of the Republic of Moldova in 2005. Lace bug - *C. ciliata* (Say, 1832), is native species to North America, accidentally got into Europe. Originally the species develops on the on the platanus trees (*Platanus orientalis* L.) and causes damages. As a result 10% of the attacked trees died. European expansion began in the 60's. XX, with the import of the planting material. In the countries of origin the insect developed 2 generations per year. Leaves on host trees affected by pests insect dry in a proportion of 50 to 100%. The larvae and adults of lace bug with a sucking buckal apparatus damaged the leaves of trees; they suck the cellular juice from the leaves of the host plant. The attacked leaves stain (specific to chlorosis), become yellowish, dry and fall down over the time. Thus, the attacked trees lose their decorative appearance, and in the event of secondary diseases and pests, the attacked trees risk to dry out gradually. To keep the population of *C. ciliata* under control, chemical methods (specific insecticides) can be used, but also biological methods, based on different microorganisms could be possible to apply also. The use of chemical methods to stop the spread of this pest in urban areas is possible, but the method is very expensive and with negative impact for environment. This research on ecological monitoring of outbreaks of pest species *C. ciliata* on the streets and parks of the Chişinău city was conducted in 2019.

Keywords: *Corythucha ciliata*, lace bug, pest, Republic of Moldova

IMPACT OF CLIMATE CHANGE ON NATURAL RESERVATION POIANA CU SCHIT FROM IASI COUNTY

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Abstract:

Global climate change is affecting the future of the planet, due to the disastrous effects produced by them. Romania is vulnerable to a number of natural climatic and geological hazards, such as: floods, landslides, droughts, droughts, extreme temperatures, as well as earthquakes, which can cause numerous losses of human lives and economic losses. The simulations made using global climate models indicated that the main factors that determine this phenomenon are both natural (variations in solar radiation and volcanic activity) and anthropogenic (changes in the composition of the atmosphere due to human activities). Only the cumulative effect of the two factors can explain the changes observed in the global average temperature over the last 150 years.
Preventive and protective measures are needed to reduce the damage caused by climate change. For this it is essential to monitor the factors that determine these changes, to evaluate the risks and to establish measures in order to reduce the damages that would occur.
Starting from these considerations, we propose to monitor the natural and anthropogenic factors in the area of the Poiana with Schit nature reserve in Iasi County and to establish the prevention and protection measures, in order to keep it unchanged.

Keywords: climate change, environmental factors, nature reserve, preventive measures, risk evaluation

EFFECT OF THIOGLYCEROL GROUPS ON DIFFERENT INORGANIC MATERIALS AND THEIR APPLICATIONS

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Abstract:

Bentonite is a mineral powder made of montmorillonite type clay, belonging to the smectite class. This type of mineral, from a structural point of view, has an octahedral layer framed among others of tetrahedral type. This type of clay mineral has an equidistance of about 14Å. Bentonite is widely used in various industries such as pharmaceuticals, cosmetics, chemistry, civil engineering, agri-food and more. This type of materials are widely available, minimal costs, recyclable, generally used for the preparation of various catalysts and absorbents. Numerous studies have reported major improvements in the desired characteristics of montmorillonite-based nanocomposites (mechanical properties, high temperature stability etc.), and have shown that chemical grafting of various thioglycerol groups attached to the surface of smectic materials leads to the formation of efficient host matrices for metal nanoparticles that have shown an increasing affinity for hydrogen. Polymers of this type can be impregnated between clay layers of smectites. Dendrimers are a special class of macromolecules among all types of polymers, these being made up of monomers that are gradually synthesized. These types of polymers have in their structure regular branches that start from a central core. When the number of terminal functions is amplified, then a new generation is formed. In this paper, three generations of Boltorn-type dendrimers (H20, H30, H40) were used to impregnate each one in samples of sodium bentonite modified by the ion exchange process. In the literature, these polymeric compounds have been tested as catalysts, especially in the development of nanomaterials. The techniques used to analyze the effect of the interaction of dendrimers with cationic clays are: to characterize the interlamellar space change-X-ray diffraction, or to prove the effectiveness by evaluating the chemical interactions-Fourier transform infrared spectroscopy, respectively, those for stability thermal-thermogravimetric analysis and last but not least those specific techniques known for observing the spatial distribution of phases and structural changes. Another application of dendrimers can be on the oenology side, being very few studies. Until now, they have been used to prevent various defects of a physico-chemical nature such as tartar precipitation. Another direction of research in this field could be to test the degree of resistance to prevent the formation of oxidase phenomena quite present in white wine but also to capture certain unwanted organic compounds.

Keywords: applications, characterization analysis, dendrimers, intercalation, smectite

SYNTHESIS OF CoO – NiO COATED ON K10-MONTMORILLONITE USED FOR CATALYTIC OZONATION OF TARTRAZINE (E102)

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Abstract:

Food colorings are the most common additives in the food industry. The color of a food product makes it look more attractive to consumers. Based on national regulations and safety reasons, all countries have a list of permitted food colors. Tartrazine (Fig. 1) is a water-soluble food coloring. It is widely used as an illicit substance in food (beverages, syrups etc.) due to its low price, good stability and the desired color of saffron. In different countries, the permissible amount of Tartrazine is strictly limited due to its potentially toxic nature. Numerous papers have been published in the literature indicating the direct relationship between tartrazine and carcinogenicity, genotoxicity, hyperactivity in children, reproductive toxicity and asthma.

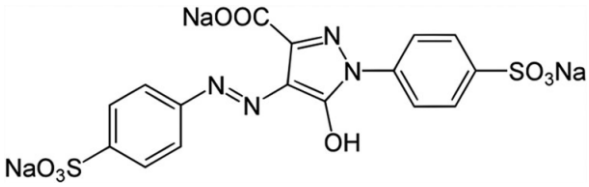

Fig. 1. Molecular structure of Tartrazine (E102), $C_{16}H_9N_4Na_3O_9S_2$, molar mass 534.3 g / mol

Synthesis of CoO – NiO nanosheets on K10-montmorillonite: 0.1 M $CoCl_2$ and 0.1 M $NiCl_2$ is added to each other dropwise at room temperature with stirring. The obtained solution is added over the 2% MtK10 clay solution, 80˚C, 4 hours and placed in the microwave for 10 minutes for aging (polymerization). The aged solution was filtrated with distilled water to remove excess Cl^- ions. The ionically exchanged clay obtained is dried in steps for 1 hour at 60, 80, 100 and 120 ˚C and calcined at 525˚C. It is expected to obtain a clay coated with Cobalt and Nickel ions. This chemically modified clay will be tested in order to obtain a total mineralization the food coloring Tartrazine through catalytic ozonation.

Keywords: catalytic ozonation, food dye, K10 - montmorillonite, synthesis, Tartrazine

PHYSICO-CHEMICAL CHARACTERIZATION OF HAZARDOUS LIQUID WASTE

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Abstract:

This paper presented a less studied subject, regarding responsible recovery of different liquid wastes. The large-scale quantities of liquid wastes had a recognized negative impact on environment. These types of wastes have a heterogeneous character, being difficult to classify it and recover. The listed disadvantages are the main consequences of the non-selective collection, a weak regulation and poor guidance for population and enterprises in this direction. More studies in this field are compulsory.
In order to characterize the liquid waste samples received from the Indeco collection center in Ploiesti, they were subjected to analyses with specialized equipment, by standard methods. The results obtained from the analyses showed a variant composition of the samples especially in terms of water content. Some showed percentages between 84% and 98.8% of the aqueous phase, mixed with oily organic substances, petroleum products and heavy metals, including cadmium, lead, nickel, etc. On the other hand, the samples with low water content have high values of chlorides, sulfates, volatile substances, suspended matter, and some samples have a low flash point (79°C). The heterogeneous composition of this type of waste, as well as the substances dissolved either in the aqueous or in the oily phase, imposes a high degree of difficulty in processing and therefore the classic methods of recovery are difficult to use. Advanced methods of separation, membrane filtration, solvent extraction, etc. can be successfully applied to certain industrial liquid wastes, selectively collected wastes, with known composition, low variability and high degree of process repeatability.
In the case of hazardous liquid waste studied in this paper, found in great amounts in specific tanks and further produced in volumes of thousands of m^3 per year, the proposed solution in this paper is the gasification of liquids in hydrogen plasma. The process main aim is to obtain synthesis gas, further used as a fuel for producing electrical energy and thermal energy. Thus, waste capitalization involves not only decreasing the current tanks, reducing the risk of environmental pollution by infiltration into soil and groundwater, but also self-sustaining processes and reducing the need of using new resources.

Keywords: gasification, hydrogen plasma, landfill, liquid waste characterization

IFFUSION MODELS FOR CONTROLLED RELEASE OF COMPONENTS FROM A MATRIX

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Abstract:

The controlled release of a component-matrix system is predominantly conducted by the diffusion process. To optimize the time required for a component-matrix design it is required to use a suitable mathematical model to characterize the system.
Mathematical modeling of some components release as drugs, cosmetic products, pesticides and fertilizers can be very useful to speed up product development and better understand the mechanisms which control the component release from diffusion-controlled delivery systems. In this work reservoir devices and matrix systems of different geometries are presented. These theoretical models can predict the dependency between different types of component-support interaction. The models presented take into account the geometry of the support, the porous or the compact structure of the support, the support-component interactions and the type of support-fluid medium contact (fixed bed, mixing vessels, etc.).
This paper highlights the necessity of using mathematical models for the life cycle development of a new product.

Keywords: controlled release, diffusion, mathematical modeling, polymer, porous matrix

A NEURO-EVOLUTIVE METHOD APPLIED FOR OPTIMIZING THE PROCESS FOR OBTAINING BRICKS USING SILICON BASED MATERIALS

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Abstract:

One of the processes for obtaining bricks involves the use of silicon-based materials containing clay, ash, sawdust and bark. Emissions resulting from the technological process are composed of methane gas, carbon monoxide and nitrogen oxides. The optimization of the process involves the determination of a starting composition (quantitative and qualitative, as well as component substances) so that the noxes to be in the minimum quantity.
The database used in experiments is composed of 118 data, within which the composition of the material based on silicon is varied and the quantities of gases discharged on the chimney of the furnace are determined. Therefore, mathematical modeling involves the determination of the dependence between the noxious results from the technological process and the raw material used for the manufacture of bricks. The instrument used for modeling were artificial neural networks (ANNs) of feed-forward type whose architecture was determined by the trial and error method based on minimizing the mean square error. Thus, a hidden two-layer neural network was selected that balanced generalization performance against network size and complexity. Small errors were obtained in the modeling stage, 4.2% in the training phase and 7.5% in the validation phase.
The determined neuronal model was included in an optimization procedure solved with a simple genetic algorithm (GA). The objective function, scalar formulated, has as components the quantities corresponding to the emissions. Genetic algorithm provides, after an iterative calculation, the optimal values for decision variables (amounts of clay, ash, sawdust and bark), which are the inputs of neural model. With these inputs, the neural network compute the final values of amounts of emissions. One of the results of the optimization is represented by the following values: 518.17 mg/Nm^3 methane gas, 823.38 mg/m^3 carbon monoxide and 94.67 mg/m^3 nitrogen oxides. Regarding the composition, the optimal case corresponds to an initial material composed of clay, ash and sawdust. An important stage of the procedure was the experimental verification of the results obtained in the neuro-evolutionary optimization, in which the deviations from the values calculated with ANN-GA were below 10%.

Keywords: artificial neural network, bricks, genetic algorithm, modelling, optimization, silicon based materials

HETEROSTRUCTURING LAYERED DOUBLE HYDROXIDES WITH METALS NANOPARTICLES OR METAL OXIDES FOR APPLICATIONS IN NANOMEDICINE

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Abstract:

Research on two dimensional nanostructures have attracted much attention in the last decades due to the potential applications of these materials in nanoscience. The 2-D nanostructures possess versatile physical-chemical properties that allow their use in different biomedical applications such as diagnosis, prevention but also the treatment of the specific diseases. An example of typical 2D nanomaterials is the class of layered double hydroxides (LDHs). They belong to the class of anionic clays and are defined by a 2D-layered structure in which the layers are positively charged and the stability of the layered matrix is ensured by anions that electrostatically bind the adjacent layers. Heterostructuring specific LDHs compositions with nanoparticles of metals (MeNP) or metal oxides will give rise to complex properties.
Herein, we present the newest results regarding the synthesis methods and characteristics of some of the LDHs and their heterostructures with nanoparticles of Cu, Zn or Au. To synthesize the LDHs with specific compositions, for example MgAlLDH, ZnAlLDH, various synthesis procedures such as coprecipitation method, reconstruction method or hydrothermal method are used. Advanced characterization techniques such as X-ray diffraction (XRD), IR spectroscopy (FTIR), UV-VIS spectroscopy, scanning electron microscopy (SEM) and transmission (TEM) are used for studying the LDHs and their heterostructures properties. The novel materials are currently tested for applications in nanomedicine (controlled release of drugs, biosensors, etc.), catalysis, environmental protection, pharmacy, and others. In this context some specific applications in nanomedicine of MeNP/LDHs for fighting diseases such as vaccine production, antibacterial and antiviral applications are also presented.

Keywords: Layered double hydroxides, nanomedicine, nanoparticles, physical-chemical characteristics

A STUDY OF THE FLAMMABILITY OF MAGNESIUM IN ABSENCE OF OXYGEN

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Abstract:

This study was performed to provide information on the flammability of magnesium in absence of oxygen. An investigation of the ignition and burning characteristics was conducted on prepared specimens of magnesium ribbon from magnesium ribbon coil, by cutting samples 7 to 10 mm in lenght and about 11 to 13 miligrams in weigh. Source of ignition was represented by a kantal wire that is passed throught magnesium samples and positioned on the device for connecting to electricity. The electricaly connectable device is added in to a pressure resistant chamber in volume of 350 cm^3 connected with gas sources, vacuum pump and provided with an evacuation outlet for depresurisation. Gases (CO_2 and N_2) was added in to the chamber after using vacuum pump to extract the air. The major results of the prepared specimen tests are presented as a family of curves which indicate the heating effect of kantal wire, the termal efect of magnesium ignition and the time and temperature were ignition take place. In general, tests indicated that magnesium can ignite in gaseous mixtures of CO_2 and N_2. The manner of developing combustion can be considered an indicator of gaseouse mixtures composition.

Keywords: carbon dioxide, combustion, ignition, magnesium, nitrogen

PHYSICO-CHEMICAL CHARACTERIZATION OF ARABICA AND ROBUSTA SPENT COFFEE BLENDS

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Abstract:

Market surveys have lately shown that coffee is the second best-selling commodity – after oil, the second best-selling edible product in the world – after edible oil and obviously the second best-selling drink in the world – after water. The best-selling types of coffee in the trade are Arabica and Robusta coffee blends in different proportions. Arabica coffee, which is grown in Central and South America but also in some African countries, has a lower caffeine content, but a more intense aroma. Robusta coffee is grown in Africa, Indonesia and Brazil and is more profitable than Arabica. It is also bitter and has a much higher caffeine content. Among the different preparation methods, the best coffee is thought to be made with automatic expressers, which involves the passage of pressurized water through the extremely fine ground coffee. The increase in purchasing power and the disappearance of excise duty in 2016 have also contributed to a significant increase in coffee consumption in Romania in recent years. The increase in coffee consumption has resulted in significant quantities of spent coffee blends for which different uses may be found. Our paper is aimed at analyzing the spent coffee blends in a professional DeLonghi coffee maker in which four types of coffee available on the market were used. The analyzed coffee contains blends of Arabica (W_A%) and Robusta (W_B%) coffee in various proportions: W_A/W_B= 70/30, 50/50, 35/65 and 20/80. Spent coffee blends density was measured experimentally at different temperatures using an Anton Paar DMA 4500 densimeter. The browning index was measured by reading sample absorbance at 420 nm, using a T60 Vis spectrophotometer (PG Instruments). We used 5 fir-wood boards of LxWxT = 120x30x5 mm to determine whether spent coffee blends may be used for the beautification and protection of wood. We used a brush to apply spent coffee blends on four of them and, after drying, the contact angle was measured using a KRUSS Goniometer. Values ranging from 70° and 90° were read for the treated plates, whereas the value on the untreated control plate was 52°. These results confirm that the spent coffee blends could be used to beautify and protect wood.

Keywords: browning index, contact angle, density, physico-chemical characterization, Spent coffee blends

MULTIPLE LINEAR REGRESSION (MLR) MODELS USED FOR THE PREDICTION OF EXCESS THERMODYNAMIC PROPERTIES FROM EXPERIMENTAL REFRACTIVE INDEX

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Abstract:

In engineering, it is very important to have thorough knowledge of the thermodynamic and conveying properties of fluid mixtures, since they are used mainly to study the interactions that occur in fluids with several components, and also to design various distillation separation, fractional distillation and solvent extraction equipment, and to achieve a scientific approach of the risk factors affecting separation processes. Our research group used statistical experimental data processing by the multiple linear regressions (MLR) method in order to estimate the excess molar volume starting from experimental values of the refractive index for ternary systems. We will prove in this paper that this type of experimental data processing may also be used to predict other thermodynamic excess properties: excess viscosity and excess surface tension (P^E). In order to attain our goal, we will use both literature data and experimental data obtained in our laboratory about the thermodynamic properties of certain fluid mixtures. The mathematical models created correlate excess thermodynamic properties with the refractive index, standard temperature and fluid mixture composition: $P^E = A_0+A_1X_1+A_2X_2 +A_3(T/298.15)+A_4n$, where X_1 and X_2 are molar fractions, T is temperature expressed in Kelvin and n is the refractive index. These models are extremely useful in practice. The refractive index may be easily determined, with rather good accuracy and low substance consumption. These mathematical models also allow the determination of other properties such as density, viscosity and surface tension, which are more difficult to determine by experimental methods.

Keywords: density, multicomponent systems, MLR models, refractive index, surface tension, viscosity

STUDY ON THE DESIGN OF A HYDROGEL FOR A CONTROLLED DRUG RELEASE OF A FROM A TEXTILE SURFACE TO THE HUMAN PATHOLOGICAL SKIN

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Abstract:

The study is based on information developed through an extensive bibliographic work whose conclusions are published in a forthcoming review. Thus, the paper presents the stage of the researches regarding the design of a biomaterial in the form of a hydrogel having the capacity to include a lipophilic drug which, after lyophilizing the biofilm, will release the drug at a therapeutic concentration. Experiments follow the parameters of appropriate concentration and therapeutic during time in the conditions of the physiological environment created by the mesoderm in the presence of perspiration at 37 ^{o}C. The experimental part considers obtaining the artificial tegument conceived by a new procedure. The polymer matrix is obtained from a mixture of polysaccharides and proteins structured around polymers with an appropriate mechanical strength. The experimental study presents the stage of the experimental works up to this date. Characterization items optimized are: the degree of swelling, porosity, water content, free volume and density of the hydrogel.

Keywords: artificial tegument, biomaterial, degree of swelling, hydrogel, porosity

VEGETAL EXTRACTS WITH APPLICATION IN AGRICULTURE

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Abstract:

Food quality is a topical issue and for this reason specialized international bodies have stipulated that it must be ensured starting with the raw material, most often supplied by agriculture. It follows that the practice of sustainable and quality agriculture will provide both the food industry and the people with high quality raw materials and products. In this context, the tendency to replace the chemical synthesis products used in the process of cultivation and growth of plants must also be considered. In this regard, attempts are being made to replace chemical pesticides with biopesticides, as a number of biologically active compounds from plant sources have high efficacy, multiple mechanisms of action and manifest low toxicity to mammals. This paper presents the results obtained in the direction of investigating the effectiveness of the bioinsecticidal effect of alcoholic / hydroalcoholic extracts obtained from plants in the spontaneous flora of the region of Moldova (Romania) (i.e. Artemisia absinthium; Primula veris; Origanum vulgare; Achillea millefolium) on seed pests during storage of insects (Acanthoscelides obsoletus) and those of crops (Colorado potato beetle (Leptinotarsa decemlineata say.)). We used several solid-liquid extraction methods (maceration, Soxhlet extraction and sonoextraction), using as extraction solvent 96% ethyl alcohol or hydro alcoholic solutions (50% and 70%). The extraction efficiency was assessed qualitatively by calculating the degree of extraction and quantitatively by determining the total amount of polyphenols and flavonoids extracted. The study of the extraction processes was done considering several physical parameters (for example, solid / liquid ratio: 1/10, 1/15 and 1/20, respectively), extraction time (10, 30 minutes, 60 minutes), temperature (30 °C, 45 °C and / or 60 °C). The extracts obtained were also characterized by UV-VIS spectra. The obtained results led to the conclusion that the extracts obtained can be considered effective products at the level of farms and micro-farms, ecological, because they do not affect the plants or seeds stored, but protect them.

Keywords: biopesticide, extraction solid-liquid, natural resources, plant extract

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TREATED FLY ASH APPLIED TO ADSORPTION OF Cu(II) IONS FROM AQUEOUS SOLUTION

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Abstract:

Copper ion represents one of the biggest polluters of the environment. Copper ion concentration levels more than 1.3 mg/L (according to the US EPA) makes provocation of eyes, nose, and mouth, stomachache, lung cancer, and neurotoxicity. A variety of traditional techniques for water treatment have been shown to be capable of removing copper from wastewaters. The adsorption process is the most used technique due to its efficiency and simplicity. Continuously, the research studies regarding the adsorption of copper ions by different adsorbents were extended. In particular, from all proposed materials, either natural or synthesized adsorbents, the fly ash have been widely employed. Therefore, The main idea of the present study was to investigate the possibility of using the treated fly ash as low cost adsorbent for Cu(II) ions.
In this research, the adsorbent has been synthesized by treating the fly ash with NaOH, 2M by direct activation method, 1/3 solid/liquid ratio. The treatment of fly ash at 90^0C, 4h contact time enhances the removal efficiency of the material. Kinetic studies indicated that adsorption of Cu(II) ions was chemical adsorption.
The pH of Cu(II) solutions was adjusted to 5 with HCl. At certain time intervals, the samples were collected and filtered. The concentration of Cu(II) ions was measured spectrophotometrically using rubeanic acid. The adsorption of Cu(II) was studied using 10 g/L adsorbent dose at 300 RPM for 480 min at room temperature. The removal efficiency, RE (%) was calculated using the following Equation: $RE = (C_0 - C_{eq})/C_{eq} \times 100$→ where C_0 is the initial Cu(II) concentration (mg/L), C_{eq} is the concentration of Cu(II) at equilibrium, V is the volume of solution (L) and m is the mass of adsorbent. From Figure 1 it can be observed that the adsorption capacity, respectively the removal efficiency was rapidly in the initial stage and gradually increased with equilibrium. In order to examine the controlling mechanism of the adsorption process, two kinetic models were used (Table 1).

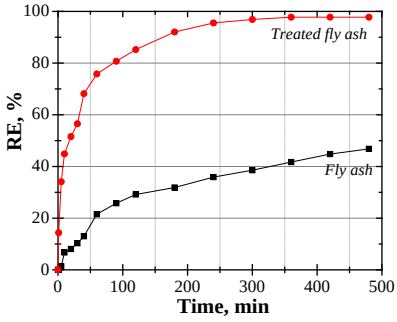

Fig. 1. Effect of contact time on RE

Table 1. Comparison of the kinetics models for the adsorption of CR

Adsorbent	q_e, exp (mg/g)	Pseudo first order kinetic model		Pseudo second order kinetic model		
		k_1, (1/min)	R^2	q_{cal}, (mg/g)	k_2 (g/mg min)	R^2
Fly ash	11.9	0.0037	0.9753	14.88	0.0005	0.9982
Treated fly ash	27.9	0.0248	0.9644	28.57	0.0049	0.9986

According to the results presented in Table 1 it can be stated that the experimental data were fitted by the Pseudo second order model.The fly ash was successfully synthesized by direct activation method and applied for Cu(II) ions adsorption. The results show that the treated ash has a good ability to retain Cu(II) ions from solutions. At a concentration of 300 mg/L, pH 5, 10 g/L adsorbent dose, the adsorbent prepared adsorbs approx. 98%.

Keywords: cooper ions, fly ash, kinetics, removal

THIOLATED CHITOSAN FOR MEDICAL APPLICATIONS

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Abstract:

Chitosan is obtained by alkaline deacetylation of chitin, which is one of the most abundant polysaccharides in nature. This biopolymer is a cationic polysaccharide composed by β-(1→4)-linked D-glucosamine and N-acetyl-D-glucosamine. For some properties like non-toxic, biocompatible, biodegradable, soluble in water, swelling behavior, chitosan has received considerable attention as a novel excipient in drug delivery systems, and has been included in the European Pharmacopoeia since 2002. The purpose of this review article is to present the methods about thiolated chitosan with their thiol compounds for different medical applications. Thiolated chitosan has an improved mucoadhesive property compared to unmodified chitosan, due to the disulfide bonds between thiol groups of thiolated chitosan and cysteine-rich glycoproteins, and permeation enhancing properties. The strong cohesive properties of thiolated chitosans make them highly suitable excipients for controlled drug release dosage forms. The primary amino group at the 2-position of the glucosamine subunits of chitosan is the main target for the immobilization of thiol groups. This modification of chitosan helps to obtain a new product without using a synthetic crosslinker agents, which are toxic. The formation of thiolated chitosan was obtained with thiol compounds like N-acetyl-L-cysteine, 2-iminothiolane, acid thioglycolic (TGA) or acid thiolactic (TLA), 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride (EDC), N-hydroxysuccinimide (NHS). It was used different methods for synthesized thiolated chitosan: by a simple condensation reaction, carbodiimide-mediated reaction, direct coupling with 2-iminothiolane-HCl. After derivation of the chitosan, the thiol group content will be determinated by Ellman’s reagent. Others caracterizations were realized functions the applications’s thiolated chitosan: for antibacterial activity, as a local mucoadhesive delivery system, to ocular delivery of therapeutics, a potential material for minimally invasive surgery of bone repair, including discriminating normal from cancer cells, to evaluating the efficiency of newly developed drugs, and to assessing cytotoxicity of various chemicals, materials for tissue engineering, as coating material for stents.

Keywords: biocompatible, chitosan, medical applications, mucoadhesive property, thiol groups

TAILORING NANOARCHITECTONICS OF LAYERED DOUBLE HYDROXIDES PHOTOCATALYSTS FOR DEGRADING ORGANIC POLLUTANTS

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Abstract:

Nowadays the industrial dyes and garment industries are big concerns for water pollution. Photocatalysis has been established as an effective tool for removing various toxic pollutants from contaminated wastewaters by using efficient catalysts that are active under irradiation with solar or Uv light. In recent years, the scientific community has been increasingly interested in the novel emerging technologies that might guarantee an efficient mineralization of a wide variety of toxic organic pollutants in less harmful products

We present in this study novel photocatalysts based on Zn - based layered double hydroxides (LDHs), as active photocatalysts for degrading the following industrial dyes: drimaren red (DR), drimaren navy (DN) and nylosan (NYL). X-ray diffraction (XRD), IR spectroscopy (FTIR), and UV–vis analyses were used to investigate the structure, composition and photoresponsive features of the catalysts. The catalysts photoefficiency was analyzed by UV–vis following the absorbance (A) at 283 nm, 277 nm and 567 nm characteristic to DR, DN and NYL, respectively. The results point out that the studied LDHs present high photocatalytic activity for the degradation of the dyes; such that the maximum photocatalytic efficiency was about 80%. The catalytic performances of ZnAlLDH and the derived mixed oxides are a function of the specific composition of the clay. Furthermore, the photocatalytic results show that the best catalyst for the photodegradation of Drimaren Red, Drimaren Navy and Nylosan Navy, under the experimental details used in this study, is ZnAl750ºC that showed an efficiency higher than 80% for the degradation of all of the dyes, after 4 hours of irradiation.

Keywords: Layered double hydroxides, organic pollutants, photocatalysts

VALORIZATION OF RESIDUAL BIOMASS AS BIOSORBENT FOR THE REMOVAL OF REACTIVE DYES FROM AQUEOUS MEDIA

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Abstract:

In the last years, the water pollution has become the global problem because it contributes to both the crisis of drinking water and deepening the ecosystem pollution.
The purpose of this work is to remove by biosorption the Orange 16 dye from aqueous media using the industrial residual biomass of *Lactobacillu*s sp. immobilized onto sodium alginate. In this context, the main directions of study were; (i) the study of the biosorptive properties of the residual biomass of *Lactobacillus* immobilized in sodium alginate used as biosorbent in the process of retaining the Orange 16 dye from aqueous solutions or from certain industrial wastewaters resulted the textile industry; (ii) the effects of certain established operational parameters on the biosorption process of the selected dye are studied, such as: temperature, solution pH, initial dye concentration, size of granules with immobilized biomass, phase contact time, amount of biosorbent; (iii) the study of biosorption equilibrium using different models presented in the scientific literature: Freundich’s, Langmuir’s (I, II) and Dubinin-Radushkevich’; (4i) the study of the kinetics and thermodynamics of the biosorption process of Orange 16 dye.
Processing the experimental data showed that the Langmuir model is the one that is best suited for interpretation. Also, the process runs optimally on small size particles (Φ=0,5 mm) that allow large biosorption capacities due to the fact that it provides a larger contact surface biosorbent - dye in the aqueous solution. Also, the study of the equilibrium, the kinetics and thermodynamics of the biosorption process allows the determination of some quantitative parameters used for the process modeling and optimization, the identification of the biosorption mechanism and the rate determining step.

Keywords: biosorption, dye, immobilization, isotherm, *Lactobacillus* sp., residual biomass

STUDIES ON THE STRUCTURAL CHARACTERISTICS AND NANOARHITECTONICS OF GALLIUM/LAYERED DOUBLE HYDROXIDES HETEROSTRUCTURES

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Abstract:

Tireless effort has been devoted nowadays to explore the multifunctionality of heterostructures based on nanoparticles of metals or metal oxides and layered double hydroxides (LDH). Particularly, complex nanoarchitectonics of LDH and nanoparticles have received high interests since their optical and electronical properties recommend them as actors in nanocatalysis, and nanomedicine.
Herein, we report the heterostructuring of nanosized Ga with MgAlLDH, ZnAlLDH or ZnGaLDH. A simple synthesis method that is based on the reconstruction of the LDHs using its “memory effect” has been used to prepare the new materials.
X-Ray diffraction (XRD), Transmission electronic microscopy (TEM) and Energy-dispersive X-ray spectroscopy (EDX) have been used to characterize the structural, chemical composition, and morphology of Ga/LDH. The results of XRD analysis revealed that Ga NP/MgAlLDH and GaNP/ ZnGaLDH heterostructures recovered the initial hydrotalcite structure while that the crystallinity decreased and the peaks of the LDHs become larger, less intense and are shifted to smaller values of 2θ. TEM analysis shows that nanoarchitectonics of Ga/LDH is defined as nanoparticles of Ga that are in close contacts with the LDH matrices such that the small Ga nanoparticles with diameters below 5 nm are dispersed on the larger platelets of the LDH.

Keywords: layered double hydroxides, nanoarchitectonics, structural properties, transmission electronic microscopy, X-Ray diffraction

AN OVERVIEW BASED ON EXTRACTION TECHNIQUES OF BIOACTIVE COMPOUNDS FROM VEGETAL BIOMASS

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Abstract:

Plants are recognized for their property of providing bioactive compounds. Moreover, plants represent a reservoir of primary and secondary metabolites. The interest in determining as many secondary metabolites as possible in plants has been created the need for economical, rapid and efficient extraction methods. To isolate bioactive compounds from plants is important to use an appropriate extraction method. The main objective of the extraction is to obtain the maximum number of secondary metabolites or, ideally, all the secondary metabolites present in the samples. Today, traditional methods of extraction (maceration, infusions, digestion, percolation) have been replaced by advanced extraction methods for increased extraction efficiency and selectivity of bioactive compounds. Regarding advanced techniques, they use it different ways for extraction such as ultrasound waves, microwaves, supercritical fluids, pressurized liquids, etc. This extraction techniques are considered innovative because final extracts is rich in compounds of interest without formation of residues and compared to existing extraction method are environment friendly, fast, simple and automated. The key for efficient extraction of bioactive compounds from vegetal biomass is selection of an appropriate extraction method. Failure in this regard could lead to the loss or destruction of the target compounds during the preparation step. This review is focused on the recent trends on the extraction of bioactive compounds depending on the nature of sample matrices and their chemical classes including, alkaloids, phenolics, terpenes, etc. Moreover, we review the selection and trends of most suitable extraction methods for botanicals such as ultrasound assisted extractions (UAE), microwave assisted solvent extractions (MASE), supercritical fluid extraction (SFE), pressurized liquid extraction (PLE). Newer methods of extractions and their optimizations might be developed in future with the increasing demand of plant based natural products.

Keywords: bioactive compounds, extraction methods, plant extracts, pressurized liquid extraction, supercritical fluid extraction, ultrasound assisted extractions

EVALUATION OF THE DRYING PROCESS OF SOME VARNISHES AND PAINTS APPLIED ON FIR WOOD

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Abstract:

Given the growing interest shown by the population in the restoration and redecoration of their dwelling spaces, wood is a material that has been increasingly used both in exterior constructions and for interior finishing works. The most important stage in the obtaining of a coat of paint able to protect wood is the drying process, which results in a coat of paint, called film, which strongly adheres to the surface of the wood. In order to analyze the drying process and to determine the effective diffusion coefficients, respectively, we applied three types of alkyd paint available on the market: a Teflon protective lake (SLT), yacht lake (LYP) and superglossy enamel (ESI) on dried fir-wood disks which were 5 mm in diameter. The drying process and the formation of the film itself were achieved using a Mettler Toledo TGA-SDTA851^e device, under constant 25°C temperature, using synthetic air with a 20 ml/min flow rate as drying agent. The drying curves: material moisture (MR) – drying time (t) enabled us to determine effective diffusion coefficients (D_{eff}) considering the analytical solution of Fick’s equation for the "thin plate" case and longer solvent removal times: $\ln\left(\frac{\pi^2 MR}{8}\right) = -\pi^2 \frac{D_{eff}}{\delta^2} t$, where δ is the thickness of the coat of varnish or paint on the wooden disk. The effective diffusion coefficient values obtained ranged between $0.4 \cdot 10^{-12}$ and $2.4 \cdot 10^{-12}$ m^2/s. The theoretical models achieved show higher deviations in the case of the ESI and SLT samples. The cause of these deviations may be the complex composition of the paint film but also the fact that a "skin effect" film is formed after drying at linear decreasing speed, which prevents solvent diffusion.

Keywords: aint, drying process, effective diffusion coefficient, theoretical models, skin effect

PREDICTION OF LATENT TUBERCULOSIS REACTIVATION IN PATIENTS WITH RHEUMATIC DISORDERS USING MACHINE LEARNING ALGORITHMS

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Abstract:

It was constituted a database that refers to the diagnosis of patiens with latent tuberculosis, patients who have rheumatoid arthritis and that are under biological therapy and classical therapy with conventional drugs.
The classification problem aims at predicting a disease indicator (Quantiferon), given a series of statistics on patients, such as age, sex, medical history, type of therapy followed, the start date of therapy and the results of medical analyses.
For classification purpose, classical machine learning algorithms are used which generally give good results: Artificial Neural Networks (ANN), Random Forest, Nearest Neighbor (NN), k-Nearest Neighbors (kNN), C4.5 decision trees and Support Vector Machines (SVM). At each algorithm, the most important parameters were varied, such as: the number of trees for Random Forest, the number of neighbors and the weighting function of the importance of the neighbors for k-Nearest Neighbors, the variants pruned or unpruned for C4.5 decision trees and the kernel type for support vector machines.
Several types of problems were addressed: • considering all records as independent and directly applying classification algorithms (Table 1 in which the best results are highlighted); • considering only the last record, the most recent one, for each patient and applying classification algorithms; • considering the dynamic evolution of patients, respectively creating a distinct model for patients who became positive during the treatment, i.e. for which the Quantiferon indicator was initially 0 and at one time bacames 1.

Table 1. Classification results for all records in the data set

Classification method	Accuracy at training (%)	Accuracy at cross-validation (%)
Random Forest, 100 trees	100	80
Random Forest, 1000 trees	100	81.7391
ANN	100	80
kNN, k=20, w=1/d	**100**	**84.3478**
kNN, k=100, w=1/d	100	81.7391
C4.5, pruned	80	80
C4.5, unpruned	92.1739	77.3913
SVM, Puk kernel	85.2174	78.2609

Therefore, the most credible predictions can be obtained with kNN algorithm that provides the best accuracy at cross-validation, 84% respectively.

Keywords: artificial neural network, classification algorithms, k-Nearest Neighbors, rheumatic disorders, tuberculosis.

BIOSORBENTS FROM RENEWABLE RESOURCES

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Abstract:

New materials created, in their various forms and structures, whether simple or composite, natural or synthetic, obtained by chemical synthesis or biotechnology, or resulted from the processing of renewable raw materials or classical synthetic materials are the basis for the development of various modern technologies, of high quality products, or of high-performance separation methods applicable in numerous fields: from environmental protection to ensuring the quality of life of people (medicine, for example). Currently, there is an increasing concern for the use of impressive amounts of existing materials in nature, and also renewable resources. The study of the ability of living organisms to synthesize materials, with specialized functions, to solve a number of pressing problems, and also to ensure resources, becomes key target in connection with the recyclability of materials and compliance with the principles of sustainable development. The paper presents the results of our team on the study of the adsorbent properties of new materials, based on cellulose, manufactured in various forms (hydrogel, gram microcrystalline cellulose, cellulose fibbers), in the retention of organic dyes (Brilliant Red HE-3B, Methyl Blue) and / or metal ions (Cu (II), Co (II)), chemical compounds polluting surface water. The study of the (bio) sorption process balance involved the determination of the influence of some physical-chemical operating parameters (solution pH, sorbent dose, temperature, contact time, chemical species concentration), but also the data modelling based on isotherm models from the literature (Langmuir, Freundlich, Dubinin- Radushkevich) following the determination of certain quantitative parameters that by comparison with the corresponding values obtained in the case of some adsorbent materials known and cited in the literature it allows the evaluation of their effectiveness as new types of adsorbents. The study was deepened with kinetic and thermodynamic modelling, and physico-chemical characterization of adsorbent materials. The results showed that the tested biomaterials can be considered effective in retaining polluting species from aqueous environments, the efficiency depending on the nature and structure of the chemical compound retained, and the particularities of the (bio)sorption process.

Keywords: aqueous medium, biosorbent, biosorption, cellulosic materials, chemical pollutants

INORGANIC POROUS STRUCTURES APPLIED ON MEDICAL TEXTILES

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Abstract:

The paper presents the level of research on the characterization and application of porous materials based on clays: Bentonite (B), Montmorilonite K10 (Mo), Clinoptilolite (Cl) as well as mesoporous silica, Santa Barbara Amorphous -15 (SBA-15), on a textile surface as a controlled drug release system. The following inorganic structures were considered: B, Mo, Cl and SBA-15 with experimental structural characterization based on: specific surface, pore size and sorption performance in relation with silver sulfadiazine (4-amino-N-(pyrimidinyl) benzene sulfonamide) (SSD) and silver nanoparticles obtained by means of $AgNO_3$. The possibility of fixing the porous structures together with the SDD absorbed in the pores of clay was explored on the inner surface of a clothing complex consisting of the blouse and trousers for the patient with acute wounds.
The work refers to the design of an assembly consisting of an outer fabric made of 50/50% polyester and cotton, a thermally adhesive sheet of ethylene vinyl acetate (EVA) cut inside and the third porous membrane of poly tetrafluoroethylene (PTFE) that allows diffusion of the drug from the surface of the fabric to the dermis, but retains the zeolite on the textile surface. The textile support forms a pocket with PTFE foil through the thermo-adhesive membrane. In the pocket is inserted the drug adsorbed in the porous material.
The second working variant is that of designing a woven structure with a controlled porosity that, under the action of perspiration, extracts the drug from the pores of clay without the latter having direct contact with the human dermis.
The paper refers to the design of an algorithm that allows obtaining a textile fabric with a therapeutic role in wound therapy.

Keywords: bentonite ,clay, clinoptilolite, medical textiles, montmorilonite, SBA-15

EFFECTIVE TREATMENT OF BACTERIA POLLUTED WASTEWATERS BY HETEROSTRUCTURING NANOPARTICLES OF GOLD-SILVER WITH LAYERED DOUBLE HYDROXIDES

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Abstract:

The quest to provide clean water for all the people has led to a tremendous boost in the synthesis of advanced materials that are able to decontaminate polluted water by harvesting the light energy. Nowadays major concerns to safe drinking water are due to the presence of biohazards such as harmful microorganisms that often lead to epidemic outbreaks. However, there are numerous scientific challenges in developing efficient materials for removing antimicrobials from wastewaters. These include finding suitable biocompatible materials with a low cytotoxicity that can remove the harmful microorganisms. Given the growing interest in the use of layered double hydroxides (LDH) in biology and nanomedicine this work presents nanoarchitectonics of LDH and gold or gold-silver nanoparticles as potential solutions to remove S. aureus and E. coli from contaminated wastewaters under light irradiation. Au/LDH and Au-Ag/LDH were obtained via a green chemical procedure in which LDH serves a dual function of both facilitating the synthesis of nanoparticles of Au and Ag and acting as a support. The effects of the heterometallic composition of the 2-D LDH layers (e.g. ZnAlLDH; MgAlLDH) and the mono/bi-metallic (Au or Au-Ag) identity on removing the microorganisms were investigated under irradiation with solar or UV-light. MgAlLDH and ZnAlLDH showed poor activity, while heterostructuring with a low amount (~5% wt) of gold or silver (2%wt) highly improved the effective treatment of the tested bacteria. Au-Ag/MgAlLDH and Au/MgAlLDH are the most potent resulting in 95% and 90%, respectively, cell death, under solar light. Under UV irradiation inhibit the biocidal effects of Au-Ag/MgAlLDH. It is expected that such low-cost and efficient antimicrobial activity of Au/LDH and Au-Ag/LDH could find potential clinical and environmental applications.

Keywords: bacteria pollutants, layered double hydroxides, nanoparticles, wastewaters

RECOVERY OF LAVENDER WASTE AS A BIOSORBENT

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Abstract:

The aim of this paper is to characterize and investigate the biosorptive properties of lavender waste, resulting from the process of steam distillation of the whole lavender plant for the extraction of volatile oils. In order to achieve this objective, we mechanically processed the dried lavender waste by crushing it, transforming it into a powder that was initially characterized physic-chemically. Subsequently, the adsorbent properties of this material were investigated, using it as a biosorbent in the process of retaining a reactive dye (Orange 16) from aqueous solution. The study consisted in establishing the influence of some physical, operational parameters, on the development of the biosorption process: the pH of the solution, the biosorbent dose, the contact time between phases, the initial concentration of the dye, the temperature. The study of the biosorption equilibrium of the reactive dye Orange 16 on lavender waste followed the modeling of the experimental data with the help of some adsorption models, the calculation of the thermodynamic parameters and the study of kinetics of process. The obtained results showed that the tested material - lavender waste - has biosorptive properties and can be considered as an adsorbent for colored organic species polluting the aqueous environment, being also a way to capitalize on this type of waste.

Keywords: aqueous media, biosorption, organic pollutant, reactive dye, waste management

NEW DERMATO-COSMETIC FORMULATION USING BIOLOGICALLY ACTIVE COMPOUNDS FROM INDIGENOUS NATURAL RESOURCES

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Abstract:

Along with the amazing development of the dermato-cosmetic industry, there has also been a surge in the research concerning the biologically active ingredients that are the basis for these products. Significant growth has taken place both in the presentation forms of the dermato-cosmetic products and in the production methods, which ensure the quality and performance of the respective compounds.
At the same time, special attention is paid to those pathologies which affect the population more frequently. Among these, rosaceae, venous leg ulcer and acne have been some of the most challenging diseases in recent years, due to their complex ethiology and difficult cure.
Among the most recent components of therapeutic formulas of the above mentioned diseases, scientific research has shown great interest in bioactive compounds with antioxidant action, which contribute to combat the effects of free radicals that appear within tissues.
Resveratrol is a well known and largely used bioactive compound in products meant for both internal and external usage.
The main concern regarding it focuses on new presentation forms, which should lead to efficient therapeutic management of the above mentioned diseases. It is also aimed at obtaining new preparations in which resveratrol is associated with other antioxidant compounds (i.e. ferulic acid) in order to increase the antioxidant capacity (determined by FRAP, DPPH, ABTS methods) while maintaining specific properties.

Keywords: antioxidant, biologically active compound, dermatocosmetics, ferulic acid, natural resources, resveratrol

SINGLE AND COMBINED TOXICITY OF LEAD AND CADMIUM TO LETTUCE

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Abstract:

The researches developed within the past decades on heavy metals toxicity have clearly demonstrated that although in low concentrations, some heavy metals are necessary for plants growth, an excessive amount in soil, over the allowable limits, they can produce negative effects on plants development. Moreover, heavy metals can inhibit the photosynthesis activity of plants. These harmful effects depend on different factors such as metal type, metal concentration and plant species. Through ingestion, inhalation or dermal contact, heavy metals are easily accumulated in the human body, posing a major risk to human health even at low levels of exposure. Considering all these aspects, the aim of our paper was to investigate the effects of single and binary mixture of lead and cadmium ions on seed germination and roots, shoots and leaves growth of lettuce (*Lactuca sativa Attraction*). The tolerance of lettuce to heavy metals toxicity was investigated under laboratory conditions, by analyzing the degree of deterioration of the plant physiological processes. Plant exposure to this heavy metals at increasing metals concentration from 10 mg/L to 500 mg/L produced a decrease in seed germination degree and plant growth. Cadmium ions proved to be more toxic than lead ions. Lettuce seeds were able to germinate at concentrations of 250 mg/L and 500 mg/L Pb(II), at a degree of 80% and 70%, respectively, while in the case of Cd(II), the toxicity was lethal to seed germination. The results showed that, under the binary mixture of heavy metals (Cd and Pb), lettuce growth and development is influenced in a greater extent compared to individual heavy metals. In all experimental conditions, the most severe toxicity was observed in the case of roots growth, compared to the other plant components. Considering these results, the future studies will focus on the evaluation of human health risks posed by the consumption of lettuce contaminated with heavy metals.

Keywords: heavy metals, *Lactuca sativa Attraction*, phytotoxicity, tolerance index, toxicity index

REMOVAL OF HG(II) FROM AQUEOUS SOLUTION ON CLAY ADSORBENT: ISOTHERM AND KINETICS STUDIES

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Abstract:

In the last decades, a major challenge for researchers is finding a new generation of adsorbent materials used in wastewaters treatment process, because these are the main sources of contamination with heavy metal ions. Due to their toxic effect and accumulation tendency, heavy metals are considered persistent environmental contaminants and represents an important problem with serious ecological and human health consequences. For many years, a lot of adsorbent material obtained from natural sources (clay material, yeasts, peat) or industrial waste (fly ash plastics) were used for remediation processes but among the tested adsorbents, clay materials have received increased attention, mainly because they are cheap, available in large quantities in almost all region of the world and required only a few stages of preparation. On the other hand, clay materials contain on their surface a variety of functional groups which can represent the binding sites in adsorption processes - clay represent an important category of materials having ion exchange properties of mineral origin that are part of the alumino – silicate series. In this study, a local clay material was tested as natural, low- cost adsorbent alternative for the retention of Hg(II) ions from aqueous solution. The adsorptive performaces of clay materials were evaluated as a function of initial solution pH, adsorbent dose, initial Hg(II) ions concentration, contact time and temperature. The experimental results were modeled using various isotherm models (Langmuir, Freundlich and Dubinin- Radushkevich) and three kinetics models (pseudo-first oder, pseudo-second order, intra-particle diffusion) and the specific parameters of each model were calculated. The experimental results included in this study highlight the practical applicability and increased potential of this clay material as adsorbent in the decontamination processes of the environment.

Keywords: Adsorption, aqueous media, clay materials, Hg(II) ions removal

ASSESSEMENT OF CRUDE LIQUID PHASE RESULTED FROM HYDROTHERMAL CONVERSION OF SPRUCE BARK WASTES

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Abstract:

There are several methods that could be applied for thermochemical conversion of biomass, namely: pyrolysis, torrefaction, hydrothermal carbonization. Amoung these, hydrothermal carbonization (HTC) has important advantages (possibility to use wet biomass in the process, mild operating conditions, lower energy consumption, higher hydrochar yield) and could be considered an environmentally friendly process.
Ussualy, the most used solvent in the HTC is distillated or deionized water. Water provides the necessary conversion reaction medium while is able to facilitate reactions such hydrolysis, dehydration and decarboxylation. There are two distinct phases resulted from biomass hydrothermal carbonization process: a solid phase (hydrochar) and a liquid phase (bio-crude liquid). The most relevant is the hydrochar, a value-added biobased product obtained with a yield of 60-70%. However, interest have to be attributed also to liquid phase that still presented an important chemical composition.
This paper is focused on hydrothermal conversion of spruce bark *(Picea abies)* and on the influence of process parameters on the chemical composition of liquid phase resulted from HTC. In Romania spruce forests represent 19.95% of the total forest fund area and generate relevant wastes quantities. Thus, the feedstock is available and in large amount. The thermal conversion of this feedstock was carried out in a stailess-steel autoclave with a glass vessel inside, at 200 and 240 °C, with a residence time of 2.5 and 5 h and a solid to liquid ratio of 1:10. In order to characterize the resulted bio-crude liquid, several methods like total phenols content, total reducing sugars content, dry matter content were applied. Chemical characterization of liquid phase showed a presence of an important content of polyphenols (10–12 mg GAE/g spruce bark) and carbohydrates (2–5 mg/g spruce bark). The process parameters had a significant influence on chemical composition. Thus, an increase in temperature and residence time leads to a decrease of total polyphenols content and carbohydrates as well.

Keywords: bio-crude liquid, hydrothermal carbonization process, spruce bark biomass, total polyphenols content, total reducing sugars content

SUSTAINABLE URBAN COMMUNITY – A CONCEPTUAL FRAMEWORK

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Abstract:

The contemporary society can be characterized by the transition from modern to post-modern society, and an extremely rapid urbanization. The planet is faced with global challenges such as climate change and maintaining the services and integrity of natural resources. The urban communities become the spaces where population benefits from increasing opportunities (mainly in terms of education, employment, social services and technological development) but simultaneously have to face increasing constraints (in terms of decreasing environmental quality with detrimental effects on human health). Worldwide, strategies and policies are developed and implemented to cope with the number of people living in cities, which roughly is estimated to be two-thirds of population by 2030. As set by the United Nations (UN), by 2030, countries are called to action in order to meet the Sustainable Development Goals (SDGs). The 11th goal requires to “make cities and human settlements inclusive, safe, resilient and sustainable”.
Responding to the increased need for implementing the sustainable urban development, the scientific community makes effort in developing frameworks and indicators to assess these issues. Since the concept is extremely complex, it requires knowledge coming from multiple domains, and usually the approach is sectorial, thus the development of an integrated framework is crucial.
The present study is addressed to the sustainable city concept as it is tackled in the scientific literature, in terms of indicators and their aggregation, used to assess the urban sustainability. It aims to develop an integrated framework allowing a better understanding of anthropic activities in urban communities according to their environmental impacts and to assess the existing premises for the development of sustainable urban communities.

Keywords: indicator, sustainable city, sustainable urban community

WASTEWATER MONITORING IN THE COFFEE INDUSTRY

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Abstract:

Coffee is globally the second largest, most traded commodity after petroleum, where the production processes use large volumes of water. The wastewater produced is composed by a variety of inorganic and organic substances and therefore mechanical, biological treatment and advanced treatment is needed.
This study objective is to determine the efficiency of a coffee wastewater treatment plant. In this case the wastewater is stored in silos and pumped to pre-treatment chamber comprising of pH trimming, flocculant (polymer) dosing and solids removal by decanter centrifuge. Centrifuges are designed to separate solids from sludge mixtures with continuous and space-saving dewatering systems combined with high efficiency. Solids removed and dewatered by the pre-treatment centrifuges are conveyed by screw conveyors.
The wastewater accumulated in the centrifuge tank is pumperd into a bioreactor through heat exchangers to reduce the influent temperature. This bioreactor contains microorganisms that convert colloidal and dissolved carbonaceous organic matter into CO_2 and other compounds.
The effluent of the biological stage is directed towards ultrafiltration, a process that is realised under pressure on hollow fiber membranes and is effective for the removal of organic matter, colloids and suspended solids and microorganisms.
For this study, influent and effluent samples were collected and characterized for the following indicators: Temperature, Turbidity (NTU), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Phosphate, Ammonia, Nitrate, Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN) with the purpose of monitoring the efficiency of the wastewater treatment plant.
Considering the last two years of monitoring, the results obtained for the removal efficiencies are presented in Table 1:

TSS, %	**COD,** %	**Phosphate,** %	**Ammonia,** %	**TN,** %	**TKN,** %
99.64	87.56	44.26	96.51	28.84	64.83

We have noticed a significant reduction in removal efficiencies of suspended solids, organic matter and ammonia and concluded that the combination of a centrifuge, aeration bioreactor and UF is effective.

Keywords: coffee industry, wastewater quality indicators, wastewater treatment

USE OF BIOCHARS OBTAINED FROM MARINE ALGAE BIOMASS AS POTENTIAL BIOSORBENTS FOR THE REMOVAL OF Zn(II) IONS FROM AQUEOUS MEDIA

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Abstract:

In last years, various natural materials or agricultural and/or organic industrial waste have been tested for the removal of metal ions from aqueous solution, but unfortunately none of these has been applied at industrial scale. This is because most of these materials have moderate biosorption capacities and therefore require the use of large quantities. A solution to this problem could be the transformation of such materials into biochars, by pyrolytic conversion, when their biosorptive performances are often improved. In this study, the removal of Zn(II) ions from aqueous solution was examined using two types of biochars obtained from marine algae biomass (*Ulva lactuca sp.*). The biochar samples were obtained by pyrolysis of algae biomass at two different temperatures (320 and 550 °C), under oxygen-limited conditions. The biosorption experiments were performed in batch systems, by varying initial solution pH (2.0 – 6.5), biochar dosage (4.0 – 32.0 g/L), initial Zn(II) concentration (12 – 210 mg/L) and contact time (5 – 180 min), at room temperature (21°C). Based on the obtained experimental results, the optimal experimental conditions for the removal of the Zn(II) ion on the two types of biochars were established. The isotherm and kinetics modelling of experimental data prove that the biosorption of Zn(II) ions from aqueous solution on biochars occurs predominantly through electrostatic interactions, and that the efficiency of the biosorption process is strongly influenced by the nature of biochar. All the experimental observations sustain the potential use of biochars obtained from marine algae biomass as promising alternative biosorbents for the removal of Zn(II) ions from aqueous media.

Keywords: aqueous media, biochars, biosorption, Zn(II) ions removal

EFFICIENCY OF COAGULATION-FLOCCULATION FOR NATURAL ORGANIC MATTER REMOVAL IN DRINKING WATER TREATMENT

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Abstract:

Natural organic matter (NOM) represents a complex matrix of heterogeneous hydrophobic and hydrophilic components, which can have a considerable impact on drinking water quality. Apart from the fact that they create problems with taste, odor and color of raw water, they are precursors of disinfection byproducts (DBPs), which in turn have negative effects on human health. Numerous technologies to remove NOM by means of water treatment have been employed, but the most common and feasible processes are considered coagulation and flocculation, or other emerging technologies that use coagulants.

This study presents a series of results obtained at laboratory scale for coagulation-flocculation of surface water from Prut River. The experiments aimed to determine the optimal dose of coagulant via Jar-test method in both the absence and presence of the flocculant reagent, to reduce turbidity (NTU), chemical oxygen demand, iron and natural organic matter in raw water (expressed as dissolved organic carbon – DOC, light absorbance at different wavelengths – UV_{254}, UV_{280}, UV_{365}).

The experimental tests were performed at the natural pH of the raw water. Polyhydroxy aluminum chloride (commercial name PAX XL 60) and polyacrylamide (commercial name AN910SEP) were used as a coagulant and flocculant, respectively. Different parameters, such as the coagulant dose (0.05 – 0.2 mg/L), river water temperature (4 and 20°C), rapid and slow mixing time, and presence or absence of the flocculant were investigated. To simulate coagulation, flocculation, and sedimentation conditions, rapid mixing at 300 rpm was performed for 3 min, and slow mixing at 60 rpm was performed for 15 min, followed by a settling time of 30 min. After settling was completed, samples of treated water were collected from the supernatant and analyzed for: turbidity, pH, oxidability, dissolved organic carbon (DOC) and light absorbance which are selected at different wavelengths corresponding to NOM fractions.

The results of this study show that a coagulant dose of 0.14 mL/L, in the presence of the flocculant, at a water temperature of 4°C and rapid mixing for 3 min at 300 rpm, followed by slow mixing for 15 min at 60 rpm, determined a decrease in NOM content (expressed as UV_{280}) of 29%. A higher water temperature (20°C), while maintaining the operating conditions as previously mentioned, resulted in a better NOM removal. In this case, a removal efficiency of 47%, expressed as UV_{280}, could be observed.

Keywords: coagulation, flocculation, jar-test method, natural organic matter, optimal dose

APPLICATION OF PET FLAKES AS LOW-COST ADSORBENT FOR Pb(II) IONS REMOVAL

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Abstract:

Most of industrial effluents discharged from various industries contain large amounts of heavy metals, and have a negative impact on environment, because drastically affects the quality of ecosystems. This is because heavy metals are persistent, non-biodegradable and have a tendency to accumulate in the environment. Among the methods used for the treatment of industrial effluents containing heavy metals, the adsorption is one of the most studied, mainly because has high efficiency and low cost of operation. However, these advantages are closely related to the type of adsorbent material used in the removal processes. PET (polyethyleneterephthalate) is a common synthetic polymer, which is widely used for the packaging manufacturing. Because the degradation of such material requires a long period of time (over 180 years), recycling of PET waste is the most economical possibility that can be used for the valorization of these wastes. Under these conditions, the use of PET flakes resulted from grinding of PET waste, as adsorbent materials can be a viable solution. In this study, easy and rapid adsorption of Pb(II) ions from aqueous solution using PET (polyethyleneterephthalate) flakes as low-cost adsorbent, was examined. The adsorption process was studied as a function of initial Pb(II) ions concentration and contact time, in batch systems. Isothermal and kinetic modeling of the obtained experimental results allowed a detailed description of the adsorption process and to highlight the potential ways of improving the performance of PET flakes in the adsorption processes of heavy metal ions.

Keywords: adsorption, aqueous media, Pb(II) ions removal, PET flasks

ADSORPTION BEHAVIOUR OF PB(II) IONS FROM AQUEOUS MEDIA ON PET FIBRES FUNCTIONALIZED WITH ORANGE G REACTIVE DYE

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Abstract:

The pollution of aqueous environment with hazardous substances such as heavy metals has become an important worldwide problem, due their harmful effect on human health and ecosystems. Among various heavy metals present in industrial wastewaters, Pb(II) is one of the most hazardous metal in the environment, because is has no known biological use and it is toxic for most life forms. Many studies from literature have shown that the adsorption can be a potential alternative technique especially for Pb(II) removal, because has high efficiency, minimization of secondary wastes and use in most of cases low cost of materials. Starting form these considerations, in this study was investigate the adsorption behaviour of Pb(II) ions from aqueous media PET fibres functionalized with Orange G reactive dye. The experimental studies were carried out at different initial Pb(II) ions concentration and contact time, in batch systems, while the other experimental parameters (initial solution pH, adsorbent dosage and temperature) were maintained constnt at optimal values (5.4; 4.0 g/L and 20 °C). The obtained data were modelled using three isotherm models (Langmuir, Freundlicj and Temkin) and three kinetics models (pseudo-first order model, pseudo-second order model and intra-partilce diffusion model), and the specific parameters were calculate for each case. Based on the obtained values of the models parameters, the adsorption mechanism of Pb(II) ions on PET fibres functionalized with Orange G reactive dye is discussed and the potential applications are highlighted.

Keywords: Adsorption, aqueous media, functionalized PET fibres, isotherm, kinetics modelling, Pb(II) ions

PREMISES FOR THE ENVIRONMENTAL ASSESSMENT OF SECOND-HAND VEHICLES IMPORTS IN ROMANIA

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Abstract:

The global auto industry is currently one of the main factors for environmental degradation. According to the International Automobile Manufacturers Organization (OICA), road transport is responsible for approximately 16% of global carbon dioxide (CO_2) emissions, but other impacts are also important: material resource pressures, toxicity-related impact due to processes in the manufacturing and use phases of vehicle.
In Romania, the car fleet increased by almost 9.5% in just one year (2017) and it has exceeded 7.63 million vehicles, of which, at the end of 2018, 5.996 million were passenger cars. According to the National Registration Department, approximately 2.28 million units in the national car park were 11-15 years old (38%), 1.774 million units between 16 and 20 years old (29.5%), 1,719 million over 20 years old (28.6%). As for new cars (0-2 years old), at the end of 2019 there were 287,174 registered units.
The environmental performances of these vehicles is governed at European level by a series of Directives which bring amendments to the 1970 Directive 70/220/EEC. The latest of these European Emissions standards are the EURO 6 which came into force in 2014, but the majority of the second-hand imported vehicles in Romania fall in the EURO2, EURO3 and EURO4 categories, which now are considered very polluting sources.
From these statistic data, it may be observed that the national car park is rather old, and the majority of these old vehicles have just recently joined the national car park through second-hand vehicles imports.
The purpose of this paper is to investigate the dynamics of second hand cars imports in Romania as well as the changes in Romania legislation related in this field. The study is intended to present the framework, motivation and the needs to perform and understand the environmental assessment of second-hand vehicles imports in Romania. This research is carried out in a larger context which is aimed at investigating how these car fleet dynamics (and especially the second-hand cars imports) generate environmental impacts in different contexts and scenarios by using the life cycle assessement methodology.

Keywords: climate change strategies, EURO Norms, life cycle assessement, used cars, vehicles impacs

EFFECTS OF CINNAMON ESSENTIAL OIL-BASED EMULSIONS APPLICATION ON TEXTILES FOR MEDICAL FIELD

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Abstract:

Wound management is a complex and dynamic process, and its main objective is to ensure the rapid wound healing with satisfactory results in terms of tissue regeneration and cosmetic appearance. In many cases, patients with skin disorders suffer from recurrent bacterial infections, which is detrimental for the healing process. Thus, in the development of devices containing active substances with antimicrobial activity, the evaluation of the resilience of textile materials against microorganisms is of real interest. The aim of this paper is to highlight the antimicrobial activity of cinnamon essential oil-based emulsions by immobilization on cotton fabrics, in the treatment of inflammatory skin conditions. The study reveals the obtaining and evaluation methods for the biomaterials developed during the experiment. In this way, seven experimental variants of oil-in-water emulsions type, based on xanthan-propolis-cinnamon essential oil were prepared and immobilized on knitted organic cotton fabric, by the padding method. The samples were evaluated by specific methods, under physical-chemical and stability aspects and also in terms of morphological and antibacterial activity. After 10 days period of recorded values, the stability index indicates an excellent stability of the emulsions, without occurring of the flocculation, creaming/sedimentation, coalescence or Ostwald ripening, normally associated phenomena with emulsion systems. The lowest value of the turbidity was observed for the sample with the smallest amount content of active principle (propolis and essential oil). It was also noticed that the viscosity of the system is not dependent on the volume fraction of active principle, the highest viscosity being obtained when using smaller volume fraction. In terms of antibacterial activity, textile materials treated with bioactive polymeric systems have shown antibacterial effects against both gram positive bacteria (*S. aureus*) and gram negative bacteria (*E. coli*) test strains. Further research on the potential application of textile fabrics treated with xanthan-propolis-cinnamon emulsions for skin inflamations therapies will be extended and will include the study of biocompatibility with human skin and possible allergic reactions.

Keywords: bioactive textiles, antimicrobial activity, xanthan gum, cinnamon essential oil

FOOD WASTE TO MATERIALS: CURRENT TRENDS, GLOBAL PERSPECTIVES AND IMPACTS

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Abstract:

Food production and consumption have a considerable impact on the environment, since one-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tonnes per year. Food waste represents not only a loss of materials, but also a substantial loss of other resources such as soil, water, energy, and workforce. Waste generated during food processing and consumption is becoming increasingly problematic, because it may account over 50% of the total waste produced in different countries, while 60 % contain organic mater.

In this context, an analysis of the current situation of food waste and wastage, continued with the practices possible to be applied to turn food waste in resources as secondary raw materials and energy is very opportune today. This work aims at developing an overview on sources and categories of food waste, their environmental, economic and social impacts, followed by a case study, which addresses the valorization of food waste to biomaterials.

The evaluation of impacts followed the life cycle strategies and methodology and considered several impacts such as: *Acidification Potential* (AP), *Eutrophication Potential* (EP), *Photochemical Ozone Creation Potential* (POCP), *Human Toxicity Potential* (HTP), *Terrestrial Ecotoxicity* (TE), *Photochemical Oxidant Formation* (POF), *Human Toxicity* (HT), estimated based on ReCiPe and CML methods (LCA methodologies) included in GaBi software.

The study demonstrated that food waste can be a sustainable resources of raw materials and energy. This approach can reduce the impacts generated by the food waste in the environment and resources depletion.

Keywords: food waste, impact, life cycle, raw material, resource

STUDIES ON THE CAPACITY OF DIFFERENT MICROORGANISMS TO PROMOTE PLANTS GROWTH APPLIED FOR PHYTOREMEDIATION OF HEAVY METALS CONTAMINATED SOILS

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Abstract:

The potential of microorganisms to promote plant growth and improve the phytoremediation of contaminated soils with organic and anorganic pollutants have been widely documented. These microorganisms are defined as plant growth promoting bacteria (PGPB) and described as “*bacteria that can enhance plant growth and protect plants from disease and abiotic stresses through a wide variety of mechanisms*”. The PGPB can enhance plant growth directly by facilitating nutrients acquisition (e.g. nitrogen, phosphorus) and phytohormone content (e.g. auxin, cytokinins and gibberellins), or indirectly acting as biocontrol bacteria (protect the plants against patogens). The majority PGPB belong to *Bacillus, Pseudomonas, Serratia, Acinetobacter, Pantoea, Psychrobacter, Enterobacter and Rahnella* group species. In our study, three bacteria - *Azotobacter chroococcum, Bacillus subtilis* and *Pseudomonas fluorescens* were isolated from soil to study their interaction with *Linum usitatissimum* (flax), *Panicum miliaceum* (millet) and *Rumex patientia* (patience dock) plants in soils. Therefore, the main objective of this paper was to establish if the selected bacteria may enhance the growth of flax, millet and patience dock plants, followed by proper selection of PGPB for application in phytoremediation of soils polluted with heavy metals. The experiments were carried out in polypropylene pots containing 15 g of soil (two types of soils were used - sterilized and non-sterilized soil) and 2 seeds for each plant. In order to establish the effects of the selected microorganisms on the development of plants, we used seeds inoculated with microorganisms and without microorganisms. The plants were grown for 25 days in the period September 9 - October 3, under laboratory conditions. The results showed that the selected microorganisms can produce positive effects on the growth of flax, millet and patience dock, since the plants were more developed compared to the plants grown in the absence of the selected microorganisms. Also, some differences were observed between the plants inoculated with microorganisms that were grown in sterilized soil and in non-sterilized soil. For example, the roots of *Linum usitatissimum and Rumex patientia* grown in sterile soil are more branched comparative to the plants grown in non-sterilized soil. Further studies will be focused on describing the mechanisms of PGPB.

Keywords: *Linum usitatissimum, Panicum miliaceum,* plant growth promoting bacteria (PGPB), *Rumex patientia,* sterile soil, non-sterile soil

NEW APPROACHES TO OBTAIN GRAPHENE-LIKE MATERIALS FROM LIGNOCELLULOSIC WASTES

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Abstract:

The integrated processing of biomass wastes through new biobased materials with innovative potential and application is one of the critical topics related to circular economy. In the same time graphene-like materials stand out for their defining properties and are used in a variety of applications: chemical activators, adsorbents in wastewater treatment, supercapacitors which are considered to be one of the most important next-generation energy storage devices. Therefore, it is of great significance to explore new approaches to produce such advanced carbon architectures using biomass wastes as precursors.
Due to a large availability, the spuce (*Picea Abies*) bark resulted as waste from sylviculture and industrial activities could be a promising candidate for biobased materials.
This work is focused on the development of graphene-like materials resulted from spruce bark wastes subjected to thermochemical conversions: (i) a hydrothermal carbonization process (HTC), in which the synthesis occurs at a temperature up to 200°C, (ii) a pyrolytic treatment, which uses high temperatures usually above 800 °C and (iii) two combined processes in order to eliminate the disadvantages of chemical synthesis methods.
The feedstock was pretreated (dried and milled through a medium particle size of 0.5-1mm) and subjected to proximate and ultimate analysis in order to point out the main properties (moisture content, ash and volatile matter) chemical (macroelements, trace elements composition), physical (particle size distribution) and biochemical (carbohydrates) composition. The structural characteristics and thermal degradation behavior using specific techniques (FT-IR, SEM, TG) were investigated as well.
Considering the obtained data, a sequence of thermochemical processes proposed to design and synthesize graphene-like materials was highlighted.

Keywords: biomass, graphene-like materials, hydrothermal carbonization, spruce bark, supercapacitors

OPTIMIZATION OF EXPERIMENTAL PARAMETERS FOR Co(II) IONS BIOSORPTION ON *Saccharomyces cerevisiae* YEAST BIOMASS

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Abstract:

In recent years, microbial biomass has emerged as an option for developing economic and eco-friendly wastewater treatment process, therefore, applying biotechnology in controlling and removing metal pollution has been paid much attention, and gradually becomes hot topic in the field of metal pollution control because of its potential application. Microorganisms, as heavy metal bioadsorbents, offer a new alternative for removal of toxic or valuable metals in water. Bacteria, yeast, fungi, algae all of them can be used for remediation processes and it is always recommended that microbe used for bioremediation must have natural decontamination process and the method should be cost-effective. Saccharomyces cerevisiae has received increasing attention due to its unique nature and capacity for metal biosorption. It is one of the most promising biosorbents capable of removing metal ions from aqueous solutions.
The yeast can be easily grown using unsophisticated fermentation technique sand inexpensive growth media as well as the yield of the biomass is high. Secondly, the biomass of Saccharomyces cerevisiae can be obtained from various food and beverage industries as a by-product and easier to get from fermentation industry in comparison with other types of waste microbial biomass.
In this study Saccharomyces cerevisae yeast was used as the biosorbent for the retention of Co(II) ions from aqueous media. The experiments were performed in batch systems, and the influence of some important experimental parameters (such as initial solution pH, yeast dosage, initial Co(II) ions concentration and contact time) on the biosorption efficiency was examined. The modelling of the experimental results was done using three isotherm models (Langmuir, Freundlich and Temkin) and three kinetics models (pseudo-first order, pseudo-second order, intra-particle diffusion). The obtained models parameters were compared with the values obtained for Co(II) ions biosoprtion using others biosorbents. All the experimental results have shows that Saccharomyces cerevisiae yeast has potential to be used for the removal of heavy metals, and this could be an alternative solution for the sustainable valorization of this biomass.

Keywords: aqueous media, biosorption, Co(II) ions, Saccharomyces cerevisae yeast

AN ASSESSMENT OF WASTE MANAGEMENT PRACTICES FOR IMPLEMENTING THE ZERO WASTE STRATEGY. CASE STUDY: COMANESTI, BACAU, ROMANIA

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Abstract:

Nowadays, more and more cities worlwide have joined the Zero Waste Networks with a clear target in implementing Zero Waste Strategies that enable closing the material and energy cycles by promoting a sustainable waste management. There is a widespread distribution of cities in Europe that not only have managed successfully to implement the European vision on the Zero Waste Strategy, but are considered leaders in material recycling such as Contarina (Italy), Vrhnika (Slovenia), or Salacea (Romania).
The main objective of this paper is to evaluate the possibilities of implementing the Zero Waste concept and Strategy in a city with 20,000 inhabitants, located in the North-Eastern Region of Romania. Comanesti municipality (Bacau, Romania) has evaluated the current status of their waste management practices and is making efforts to implement the Zero Waste Strategy.
The methodology proposed in order to achieve this objective consists in the analysis of: the waste generation and waste composition indicators (for the reference period 2017-2019); the changes needed in the existing waste collection infrastructure; the overview of investment and operating waste management costs, with a comparison of the current situation and the Zero Waste scenario and environmental performances estimated by the Zero Waste Index and associated environmental benefits methodology.
Comanesti municipality generated municipal solid waste rates between 248-287 kg/inhabitant/year, in the period 2017-2019, which is almost half of the European average. The current waste management practices are predominantly focused on waste landfilling with a significant 85% of waste diverted to landfills which means material and energy losses, high negative environmental impacts and high associated costs for remedial solutions. Less than 10% of waste is recycled. The current collection system is organized on 2 waste streams: wet and dry wastes, while the Zero Waste Strategy will redefine the collection system with focus on 5 waste streams: biowaste, paper and cardboard, plastic and metal, glass, mixed waste. The economic analysis has indicated 1.3 million RON annual savings for the Zero Waste Scenario implemention compared to the existing waste management system in Comanesti. Based on data from 2017-2019, the environmental performance of the Zero Waste Scenario showed the following maximum individual environmental benefits for 1 year timeline: virgin material substitution 5.8-13.25 tones/inhabitant, energy substitution 1-2.33 GJ/inhabitant, water consumption 320-370 L/inhabitant, greenhouse gas emission reductions 240-280 kg CO_2e/inhabitant. The Zero Waste Index for the Zero Waste Scenario is 0.456-0.503. All the environmental performance indicators are one order of magnitude higher in the case of the Zero Waste scenario than the values obtained for the current waste management practices. Therefore, the main conclusion is that the Zero Waste Scenario and Strategy may be successfully adopted in Comanesti, with significant economic and environmental benefits.

Keywords: economic, environmental, performance, Waste management, Zero Waste Strategy, Zero Waste Index

REMOVAL OF ANTIBIOTICS FROM AQUEOUS MEDIA BY ADSORPTION: CURRENT AND FUTURE APPROACHES

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Abstract:

Antibiotics as persistent contaminants are of global concern due to the development of antibiotic resistant genes potentially causing superbugs. Therefore, the presence of antibiotics above the permissible limit in the environment is considered a risk factor for all ecosystem components due to their geo- and bio-accumulative characteristics. Traditional wastewater treatment methods cannot sufficiently eliminate antibiotics and therefore new and low-cost technological approaches are needed. In this study, the adsorptive methods used for the removal of the main types of antibiotics (tetracyclines, sulfamides, and quinolones) are summarized, using different adsorptive materials. Different adsorbents have been evaluated by examining their efficiency in the removal processes of antibiotics, and the main advantages and disadvantages were highlighted. The most important aspects related to the retention mechanism are discussed, in order to provide an overview of the adsorbent materials that can be used for the antibiotics removal from aqueous media. Based on all these observations, an experimental strategy for removing antibiotics from aqueous media has been devised, which can be further tested in laboratory studies.

Keywords: adsorbent materials, antibiotics, aqueous media, removal process

BIOMASS WASTE DERIVED POROUS MATERIALS FOR HYDROGEN STORAGE

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Abstract:

The use of hydrogen as a source of renewable and non-polluting energy is one of the most important current research topics due to the imperative requirements to significantly reduce the CO_2 emissions. One of the major problems of practical implementation is the efficient storage of hydrogen for use or transport. In order to increase storage efficiency and reduce the risks associated with the use of hydrogen, porous materials with a high adsorption capacity are expected to play a key role in achieving these goals. In this context, porous materials prepared from/with biomass can offer an interesting and cost-effective approach along with the added advantage of availability and minimal impact on the environment.
In this work, new porous carbon microstructures are prepared by pyrolytic processing of a lignocellulosic waste. In the first step, the feedstock is grinded and further dryed at 100-120^{o}C for 24 hours. Then, the dryed waste is thermally processed at 500^{o}C for 30 min. in a laboratory setup consisting off a quartz tube with surrounding glass mantle and a temperature/flow controlled hot air source. The resulted mass is rapidly flooded with cold water, the steam produced in the process additionally expand the carbonaceous microparticles. In the final preparation stage, the resulted aqueous dispersion of carbon microparticles is frozen at 265K and further lyophilized resulting a fine powder of porous carbon microstructures. The morphology and porosity characteristics of the resulted material was investigated through SEM and BET techniques. Also, the hydrogen absorbtion capacity along with release methods (thermal stimultation, ultrasonic assited) are currently under investigation. The prepared porous carbon microstructures allow both the superior exploitation of biomass wastes into new materials and the approach of some applications in areas of high interest such clean/renewable energy sources with a reduce environmental impact.

Keywords: Biomass wastes, carbon microstructure, hydrogen storage, porous materials, thermal degradation

TRENDS IN MUNICIPAL SOLID WASTE MANAGEMENT IN EUROPEAN UNION

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Abstract:

Municipal waste represents the wastes generated by households or those similar as nature and composition. Across the European Union, municipal solid waste (MSW) is regulated by Waste Framework Directive, imposing a recycling rate of 50% of the MSW generated and Landfill Directive, seting diverse targets from landfilling; both are transposed into national legislation by all EU members. The Circular Economy package adopted in 2018, enforce a higher common target for municipal and packaging waste recycling and lower limits for landfill. From a total of 5 tonnes of waste generated per each EU inhabitant in 2016, aproximately 10% is comprised by the muncipal waste, however due to its complex character, composition, environmetal impacts it has gained a lot of attention from decision makers. In 2018 MSW generation varied considerably, ranging from 272 kg per capita in Romania to 766 kg per capita in Denmark. MSW composition is non-homogenous, including various materials from non-hazardous recyclables (paper/cardboard, plastics, glass), biodegradable fraction (the largest proportion) to hazardous waste (WEEE, batteries, household chemicals, prescription drugs). MSW management can de broken down into 5 categories: incineration (separately for with and without energy recovery), landfilling, recycling (excluding composting or fermentation), composting/digestion and other forms of treatment. Landfilling rate in the EU-28 dropped from 64% in 1995 to 23% in 2018, while the combined recycling and composting rate, for the same period increased from 17% to 47%, with Germany, Austria and Nordic countries being the highest performers, while Romania, Bulgaria and Malta are the lowest. Increasing recycling rates and declining landfilling rates are linked, but correlation is not linear, landfilling dropping faster than the growth in recycling, as waste management move from landfill towards recycling and incineration, and in some cases mechanical–biological treatment. EU countries use a variety of policy instruments in order to divert waste from landfills and recover more of the waste being generated. The countries that achieved a recycling rate of 45% or higher have implemented pay-as-you-throw scheme, while the ones with 20% or lower do not use the instrument; similar case is with landfill tax or ban on biodegradable waste.

Keywords: composting, inceneration, landfilling, MSW management, municipal solid waste, recycling

LEAD-INHIBITORY EFFECTS IN SEED GERMINATION AND SEEDLING GROWTH OF WHEAT (*Triticum aestivum L.*)

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Abstract:

Contamination of soils with heavy metals is considered a serious environmental problem at international level. Among heavy metals, Pb(II) is one of the most toxic pollutant that can cause negative effects on the environment. Once accumulated in soil, this pollutant can affect fauna, flora of the contaminated site and also human health inducing multiple organ damage, even at lower levels of exposure. Considering the acute toxicity of this heavy metal, it is necessary to develop efficient and sustainable methods for its removal. In this sense, phytoremediation technologies are successfully applied for the removal of heavy metals from soil and water.
The main objective of this paper is to establish the potential of wheat (*Triticum aestivum* L.) hybrids (specifically, *Glossa* genotype) to tolerate different leves of lead concentrations in soil. In this framework, we tested the toxicity of lead on *Glossa* development taking into account phenological observations and determinations based on different growth indicators: the germination degree of wheat seeds, the elongation rate for roots (tolerance index), stems and the elongation inhibition rate for roots and stems (toxicity index). For this purpose, the *Glossa* seeds plant were subjected to synthetic contamination with $PbCl_2$ solutions of different concentrations: 50 - 400 mgPb(II)/L. Prior to experiments, the wheat seeds were sterilized with NaOCl. Then, 10 wheat seeds were evenly distributed in Petri dishes containing one layer of Whatman filter paper with 10 mL of $PbCl_2$ solution of known concentration to create metallic stress, or 10 mL of distilled water for the control samples. For each experimental concentration, the growth indicators were determined. The roots and stems were collected separately for the determination of biomass (fresh and dried biomass). The seed germination rate was affected by the presence of $PbCl_2$ ions. The length of the roots and stems decreased as the concentration of metal increased. In conclusion, the inhibition effect depends on metal concentrations values and the specific parts of the plant are affected in a different way. The roots were the most affected by the toxic effect of lead ions, since they are the first organs exposed to the highest lead concentrations.

Keywords: germination, lead, phytoremediation, toxicity, wheat seeds

PRIORITY POLLUTANTS MONITORING IN THE SIRET RIVER BASIN, ROMANIA

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Abstract:

Water is one of the most precious natural resources and the subject of increased human impacts due to its multiple uses in industry, agriculture, hydropower, navigation, irrigation, recreation, as well as due to the disponsal of municipal / industrial wastewaters.
Surface waters quality monitoring is of a major importance for the integrated water resources management and in order to address pollution treatment in an adequate way. The organization of the monitoring systems has imposed in the last years an integrated approach, taking into account the cause-effect interdependencies, and the point sources and diffuse pollution that influence the water quality, especially due to the priority pollutants that influence both drinking water treatment but also wastewater treatment. Pollution with heavy metals or other refractory organic pollutants can have negative effects on the biodiversity and therefore the monitoring activities and the proposal of specific measures to reduce the source pollution are particularly important. Pollution with priority/priority hazardous substances is due to wastewater discharges from point sources or emissions from diffuse sources containing non-synthetic pollutants (heavy metals) and / or synthetic pollutants (organic micropollutants).
The present study aims to monitor the priority pollutants in the surface waters of the Siret river basin for 2015.
Monitoring is a complex process that includes data collection, analysis, interpretation of results, integration into a decision-making process in order to protect the environment and prevent pollution. Romania, as a member of the European Union, has adhered to the European directives in the field of environmental quality monitoring, including the Water Framework Directive, 60/EC/2000. This directive establishes the legal framework through which the member and candidate countries develop their water quality monitoring programs.
For this study, the monitoring of priority pollutants was developed taking into account 18 sampling sites (17 river sections and 1 lake) in the river basin, for 2015. The priority pollutants considered in the impact assessment were: heavy metals (Ni, Cd, Pb, Hg) and organic priority pollutants, such as polycyclic aromatic hydrocarbons: naphthalene, phenanthrene, fluoranthene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi) perylene, organochlorine pesticides: α, β-HCH, lindane, aldrin, dieldrin, 1,2,4-trichloro-benzene, simazine, atrazine, Di-2-ethyl-hexyl-phthalate (DEHP). The water quality assessment took into account the sampling and analysis of the priority pollutants 12 times/year by means of the following specific procedures: Atomic absorption spectrometry - AAS (Ni, Cd, Pb), Atomic fluorescence spectrometry (Hg), Inductively coupled plasma mass spectrometry - ICP-MS (Ni, Cd, Pb), high performance chromatography with fluorescent detector (PAH) and diode array detector - DAD (simazine, atrazine), gaschromatography with electron capture detector- EDC (organochlorine pesticides, chlorobenzenes and DEHP), respectively mass spectrum detector (GC-MS).

Keywords: monitoring, priority pollutants, Siret river basin, water quality.

BOOK OF ABSTRACTS

SECTION 3. Civil engineering and installations

ADAPTIVE ARCHITECTURE – A BENEFICIAL INTERACTION WITH TECHNOLOGY

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Abstract:

Architecture has failed to incorporate the technological evolutions of the last 2-3 decades that have been far too accelerated. Contemporary architectural space is still static in terms of adaptability and active user interaction. The implementation of the latest technologies - both those related to communication and information transfer, as well as those related to intelligent materials, sensors, components and modules represent the only plausible way towards the emergence of complex, autonomous and decentralized systems of adaptation. Adaptive architecture deals with buildings designed to adapt dynamically to the environment, inhabitants and contained objects, its behavior being partially or totally influenced by the response of the users and the environment. This form of architecture resides at the point of confluence and dialogue of social sciences (sociology, psychology and cultural anthropology) with technology and computer science. Indicating the motivations that govern the emergence of adaptive architecture, the paper presents its technological context and dimension. The innovations and adaptive capacities currently available are presented in terms of the desired beneficial effects (increasing comfort, protecting the natural environment, sustainability etc.).
The author highlights these things by critically examining the specialized literature in the fields mentioned above, by showing the philosophy behind the design of adaptive architecture - the direct involvement of the user in the act of designing and personalizing the adaptive architectural space, a continuous optimization process, in real time, by using it. The research results indicate that the built environment influences the cognitive level, the emotions, the mental and physical well-being. Speculating this direction, adaptive architecture has the necessary tools to create suitable environments and optimal conditions for the activities developed inside the building, by actively involving the user in the process of optimizing and personalizing the space. In conclusion, the emergence of adaptive architecture is based on the continuous cultural and technological remodeling of the contemporary ethos. The processual dimension, conferred by technology, allows for the possibility of manifesting an autonomous behavior, capable of alternating the organization of the space, by modifying the structural resistance of the elements and of the envelope, thus outlining a framework well suited to user's searches.

Keywords: adaptive architecture, evolution, technology, intelligent materials, interactivity

THE ARCHITECTURE OF PROTODESIGN: THE TECTONICS OF ADAPTIVE CINEMATIC DESIGN AND ENACTED SEMANTICS BETWEEN MOVEMENT AND SCENIC MORPHOLOGIES

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Abstract:

The contemporary landscape of architecture, arts and performance are pushing towards participatory and immersive forms of performance. Can architecture integrate living functions? What are the fundamentals qualities that living architecture might offer? The kinetic morphologies of adaptive and scenic protoarchitecture are based on the analysis and development of the architectural and performing space. The human relationship with architecture could be transformed, by contributing with a kind of `agency` that creates active conversations and exchanges with their occupants, greatly enhancing the quality, the economic value, and the technical performance of the built environment. How can we design kinetic, living architecture that engages with visitors during extended interactions and enhances the human experience in an immersive environment? How and when should interactivity be introduced in performing art spaces? How do humans respond to these evolving interactions, in the process of mutual adaptation?

Inspired by the sensibilities and dynamics of natural systems, the new adaptive design will engage directly with the surrounding environment and go beyond the aspiration for the neutrality of the built environment. Protoarchitecture does not yet exist as a tool to be applied in performing arts practice. These interactive installations – part creatures, part environment, part mechanical, part biological – remind us that the point of reference for architecture has shifted from the human to the non-human. I present this research's future direction by defining synthetic metabolic design and analysing how adaptive cinematic and scenic morphologies are part of the next generation of architecture, addressing the role of set design as a mediator between actors and audience.

Keywords: protoarchitecture, self-referential form, semi-living organism, tectonism, utopic,

ISSUES REGARDING THE APPROPRIATENESS OF USING PRECAST REINFORCED CONCRETE FRAME STRUCTURES COMPARED TO MONOLITHIC REINFORCED CONCRETE FRAME STRUCTURES, IN OFFICE BUILDINGS AND RESIDENTIAL BUILDINGS

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Abstract:

Given the current context at national and European level in terms of reducing skilled labour force in constructions, as well as the high level of density and traffic in large cities, there is an increasing emphasis on the possibility of shortening the duration of building the structural frames on site, reducing the number of workers or even reducing the level of noise pollution. Thus, the introduction of precast technologies in the case of office buildings and residential buildings, with multi-storey frame structure, is becoming an increasingly pressing and topical issue.
The purpose of this paper is to enable structural engineers, architects and potential investors to consciously choose the type of optimal structure, taking into account a number of technical and economic aspects.
In this sense, in order to highlight the main advantages and disadvantages of using multi-storey precast reinforced concrete frame structures, a comparative case study will be carried out between a precast frame structure and a monolithic frame structure, respectively. For the precast structure made of beam-column or column-column linear elements, the main problem is the joining of these elements, respectively the joint. The proposed joining is the mechanical dry joining made on site by the use of high-strength bolts. The two types of structures analyzed are considered to be located în the city of Iași, a seismic zone.
The results obtained following the dimensioning and detailing of the 2 types of frame structures will clearly highlight, in the form of comparative charts, aspects regarding the total cost for building the structure, performance duration on site, labour force costs, the cost for equipment and transport of materials on site, respectively the labour force required to build the structure.
In conclusion, the advantages and disadvantages of using precast reinforced concrete frame structures compared to monolithic reinforced concrete frame structures will be presented.

Keywords: beam-column joining, high-strength bolts, mechanical joining, multi-storey frames, precast technologies seismic zone

CONSERVATION MEASURES AND HIGHLIGHTING THE ARCHITECTURE OF AN HISTORICAL MONUMENT: „PALATUL OȘTIRII" OF IASI, ROMANIA

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Abstract:

The intervention and conservation works on the historical monuments presume high specialization operations, which involve complex and various knowledge that lead to restoration solutions specific to each particular construction.The final purpose of the restoration works is to exploit the architectural potential concomitantly with the safeguarding of the monument and preserving its authenticity. For the judicious choice of restoration solutions, it is necessary to correctly identify the causes of construction degradation and to establish measures to combat them.
The "Palatul Oștirii" of Iași is a historical construction, designed and realized at the end of the 19th century, as a result of the reorganization and equipping of the armed forces from that period. With a heavy and annoying genesis due to the shortcomings of the time, the neo-Gothic monument has largely preserved its original appearance and constituents.
Given that, this construction has gone through a series of major earthquakes, without major consequences on the structure of resistance, the solution chosen for the restoration of the monument emphasizes measures to combat the causes of infiltration and to restore the color of the facade to the level of the original design.
Therefore, the present paper intends to highlight the solutions and the particularities applied for the restoration of the mentioned monument. The restoration in this case involves the following works: changing the zinc coated sheet with titanium-zinc monuments sheet, replacing the current woodwork with stratified woodwork, restoring the facades with the original color of the monument, efficient solutions for unwatering and removing rainwater.

Keywords: restoration work, silicated plaster, stratified woodwork, titanium-zinc sheet

CONSIDERATIONS OF THE BIODEGRADATION STATUS OF AN HISTORICAL MONUMENT, “CAZARMA ARTILLERY” OF BRAILA, ROMANIA

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Abstract*:*

An important stage in the restoration work involves the identification of the materials and construction techniques used, as well as the analysis of the mechanical characteristics and the biological expertise of the materials used. From the experience of the consolidations, the difficulty of discovering the causes of the degradation of the historical constructions is quite high, because most of the times, the cases have simultaneous action, and it is difficult to determine the border between cause and effect.
The degradation of materials is due to physical, chemical or biological processes. Natural phenomena of aging of materials are associated with other degrading phenomena caused by various environmental factors, with permanent, periodic or accidental action. It has long been considered that the main aggressive factors involved in the degradation are those of a physical nature (temperature variations, frost, wind actions, mechanical actions, etc.). Recent studies tend to give priority to explaining the phenomena of degradation based on actions of a chemical and even biological nature.
The "Cazarma Artileriei" of Brăila is a historical monument built at the end of the 19th century, on which the aggressive physical and chemical-biological factors worked very well, the result being a significant one. The control of agents of a chemical-biological nature implies laboratory biological analyzes for: masonry, mortar, plaster, reinforcement, wood elements and establishing the intervention measures and their size.
The present paper aims to discuss the aspects regarding the action of the chemical-biological agents, the laboratory analyzes, methods of combating the agents as well as the proposed intervention solutions for the restoration of the affected elements.

Keywords: causes of the degradation, historical monument, laboratory biological analyzes, restoration work

REVIEW ON THE ENERGY PERFORMANCE AND EFFICIENCY OF RADIANT FLOOR HEATING SYSTEMS WITH INTEGRATED PHASE CHANGE MATERIALS

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Abstract:

In the modern society the concept of energy efficiency of buildings has become a subject of great interest, due to the negative impact of buildings upon the environment, society and economy. One of the methods is to provide a better efficiency of the energy storage because it is the key to resolve the difference between supply and demand. In comparison to electro-chemical batteries which provide limited energy storage at a high financially cost, thus in this regard, thermal energy storage technologies with high energy density have increased market potential. The storage technologies that harness latent heat and sensible heat have been commercialized. Sensible heat storage can be achieved using a fluid or a solid material by increasing their temperature without phase change, utilizing the thermal mass of the materials. This is the case for most conventional construction materials. Latent heat storage is based on the phase transition of a material. By melting, the material stores large quantities of heat while maintaining a constant temperature and through solidification this heat is released. The materials that use latent heat storage are called phase change materials (PCM). PCMs present objective advantages in comparison to classic construction advantages due to their characteristics of being able to store and release higher quantities of thermal energy during the phase change process. Researchers have integrated PCMs in building elements such as walls, windows, ceilings and floors. In terms of applications integrating PCMs in floors has produces the best results in terms of reducing buildings energy consumption. A PCM radiant floor heating system can provide a reduction of the energy consumption for heating by up to 43%, trough the higher discharge time of the PCM compared to regular heating systems. Furthermore, a double layer PCM floor heating system can reduce the energy consumption by over 50% both during winter and the warmer seasons. A further reduction of the energy demand can be achieved with the use of green energy sources such as solar-thermal panels in order to preheat the working fluid in wet floor heating systems or the use of photovoltaic panels to generate a part of the energy in dry floor heating systems.

Keywords: energy efficiency, energy consumption reduction, floor heating, space heating performance, phase change material

PASSIVE STRATEGIES OF VERNACULAR ARCHITECTURE FOR ENERGY EFFICIENCY

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Abstract:

Due to the need of sustainable development of the building sector, it is important to increase the energy efficiency in buildings and reduce the energy consumption for heating and cooling. In a changing world, full of innovative solutions and technologies, passive strategies of vernacular architecture are more used to achieve life quality and eliminate the negative impact on the environment and human health.
The vernacular architecture is based on the local construction materials and influenced by the traditions, culture and climate of the place. The “architecture without architect”, used mainly in housing, evolves over time and reflects the level of technology and historical context of the building. The core of this type of buildings was to use architecture to collect free energy from natural environment.
Demonstrated over time, the inherent and timeless knowledge of vernacular architecture offers the basic level of comfortable living without the active strategies that include technologies. Passive architecture strategies are defined by minimizing or avoiding the energy consumption, using architecture and the natural environment to produce heating, cooling, ventilation and light. The elements of the natural environment are the sources of the energy: the sun, the earth, the air – the wind, the water. By adding active technologies, the quality of living must increase, but without influencing the main resources gained through passive strategies.
The present paper will provide the information needed to understand the importance of the vernacular architecture’s passive strategies, as well as describe a few examples of those strategies in different parts of the world, examples that demonstrate the efficiency and the impact of these systems. The authors state that the use of those strategies in the first stage of architecture design helps to achieve easier the energy efficiency required nowadays and represents the fundamental base for passive houses and nearly zero energy buildings.

Keywords: architectural identity , buildings, sustainable architecture, sustainability

STRUCTURAL RESPONSE OF STEPBACK BUILDINGS IN CASE OF MULTIPLE UNDERGROUND LEVELS

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Abstract:

The paper discusses the influence of multiple underground levels on the structural response of buildings located on natural ground slopes. The parametric analysis is carried out on a stepback structure, where the underground spans progress in a step-like succession from one side of the building along the entire length. This type of structure is proposed as fit in case of ground slopes due to a significant reduction of the excavation work and volume. The location of the building is in the metropolitam area of Iasi city, the ground consisting of medium dense sandy soil. The variation of the geometrical data refers to span dimensions as 4.0 m (SBI), 5.0 m (SBII) and 6.0 m (SBIII) and depth of the underground levels as 3.0 m, 6,0 m and 9,0 m. Thus, the structural analysis is carried out on a number of nine alternative buildings, where one, two, respectively three underground levels are displayed along two spans. The number of above ground levels is constant as three for all structures. The structural analysis has been performed using ETABS software, based on the finite element method, generally accessible to civil enegineering design.

The variation of the internal forces is discussed over several beams, one column and several internal underground walls that are subjected to the highest value of the earth pressure. These values are further discussed in contrast with the ones resulted from the same spans and underground levels variation referring to the stepback – setback structures, also recommended for buildings located on natural ground slopes. The advantage of stepback-setback buildings is an architectural benefit for the individual dwellers but the cost is considerably higher for the construction company as both types of structures develop the same construction footprint on the ground slope. The significant increase of the internal forces as resulted from the influence of the multiple underground levels on the stepback buildings can alter the design output by modifying the materials and not the dimensions of the structural elements, thus ensuring the cost-efficiency of the end-product, a safe and resistant structure.

Keywords: ground slope, stepback buildings, structural response, underground level

INFLUENCE OF THE DISPERSING AGENTS ON SOIL PARTICLE ANALYSIS

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Abstract:

The foundation soil is a three-phase system consisting of: solid, liquid and gas phase. Soils consist of mineral particles that cover a wide range of sizes. The granulometric composition represents the distribution of the mass percentage by fractions of the particles that enter the soil composition and can be established by particle size analysis. The concept of particle size fraction represents the mass percentage of soil particles with dimensions included between two pre-defined limits. The main particle size fractions are internationally accepted as clay, silt or sand.
Fine-grained soil particle size has been acknowledged to have a significant influence on permeability, shear strength parameters and soil compressibility. Thus, accurately measured the particle size distribution is important in geotechnical engineering design.
In the case of fine soils, the most used methods in determining the particle size are: the sedimentation method (with the areometer) and the pipetting method.
Dispersing agents are used to ensure the separation or dispersion of soil particles, especially for the clay fraction. This agents can either act as a protective colloid on the solid particle or alter the electrical charge on the particle to prevent the formation of flocs.
Experiments were performed to determine the effect of amount and concentration of the deflocculating agent used on the efficiency of dispersion.
Laboratory investigations were performed on two soil samples, the first soil sample with a plasticity index greater than 10% and the second sample with a plasticity index less than 10%.
〖CaCO〗_3 and (Na〖PO〗_3)n were used as dispersing agents on both samples in different percentages, the research main goal being the influence of the amount of these dispersant on the accurate percentage mass of the soil particle fractions.
The experimental results showed that the percentages of soil particle fractions vary with the amount and type of dispersing agent used in the analysis. The paper presents an analysis of these results and their comparison with the percentages recommended in national and international standards and conclusions on the influence of the amount of the dispersing agent used on the correct classification of soils.

Keywords: areometer, dispersing agents, plasticity index, soil sedimentation, soil fractions

USE OF LIMESTONE BLOCKS IN CONSTRUCTIONS IN THE REPUBLIC OF MOLDOVA

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Abstract:

One of the most important problems in modern society is the problem of using natural, ecological, harmless products for humans. In construction, this problem is solved by selecting, combining and using natural, traditional materials for some geographical areas. The most widespread in the world, starting from antiquity, is limestone. Limestones have a special economic importance, being used as a raw material in the construction industry, they are natural reservoirs for storing oil, natural gas, or it is the rock where karst processes take place, with the formation of caves these are places of tourist attraction.
The limestone block, the so-called „cotileț”, is a construction material that has been used in masonry for over 60 years on the territory of the Republic of Moldova. In this research is considered dynamic extraction of limestone blocks in the last two decades are analyzed existing excavations, its location, the limestone reserves in Moldova. The differences between the extracted limestone blocks and their applicability in constructions are examined. The technical characteristics of the „cotileț” are studied, such as dimensions, density, water absorption level, softening coefficient and earthquake resistance. Depending on the strength, the brands of limestone blocks used in construction are mentioned.
At the same time, the existing buildings on the territory of the Republic of Moldova were examined and the characteristics of those built of limestone blocks were highlighted. It was found that the use of mass limestone blocks began in the 50s of the twentieth century.
The research focuses on the bibliographic synthesis, statistical analysis and visual method applied to the inspection of buildings and the assessment of their physical condition.
The limestone layers are inhomogeneous, respectively in the same mine the extracted blocks may have different resistance, respectively the use in constructions must differ: in building load-bearing walls or only partitioning, or only for cladding facades, making decorative elements, etc.
The „cotileț”, in addition to being an ecological material, has a number of advantages such as: earthquake resistance, fire resistance, ensures a high degree of sound insulation and thermal insulation. In the same time, there will be also mention the long life of the „cotileț” in construction. In the case of proper maintenance, buildings made of „cotileț” have a lifespan of centuries.

Keywords: construction material, cotileț, excavations, limestone, masonry

NOTES ABOUT CRUSHING SAND FROM BITUMINOUS SCHIST

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Abstract:

People have used sand and stone for foundations for thousands of years. Significant refinement of the production and use of aggregate occurred during the Roman Empire, which used aggregate to build its vast network of roads and aqueducts. The invention of concrete, which was essential to architecture utilizing arches, created an immediate, permanent demand for construction aggregates.
Construction aggregate, or simply "aggregate", is a broad category of coarse to medium grained particulate material used in construction, including sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates. Aggregates are the most mined materials in the world. Aggregates are a component of composite materials such as concrete and asphalt concrete; the aggregate serves as reinforcement to add strength to the overall composite material. Due to the relatively high hydraulic conductivity value as compared to most soils, aggregates are widely used in drainage applications such as foundation and French drains, septic drain fields, retaining wall drains, and roadside edge drains. Aggregates are also used as base material under foundations, roads, and railroads. In other words, aggregates are used as a stable foundation or road/rail base with predictable, uniform properties (e.g. to help prevent differential settling under the road or building), or as a low-cost extender that binds with more expensive cement or asphalt to form concrete.
Preferred bituminous aggregate sizes for road construction are given in EN 13043 as d/D (where the range shows the smallest and largest square mesh grating that the particles can pass). The same classification sizing is used for larger armour stone sizes in EN 13383, EN 12620 for concrete aggregate, EN 13242 for base layers of road construction and EN 13450 for railway ballast.
Aggregates themselves can be recycled as aggregates. Unlike deposits of sand and gravel or stone suitable for crushing into aggregate, which can be anywhere and may require overburden removal and/or blasting, "deposits" of recyclable aggregate tend to be concentrated near urban areas, and production from them cannot be raised or lowered to meet demand for aggregates. Supply of recycled aggregate depends on physical decay of structures and their demolition. The recycling plant can be fixed or mobile; the smaller capacity mobile plant works best for asphalt-aggregate recycling. The material being recycled is usually highly variable in quality and properties.

Keywords: aggregates, bituminous aggregate, crushed stone, gravel, sand

CASE STUDIES ON FINITE ELEMENT MODELING OF WELDED JOINTS

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Abstract:

Joints made out of tubular steel members are often used in industrial sector. Typical application areas are offshore constructions, trusses, wide-span bridges, high-rise buildings or tree-shaped columns. The joint area is the weakest point in a truss structure and the most complex part to calculate. Beside the normal static behaviour many non-linearities due to the geometry or to the welding process in the microstructure have to take into account. The maximum resistance and a minimum of weight simultaneously must be the focus. Because of this reason steel hollow sections with different profiles are often used. In the following paper a summary of the characteristics and difficulties of welded joints are shown. Much numerical and experimental research was made on welded nodes so far, but mostly it is valid for limited geometries or load cases. A review of the main aspects in designing welded nodes, like loads, fatigue life, resistance of the welding line, stress concentration or stress distributions are given. Beside this there is an introduction to the different calculation methods given by standards, design codes and design guides.
The second part of this paper is about a study of three aspects, which affects a welded joint. The first aim is to investigate the influence of the joint angle on the resistance of a T-joint made out of CHS (circular-hollow-sections) or SHS (squared-hollow-sections) under a tensional load. Numerical analysis will be made by the use of FEM (Finite Element Method). There are many different methods to analyse the steel nodes. Often the simulation parameters are set in studies, without taking into account the differences of numerical solutions. To archive the most realistic results, the second aspect, a numerical study on the finite element types will be made. The third aspect is about the element shape functions. Both studies will be made for the two profile types, mentioned above. The influence on the Von-Mieses stresses and deformation of welded joints will be analysed.

Keywords: welded joints, hollow sections, numerical simulation, joint angle, steel, tubular T-joint

VALUES OF MECHANICAL STRENGTH, DENSITY AND HEAT TRANSFER COEFFICIENT OF CONSTRUCTION MATERIAL MADE FROM CULTIVATED ROMANIAN HEMP VARIETIES

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Abstract:

Many researches carried out today in various spheres of interest, place the experiments and the results obtained in the context of sustainable development. The conservation of the Earth's natural regeneration capacity, resulting in the self-maintenance of the biosphere balance, can be achieved only if the maximum limit of assimilation and neutralization of artificial influences caused by human activities is not exceeded.

In the conditions of altering the climatic parameters in a rhythm towards which humanity has come to recognize and realize the inability to keep up, it is necessary to analyze archaic social structures whose way of life was the very definition of sustainability, that characteristic of a system of whose principles, laws and limits are based on the ability to coexist, to coexist gently with nature in a symbiotic relationship with those defining particularities of the area in which the inhabitants live their lives. Technological modernization, in addition to the advantages related to personal comfort, also highlighted the problems related to the conservation of the biosphere.

Carrying out economic and social activities without identifying the initial climatic conditions specific to the area and without relating to the real potential of self-regulation of natural balance and regeneration of local resources means that man becomes more important than the very parameters that allowed him to exist and maintain his life.

Starting from these principles, this paper aims to bring to the present economic and ecological aspects of some industrial and household activities representative for the Romanian society from the period before 1989, with implications in tradition, culture, national identity, economic independence, energy efficiency, and ecological neutrality. The aim is to identify the opportunity to research, create and standardize construction materials by capitalizing on plant waste that is by-products of technical plant cultivation activities such as flax, hemp, or plant matter from local spontaneous flora such as reeds and rushes.

Mechanical strength, density, shape stability and heat transfer coefficient are the first characteristics to be mastered by a construction material. The research activity and laboratory tests were developed on specimens made from a mixture of waste from hemp, lime, cement and water, and aimed to establish a reference point for further determination, in order to motivate the introduction of construction materials. environmentally friendly, as an alternative to current traditional products such as stone, concrete, brick, autoclaved aerated concrete, polystyrene, gypsum or polyurethane foam and so on. Values of mechanical strength and the heat transfer coefficient was determined. The results obtained offer the premises for the continuation of the researches and the widening of the interest area of identifying some binders and some natural addition materials by exploiting the local resources. From the point of view of ecological constructions and implicitly of the sustainable way of living of the rural society, Romania has original particularities closely related to the geomorphological and climatic specificity of the geographical zoning. The reason why it is important to continue this research is to innovate by developing modern technologies for the implementation of traditional ecological materials in an industrial technology, thus obtaining by standardization the labor efficiency, reducing energy consumption integrated in the manufacturing process and refurbishment of at least two industries that Romania had but which, they were rated as inefficient by the foreign producers, and for that reason were gradually eliminated, giving way to technologies of external origin.

Keywords: energy efficiency, hemp shiv, renewable resources, sustainability, traditional ecological materials, vegetable waste

TECHNOLOGIES FOR RENEWABLE ENERGY ON-SITE GENERATION -IN THE PRESENT CONTEXT OF NEARLY ZERO-ENERGY BUILDINGS

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Abstract:

Taking into account the amounts of raw materials and non-renewable energy consumed, out of all global industrial sectors, the construction industry has one of the most important negative environmental impacts. Therefore, the built environment is considered a key factor in achieving sustainability’s primary dimensions at the global scale. The high level of environmental burdens is mainly influenced by the enormous volumes of energy that are consumed during the operation phase of a building for creating and maintaining a proper level of indoor conditions. Adding that at the present moment, these consumption levels are mainly covered by using non-renewable sources, it is justified to argue that improving the energy efficiency of existing and new buildings represents a must in order to improve the overall ecological performances of the construction sector. In the last decades, the European Union has tried to tackle this issue by assuming a series of Directives that are related to nearly zero-energy buildings, which are highly energy efficient buildings that also use, during the operation phase from their life cycle, energy from renewable sources. According to these Directives, starting January 1st 2021, all new buildings need to be nearly zero-energy buildings, while new constructions that are owned, occupied and used by public authorities must have a nearly zero energy consumption starting December 31st 2018. Thus, civil engineering specialists must develop a set of constructive solutions in order to achieve the imposed criteria at the European Union level. A way of meeting these conditions is to take into consideration the Passive House Plus and Passive House Premium standards, developed by the Passive House Institute in Darmstadt. Besides achieving an extremely low level of energy consumption by taking into consideration different construction details in order to minimize the influence of the linear and punctual thermal bridges and to achieve certain values for the thermal transmittance coefficient for the buildings’ envelope elements, these standards also impose the use of different technologies in order to harvest and use renewable energy. Taking into account that in Romania, this issue still represents a major problem, and one that is not correctly addressed in the built environment in the context of the nearly zero-energy building concept, the present paper presents a set of solutions that can be used for achieving the required level of renewable energy for the Passive House Plus and Passive House Premium standards in order to satisfy the European Union directives regarding energy efficient buildings.

Keywords: construction industry, environmental impact, nearly zero-energy buildings, passive house plus, passive house premium, renewable energy sustainability

SYSTEM OF COUNTING USERS OF A PUBLIC BUILDING

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Abstract:

In the last decade we witnessed a rise in the citizens’ interest for fire safety, a notion that came to the fore after the tragedy at the Collective Club in Bucharest. In the wake of this event, the necessity of a minimum security level of fire safety idea has spread addressing the public feeding spaces and educational units. In order to achieve a high level of fire safety of a building, it is necessary to have this aspect in mind during the design stage and subsequently, it is necessary to adopt organizational measures that will ensure safe exploitation of the construction. The fire safety security level of a building is maintained at an optimum level as long as the building elements and fire prevention and extinguishing facilities of a building meet the requirements set up at the design stage. Even if these requirements are met, there is still an aspect that may lead to a decrease in the level of fire safety, because at present there is no monitoring of the number of users in a public building, which leads to exceeding the designed value. In the context of those presented above, it is necessary to identify a solution to allow the monitoring of the number of people in a public space at a given time, so that measures to limit access can be arranged in order to increase the level of security. At this moment there is a concern in the marketing area to monitor the behaviour of customers in order to optimize sales.
This paper will provide an overview of current concerns about counting people in closed public spaces. In order to improve the fire safety level of the constructions, the creation of a system for counting users in a public building is proposed, as part of the concept of fire safety.

Keywords: crowding, fire safety, fire detection, fire extinguishing, user counting facility

NOTES ABOUT BF SLUDGE FOR POTENTIAL USE AS FILLER IN ASPHALT MIXTURE COMPOSITION

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Abstract:

Sustainable development as a modern tendency all around the world, includes concept as taking our planet into greater consideration. In present time, any nation should take measure for a better environment. Using an intermediary material obtained from industrial process as a raw material for other industry covers an aspect of this nececity.
The purpose of the research carried out is to develop a new perspective on a material resulting from industrial process wich is not fully used. Currently, the blast furnace sludge from Galati is used as granular material for road construction, generally at foundation layer. During the research process i will study the ability to use bf sludge as filler in bituminous mixture.
The bf sludge has the chemical and mechanical potential as a result of its particular composition wich does not interact with bitumen and the ability to be crushed in particle fractions.
The main constituents of the bf sludge are different oxides, as calcium, aluminum, iron, magnesium, manganese oxides, sulfide.
The raw material is homogeneous, with no impurities and it is not toxic for the environment. The bulk density of the bf sludge analysed is almost equal with another natural rock with similar dimension (0/4 mm) and its around 1,5 Mg/mc. This makes the raw material a solid base for processing as filler.
The first step in conducting the study is to deteremine the characteristics of the filler sample and to compare the results with standards specifications. The main characteristics of the filler concludes this aspects: granulometric analysis and harmful fine particles, physical and chemical characteristics, rigidity. These properties influence the properties of the final product, the bitouminous mixture, in the sence that they will determine lucrability, voids content, adhesion of bitumen on aggregates surface, physical and mechanical properties, resistance to permanent deformation.
The filler was ground into very fine granules as a test sample, with the maximum dimension of 2 mm, and than tested in laboratory in standard conditions. All the results obtained on sample fulfill the requirements of the standards for aggregates and fillers used in road constructions. The results are similar to those on a natural aggregate.

Keywords: artificial aggregate, blast furnace sludge, bituminous mixture, filler, sample

COMPRESSION RESISTANCE OF CONCRETE

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Abstract:

The paper presents the main mathematical relationships for the evaluation of the compressive strength of Portland cement concretes made over time by researchers of worldwide recognized scientific value. The authors use in their relations the influence factors on the value of the compressive strength and the conditions that the components of the concrete must meet. Each mathematical relation was verified by the authors through complex laboratory research and by imposing restrictive conditions for achieving the mechanical performance and durability of the studied concrete. It presents the advantages, disadvantages and scope of use of relations, as well as the possibilities for their application for the present. The relationship established by Feret in 1892 (also reformulated by him in 1896) is a qualitative relationship, which takes into account the absolute volumes occupied by cement, water, occluded air and the quality of the cement; the relationship established by Bolomey in 1935 and completed by the Russian scholar Skramtaev is a quantitative relation, which takes into account the dosages of cement, water and the quality of cement and aggregates. Feret's relationship, updated in 1999 by François de Larrard, as well as Bolomey's relationship, updated in 1979 by Dreux-Gorisse, proved their validity and usefulness in evaluating the mechanical performance of Portland cement concrete.z

Keywords: absolute volumes, cement paste compactness, cement hydration coefficient, components, granular coefficient, space gel ratio available

IMPORTANCE OF ENETREPRENEURIAL MANAGEMENT IN THE CIVIL CONSTRUCTION BRANCH

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Abstract:

The branch of civil constructions is one of the most important components of the economy of a country, contributing fully to the economic growth and development both at national level and in the international context. Obtaining a maximum effect, respectively the profit, with minimum effort, in the construction sector, involves the implementation and monitoring of the application of an entrepreneurial management system, as well as establishing strategies for the optimization of the entrepreneurial processes. Also, the entrepreneurial management must contribute to the efficiency of the entrepreneur's decisions regarding the compliance with the quality conditions of the constructions, risk management, human resource management, environmental protection and waste management. The substantiation of the necessity of implementing an entrepreneurial management system in the construction industry by approaching concepts such as entrepreneur, entrepreneurship, the forms and type of entrepreneurship, the entrepreneurial environment and the factors that influence it, thus becomes imperatively necessary in the current economic context. In this study the economic models of entrepreneurship are considered, as well as the quality conditions and the requirements to be met through the entrepreneurial activity.

Entrepreneurship can be defined as a complex process through which a series of resources are mobilized in order to exploit and capitalize on business opportunities and ideas, constituting one of the most important factors that bring a big contribution to the economic growth. The whole mechanism is set in motion by an entrepreneur, represented by individuals or groups, who by assuming in the decision making, innovation and creativity, aim to obtain the maximum profit with a minimum financial effort. The profile of the ideal entrepreneur, either an individual or an organization, is shaped by a series of qualities, including the ability to assume and lead, the capacity for intense effort over long periods, the speed of reactions and the speed of decisions, the efficient organization of work. The efficiency of the entrepreneur's decisions and activity can be improved by applying an entrepreneurial management system, in order to identify and capitalize the business opportunities.

Keywords: civil construction, civil construction branch, entrepreneur; entrepreneurship; entrepreneurial management; entrepreneurial environment;

ASPECTS OF THE TEMPERATURE FIELD DISTRIBUTION IN TRADITIONAL EARTHEN HOUSES FROM MOLDOVA REGION

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Abstract:

The rural area of Moldova is characterized by the presence of earth dwellings. The construction system is either made of masonry with mud bricks (adobe), or of rammed earthworks.
The traditional composition of the earthen houses consists of two rooms and an entrance hall. One of the rooms is permanently inhabited and has a mixed destination: living room, bedroom and kitchen, the heating being provided by a stove with hob (sometimes also an oven). Usually the entrance hall and the second room are unheated in winter and only occasionally, the second room has the function of the living room in summer.
Due to the specific way of heating, depending on the destination and the degree of occupancy of the rooms, the temperature of the indoor air in traditional houses has an uneven distribution, so that sometimes in the unheated room the freezing temperature appears on the surface of the interior walls.
The aim of the study is to determine the distribution of the temperature field in traditional earthen houses partially heated.
The study contains two types of analysis: the first consists in bidirectional simulation of the indoor air temperature field using HTflux software which is based on the finite element method, and the second aimed at validating the results obtained by the first method, using infrared thermographic image analysis. The study was conducted in parallel on two buildings.
In the first case, the peculiarity of the method consists in seting boundary conditions in the hearth of the stove and not on the inner surface of the envelope. The second method allows not only the graphical analysis of the temperatures of the exterior walls, but also the analysis of the envelope parts characterized by an increased heat flow, such as thermal bridges.
The results of this study confirm that both methods provide real data which define the interior comfort in earthen houses.

Keywords: earthen houses, temperature field, thermographic analysis

AUTONOMOUS PROCESSES IN CONCRETE MATRIX ON BIO PRODUCTS

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Abstract:

In this paper are presented different approaches of microbiological type, on the concrete matrix, that has the ability to self-healing the micro-cracks in their early phase. Although the prevention of cracks in the concrete structure is not possible, there are many types of techniques that will lead to self-sealing. Thereby we can say the cracks represent the the biggest enemy of the elements in the constructions, and if they are not observed and treated in the early phase, they can create real dangers, both for the constructions and for the people. The micro-cracks appeared in the concrete matrix are determined by a number of internal and / or external factors. The determination of the cause of the appearance of the micro-cracks is done by visual inspections and by direct measurements, using special equipment. The identification of the various biological compounds and their use in autonomous processes can represent a sustainable but also efficient alternative on the costs of concrete production. From the researchers' reports, the application of chemicals and polymers represents a source of risks for human health, plus the fact that these methods are viable in the short term. The bio products exemplified in this paper are found in nature, are human friendly, and through the information provided by the researchers we can say that they increase the life of the construction. An important feature of the use of organic products in the concrete matrix is the fact that the concrete can self-healing, only needing water and oxygen. The two approaches of autonomous type presented in this paper are similar in terms of the result obtained but different from the point of view of the healing agents used. This paper will provide an overview of the bio approach through the production of calcium carbonate, will present the new challenges for sealing the micro-cracks and recommendations for future research

Keywords: bacteria, cracks, concrete, sealing, self-healing

EXPERTIMENTAL INVESTIGATION ON THE OPTIMUM FILING RATIO OF HEAT PIPES USED FOR HEAT RECOVERY SYSTEMS

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Abstract:

Thermal energy recovery is an important factor in the energy efficiency equation of industrial processes or buildings. The equipment used for heat recovery has undergone gradual improvements over time, one of the most significant being the introduction of heat pipes as part of their components. In order to optimize the functioning of the heat recovery systems, it is important to use heat pipes suitable for the temperature and the nature of the heat source. The efficiency of a heat pipe is given by many factors such as the thermal conductivity of the material used for the shell, the working fluid, the vacuum inside the shell or the filling ratio. In this study, I analyzed experimentally a number of copper heat pipes with a diameter of 15 mm which will be introduced in a heat recovery system. The working fluid is distilled water and the vacuum inside was made using a vacuum pump. The heat pipes had different filling ratios and the purpose of the research was to find the optimum filling ratio for the ones that are going to be used for the heat recovery system. In order to perform the measurements in the laboratory, a number of 20 heat pipes were designed and manufactured with 5 different filling ratios: 15 ml, 20 ml, 36 ml, 48 ml and 72 ml, the last one representing 50% of the internal volume of the shell. The temperature was measured with an electronic thermometer with temperature sensors applied in different zones of the heat pipes. The evaporator zone of the heat pipes was introduced in a box with water at different temperatures. The measurements revealed that the optimum values were for the case with 36ml representing a filling ratio of 25%. Further researches for improvements of the heat transfer of the heat pipes used for heat recovery systems could be done by varying the materials used for the shell or by using different types of working fluids.

Keywords: energy efficiency, filling ratio, heat pipe, heat recovery system, optimization

RESEARCH ON THE MONITORING OF EARTH DAMS WITH GNSS TECHNOLOGY

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Abstract:

The geodetic measurements are very important in the monitoring and evaluation stage of the operational safety status of the hydrotechnical construction. From the perspective of the many accidents produced around the world, it is worth noting the need to implement modern methods of controlling and monitoring the small earth dams owned by private owners. The structure of an earth dam and the physical effects it has on the surrounding areas require systematic monitoring to see if any unexpected changes have occurred. In recent years, new technologies have been applied to track the behavior of hydrotechnical constructions offering favorable results for safety, management and structural analysis. Global Navigation Satellite System (GNSS) is a modern technique that allows the creation and measurement of geodetic networks for tracking the movements of landmarks mounted on and around dams. The purpose of this study is to design a local geodetic network, for tracking the Podișu earth dam on the Valea Oii river, in Iași county. In this study, three GNSS receivers were used for static measurements.

Keywords: earth dam, geodetic network, GNSS receivers, monitoring, static measurements

ASPECTS REGARDING THE SPECIAL TRACKING OF THE DAMS

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Abstract:

Tracking the behavior of hydrotechnical constructions is a systematic activity of collecting, recording and capitalizing on specific data and information, resulting from direct observations and measurements on parameters that define the state and evolution of the safety state of the constructions, in relation to the actions to which they are subjected.
The main purpose of the monitoring of the behavior of the hydrotechnical constructions is to evaluate their technical state during the entire period of existence. The objectives of the activity of tracking the behavior of constructions can be grouped into two categories: timely detection of developments, which, over time, can compromise the safety of constructions and explain, evaluate the anomalies observed in the activity of the U.C.C. conducted.
The monitoring of the behavior of a dam and the related accumulation is carried out in the form of special follow-up, which also includes the current follow-up. The current monitoring is carried out on the basis of a program established by the "Regulations of operation" of the accumulation, with a constant frequency appropriate to the situation in which the construction is and with a frequency higher than the current one in case of occurrence of expected (future) or unexpected events (earthquakes, reactivation of settlements after the execution of consolidations, opening of joints or cracks suddenly etc.). It applies to all constructions, regardless of the form of ownership;
Special monitoring is an activity for tracking the behavior of hydrotechnical constructions, which is performed by processing and interpreting the data from measurements at the measuring and control devices, regarding the way of evolution of significant parameters or behavioral aspects. It is performed with complex and specialized technical means of measurement, adapted to the specific objectives of each construction and taking into account the provisions of the technical regulations in force, it has a permanent character and consists of the measurement, recording, processing and systematic interpretation of the values of the parameters that define the measure in that the constructions (the component parts) maintain the requirements of resistance, stability and durability established by the execution project.

Keywords: dam, hydrotechnical constructions, special monitoring

THEORETICAL ANALYSIS REGARDING GROUNDWATER MOVEMENT

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Abstract:

This paper sums up the theoretical analysis on the subject of groundwater movement. The law governing water movement is Darcy’s Law which consists of the relationship between the hydraulic gradient and the cinematic characteristics of the groundwater stream.
The parameters necessary for modelling are: hydraulic gradient (I), average filtration speed (v), filtration flow rate (q), pressure distribution (p), porosity (n), water potential (Δh) and coefficient of filtration (k).
Based on the results, diferent scenarios of how nutritive elements or pollutants disperse in the soil can be studied or researched along with diverse soil depollution technologies.

Keywords: Darcy’s Law, groundwater, hydraulic gradient, porosity, soil depollution technologies

NON-INVASIVE RESEARCH METHODS IN INVESTIGATION AND INTERPRETATION AREAS WITH ARCHAEOLOGICAL AFFECTED BY THE ROAD INFRASTRUCTURE. CASE STUDY THE BYPASS BACAU (BACAU COUNTY, RO)

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Abstract:

Non – invasive research methods, techniques and models (aerial photographs with the help of the drone, hypsometric maps in GIS system, GPR, Digital Surface Model (DSM), Basic Terrain Analysis model from SAGA GIS), in investigationg and interpretation areas with archaeological potential affected by the road infrastructure.

Geomorphological and pedological data from the bypass Bacău (Bacău county, RO), as well as a morphological analysis of the soil, completed with interdisciplinary data (geophysic, topographic, geography, hydro-geomorphology) that highlight the presence of a type of soil and which is strongly modified up to the depth of 1 m as a result of a long period of living according to the archaeological complexes discovered on the central part of the beam.

Through interdisciplinary research and based on the archaeological potential, the prehistoric landscape will be reconstructed.

Keywords: aerial photographs, Basic Terrain Analysis, Digital Surface Model (DSM), GIS system, GPR, hypsometric maps

CONSIDERATIONS ON FLOODS IN THE PRUT BARLAD BASIN

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Abstract:

The work presents an analysis of historical floods and areas with potentially significant risk to floods, in the Prut-Bârlad river basin, as well as measures to reduce flood risk. Over the years, floods have had significant consequences for human activity, the environment, cultural heritage and economic activity. In order to reduce flood risk, various programmes for tracking hydrometric and hydrometeorological parameters have been created, critical defence work has been fixed, the warning system has been implemented-alarm, the defence plan has been updated against floods, critical points were inventoried on water courses and hydrotechnical constructions. In order to assess flood risk, hazard maps have been drawn up in 3 flood scenarios with different probabilities, as well as flood risk maps using hydrological and hydraulic modeling. In order to reduce the risk to floods, at European level, emphasis is placed on non-structural measures: measures to reduce the probability of flooding (reduction of hazard) and measures to increase resilience to floods.

Keywords: damage, defense, flood, hazard, measures, risk reduction, warning

EFFICIENT ADAPTATION TO RISING FLOOD RISK

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Abstract:

Floods wreak havoc increased in our urbanized world quickly, with high disproportionately high impacts on the poorest and the most vulnerable. Strategies adapting efficient infrastructure, which combines flood protection solutions based on nature and financing schemes risks to manage floods and cushion the impact of their economic.
Effective adaptation to increased risks of flooding it requires assistance, which may include structural measures flood protection, early warning systems, spatial planning informed about risk, solutions based on nature, social protection and financing instruments risk.
The maps of the hazard indicates the tragic floods scenarios with different probabilities.
The floods are best handled at the level of the river basin, where there are a number of measures to restrict the leakage, slow down the rivers flow, permit extending the floods on natural and agricultural land, protects the vulnerable and goods which does not worsen floods downstream, in accordance with the floods directive.

Keywords: economic, flood, hazard, impact, map, risk, river

STUDY OF THE HYDRAULIC CHARACTERISTICS OF THE SOIL

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Abstract:

The paper presents an analysis of the techniques for determining soil moisture as well to establish the suction curve. The data extracted from the suction curve determined for 5 soil types have been processed and the gradient values of the suction and hydraulic conductivity have been established under the conditions of unsaturated soil.
Based on the results obtained, forecasts can be made regarding the evolution of the hydrological regime of the soil according to weather and hydrogeological factors.

Keywords: humidity, hydraulic conductivity, hydrological regime, suction curve, soil

CONSIDERATIONS REGARDING THE CURRENT STATUS OF WASTEWATER TREATMENT PLANTS

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Abstract:

The paper deals with the evolution of wastewater treatment plants in the context of multiplying the number of polluting substances and the progress of their complexity. The documentary study shows the total evolution of wastewater treatment plants according to pollutants from domestic water, industrial water and water from agriculture. Pollution of the waters with various stable and non-biodegradable compounds that can survive the primary and secondary stages of the treatment plants is a fact that can cause damage to human health and safety. Lately, the optimization of the technological process of wastewater treatment consists in the introduction of tertiary steps that will help to better purify the urban waters. The classic schemes have been improved by the adoption of new technologies and equipment, and yet it seems that the depolution of some substances is not fully realized, and the protection of the water quality is the main means of environmental protection. Research has shown some of the most important treatment plants in which are analyzed the technological schemes of treatment and the current requirements of saving the energy consumed in the development of the technological processes.

Keywords: depolution, pollution, pollutants, technological process, technological schemes

STUDIES AND RESEARCH REGARDING DEBITMETRY MANAGEMENT FROM WATER SUPPLY SYSTEMS

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Abstract:

The paper presents the result of a documentary study on the need to rehabilitate some components of the water metering system delivered to consumers in water supply systems. A large part of the water losses are determined by the absence of flow meters placed at each consumer. The paper presents the result of a documentary study on the need to rehabilitate some components of the water metering system delivered to consumers in water supply systems. Rehabilitation is imposed by limiting water losses from distribution networks located in localities. A large part of the water losses are determined by the absence of flow meters placed at each consumer. The data obtained contributed to the definition of water losses and the need for actions to detect them, but especially to efficiently meter water consumption. Lately, most operators incorporate this data into GIS applications that provide an overview of the entire system. Underestimation of metered consumption is another cause of water loss. An important role in the occurrence of errors and the increase of excavation losses is played by the wear of flow meters, but also by exceeding the operating time. This aspect influences the management of water losses in the distribution network. Metering errors include accounting procedure errors due to erroneous reading of water consumption values. The selection of the type of metering devices and their accuracy class can be limited both for technical reasons (quality of service) and for financial reasons. Following the analysis of the conclusions of several policies for replacing the flow meters, it resulted that their change must be made after a period between 5 and 10 years. Individual flow meters tend to measure less for two reasons: damage to the meter due to the extension of the recommended operating period and the inability of the flow meter to detect very low flows.
A case study was started to analyze the behaviour of the flow meter system on water losses in a distribution network. It is carried out within the water supply system of Harlau - Cotnari localities, which presented in 2010-2017 very high water loss rates. The absence of an adequate management of the water losses, but also the absence of some works of rehabilitation of the flow meters system contributed to the increase of the losses. The supply of the system from various sources and the non-uniformity of the metering also led to the modification of the results of the efficiency analyze. The flow meters used were different in model and measurement errors. This has led to differences in reading values due to the difference in sensitivity class of each meter. Incorrect location of flow meters for system analysis, as well as differences in accuracy class can induce unrealistic consumption values. The first step in streamlining systems of this type is to ensure the correct collection of field data by changing the position, type and number of flow meters. A strategy on how to retrieve and interpret data must also be developed.

Keywords: efficiency, errors, flow meters, methodology, water losses

THE IMPORTANCE OF ECOLOGICAL EDUCATION AT ACADEMIC LEVEL IN REGARDS TO THE ENVIROMENTAL QUALITY PROTECTION

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Abstract:

Human interaction with the natural environment, which is today the content of the ecological problem, has reached extreme forms, posing the problem of a danger to the biological existence of humankind. In this project we have analyzed the necessity of ecological education at academic level in order to raise awareness of the public opinion on the importance of environmental protection and the sustainable exploitation of natural resources.

The problems of environmental protection are of great complexity and their resolution involves other printers and the adoption of ecological education strategies in which to participate the education, the nongovernmental organizations and the mass media.

The key problem in limiting the process of environmental degradation and maintaining the environmental factors unaltered is the avoidance of the boomerang effect through ecological education and reconciliation between the two human aspirations: the need to continue the economic and social development, but also the protection and improvement of the environment as the only way for the well-being of both present and future generations.

Keywords: ecological education, strategies, reconciliation, sustainable, resources

WATERSHED DELINEATION IN FLAT URBAN AREAS USING GIS TECHNIQUES

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Abstract:

The accurate determination of the catchments is still a challenge in the flat terrains of the urban areas even if this is a precondition for runoff modeling, hydrological modelling and water quality simulations. Watershed analysis represent a mandatory process in the sustainable management of our natural resources. If the drainage areas and the flow paths networks are accurate identified correctly the adequate management of the stormwater runoff and water quality issues can be completely accomplished. To aid in delineating of the contributing drainage areas across an entire city at the level of individual drain inlets, which were then aggregated to larger basins in an urban landscape, a workflow was been developed. The purpose of this paper is to delineate the regional storm watershed properties in order to perform a drainage analysis on a terrain model. GIS software contains an hidrologic tool which can be used to derive datasets that describe the drainage characteristics of a catchment basin. Arc Hydro package was been utilized for this study because can reduce considerably the time consuming processes as well as help to improve the reliability and resolution. The utility of this methodology is used to develop valuable information who are mandatory in the hydrologic modeling. Necessary data used for this are the stormwater network, the water channels and raster data. The entire poposed algorithm for this analysis can be divided into three phases processing of DEMSs, flow analysis and basin analysis. A high-resolution base has been used for creating the model. The results of this study show that delineations of urban watersheds in flat areas can be possible even in lower resolution city models and provide high superiorly data if a complete database that reflects the reality will be utilised. Furthermore, a distinction has been made between the basins which drains to the surface waters and those that are draining to the sewerage network. The results can be easily used to study the pipe hydraulics for sewer systems and for future management planning.

Keywords: digital terrain model, hydrology, stormwater network, watershed deliniation

PROBABILISTIC METHODS FOR DETERMINING FLOOD WAVES

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Abstract:

Floods represent a phenomenon of rapid and significant increase and decrease of the levels, respectively the flows of the watercourses; these are defined by hydrographs. For the dimensioning, the execution and the exploitation of the hydrotechnical constructions in safe conditions it is necessary to know the flood waves with different probabilities.
The paper presents the way of determining the flood waves with different probabilities for the cases when there is and when there is not enough data from measurements, followed by calculation examples. Finally, some flood prevention measures are recommended.

Keywords: flood, hydrotechnical construction, prevention measure, watercourse

ANALYSIS OF TORRENTIAL RAINFALL AND AUTOMATIC MONITORING OF THE RAINFALL REGIME IN THE CATCHMENT OF THE SLANIC RIVER, BACAU COUNTY

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Abstract:

The present paper intends to analyze the precipitation from the catchment of the Slanic river, a tributary of the Trotus river from the Siret catchment.
This analysis is of interest because the catchment of the Slanic river has a pronounced torrential character, causing floods that bring great social and economic damage in that area.
As a result, automatic monitoring of the rainfall regime in the area is necessary; this is done through the automatic stations in the Siret river basin through the DESWAT and WATMAN programs. The final aim of these projects was to modernize the hydrological monitoring network in Romania, using the latest technology and creating products for the adequate information / alarm of the public in case of floods.
Finally, the aim is to reduce the impact of floods by forecasting the floods through modeling and modernizing the appropriate infrastructure.

Keywords: automatic monitoring, catchment, flood, rainfall, river basin

THE DISSOLVED OXYGEN CONCENTRATION (DO) FROM AN A^2/O BIOREACTOR SUPPLIED WITH COUNTER CURRENT OXYGEN

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Abstract:

This article will include a study on the distribution of oxygen from a bioreactor located in the advanced biological stage of the wastewater treatment plant of Iași Municipality. The purification process from the bioreactor works under optimum conditions when the dissolved oxygen is found in sufficient quantities in the water-sludge mixture, being necessary for biomass and wastewater. The bioreactor is supplied with oxygen from a blower station, by means of seven blowers that distribute the oxygen on the surface of its oxic zones, through a fine bubble pneumatic aeration with the input of porous diffusers.
The oxygen supply of the flocs found in the active sludge from the bioreactor must be as constant as possible, without variations, for high efficiency. This is possible to control by means of dissolved oxygen sensors.
The oxygen dissolved in the bioreactor varies depending on the temperature, the amount of suspended solids, the altitude, the shape of the basin, the number of porous diffusers and their position. For the proper functioning of the technological process, an oxygen concentration between 1-3 mgO/L is sufficient, high oxygen concentration leading to increased energy consumption. The measurements made highlighted: the amount of dissolved oxygen from the wastewater influent to the bioreactor, the amount of dissolved oxygen from the bioreactor effluent and the amount of dissolved oxygen from the bioreactor.
The analysis and interpretation of the results showed the need to extend the measurements for different work scenarious

Keywords: active sludge, blowers, bioreactor, oxygen dissolved, porous diffusers, wastewater treatment plant

INITIAL DATA ANALYSIS FOR ESTABLISHING THE AGRICULTURAL CADASTRAL SYSTEM IN STRASENI DISTRICT, REPUBLIC OF MOLDOVA

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Abstract:

The paper is focused on examining the method of completing the data base content with initial data; the data base being developed for the purpose of conducting agricultural cadastre surveys at the district level. The agricultural cadastre aimed at creating the national agricultural register. This study is required by the need to implement the best European practices. Also, the authors highlighted some peculiarities regarding the data base structure and the interaction between the Real Estate Cadastre as an Information System with the Agricultural Cadastre.
The European Union has proposed the development of an Infrastructure for Spatial Information at European level (INSPIRE), in the composition of which will be introduced spatial data (land, buildings, agricultural cadastre, environmental applications, etc.) on a clearly predefined structure that is compatible with the structures used in all Member States that will provide the spatial data.
The National Spatial Data Infrastructure (NSDI) in the Republic of Moldova was born with the partial transposition into national legislation of the INSPIRE directive. By considering these requirements, the agricultural cadastre was structured to adapt it to European practice. The Agency for Land Relations and Cadastre as the coordinating authority and holder of basic spatial data in digital format is the authority that created the mechanism of the national spatial data infrastructure at national level. The Land Relations and Cadastre Agency owns the geoportal of the national spatial data infrastructure. It holds the catalog of data that are created and updated by the public entities responsible for spatial data. Thus, the spatial data are identified directly from the thematic portals of the public entities responsible for creating this information.
The recent changes in the type of land ownership have required a revision of the agricultural cadastre. A case study on the agricultural cadastre was conducted on the territory of Straseni in the Republic of Moldova. For this territory, the database was updated by revising the old ones and completing them with new elements in accordance with the European provisions. The case study is ongoing and is intended to be a model for how to manage cadastral data.

Keywords: agricultural cadastre, agricultural information system, GIS, land management

ECOLOGICAL STATE CONSIDERATIONS OF THE MOLDOVA RIVER IN THE CORDUN AREA

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Abstract:

The paper presents the analysis of the ecological status of the river Moldova in the area of Cordun locality in Neamț county. The studies and researches were carried out on the river Moldova, on the sector where the industrial water catchment is located for the Roman city. The water catchment is located on the banks of the river, a situation that influenced the morphology of the minor riverbed of the river Moldova on a length of about 400 m. Carrying out the capture construction required the division of the river into two arms by creating an island. The island in the Cordun area is located at approx. 6.00 km upstream of the confluence of the river Moldova with the river Siret. The surface of the ostrov is 21.0 ha. Water catchment is located on the left arm of the river. It has a calibrated section and is rectilinear on a length of 320 m, being equipped with a series of hydrotechnical constructions (bottom threshold, dissipation basin, shore defense). Water flow on the left arm occurs at high speeds, a situation that does not respect the conditions of protection of the aquatic habitat. The right arm of the river has a secondary function, and the supply is regulated by an improvised spillway. The right arm is fed in particular at high flow rates. Research has shown that the aquatic environment on the right arm is degraded at the current stage. The right arm is affected by morphological changes generated by floods, which have formed areas of erosion and alluvial deposition. In some areas, water stagnates and creates an anaerobic environment. The researched area is located in the perimeter of the Natura 2000 site, ROSCI0364 - Moldova River between Tupilaati and Roman, being a protected natural area for the conservation of natural habitats, flora and fauna. The research carried out between 2015 and 2019 indicates the adoption of measures to restore the ecological status of the right arm of the Moldova River.

Keywords: degradation, flows, habitat, regularization works, river morphology

STUDIES AND RESEARCH ON WATER LOSSES FROM IRRIGATION SYSTEMS

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Abstract:.

The paper presents a study on water losses in the pipeline and canal network of irrigation systems in operation for a long time. The irrigation systems in Romania have been in operation for about 35-45 years. They present phenomena of wear and aging of the structural components (feed channels, pipes, fireplaces with hydraulic installations, irrigation hydrants, pumping stations, etc.). The researches carried out on a series of irrigation systems in the eastern and southern part of Romania, with different periods of exploitation, have highlighted the complexity of the degradation process of the structural elements. The degradation of the structural components of the irrigation system caused the formation of water losses and the decrease of the operating efficiency. The research highlighted the type of water losses, their mode of initiation and evolution, the forms of manifestation and the influences on the irrigation process. The irrigation systems are currently in the management of two entities: the state manages the basic infrastructure (basic pumping and repacking stations, main discharge pipelines, adduction and distribution channels); the homeowners associations manage the irrigation plots. Each entity manages part of the water losses. Research has shown that the private system with irrigation plots was more concerned with reducing water losses

Keywords: -

PRESSURE MANAGEMENT FOR LEAKAGE REDUCTION IN WATER DISTRIBUTION SYSTEMS

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Abstract:

As a response for water losses in urban water supply networks, the pressure management has become now, one of the most effective method in order to reduce the leakage part of non-revenue water (NRW). The implementation of pressure management has as main objectives besides reducing leakage, reducing bursts frequency and extending the life of the infrastructure. Therefore, in order to improve the water distribution systems, this paper presents the advantages of pressure control and optimization for water distribution using pressure reducing valve (PRV). The main purpose of using PRV is to provide uniform distribution of the pressure and decreasing of the excessive pressure on the water system, reducing the water leakage and energy consumption accordingly. Reducing average and maximum excess pressure by only 10% produces a reduction in leakage, reduction in pipe bursts, deferred renewal and extension of residual asset life, as well as energy savings.

Keywords: pressure management, PRV, water losses

CONSIDERATIONS REGARDING THE LAND FUND OF THE NORTH-EAST REGION OF ROMANIA

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Abstract:

Within this paper work, it starts from the assumption that the land fund, meaning the totality of cultivated or uncultivated land, regardless of destination and owner is needed for performing an efficient management system. In order to know the agro-productive capability of the land fund, according to present legislation, it is required the creation of the general and mandatory accounting system of all land, including the agricultural ones, regardless of its owner and destination.
The land cadastre is highlighted as a unique tool that meets all technical, legal, social and economic conditions where each plot of land is located. The agricultural cadastre, through the database of the informational system, with the two components, digital plan and cadastral registers has the meaning to provide at any time technical and economic reports on the land fund.
Based on these data, the technical solutions needed for reorganization, modernization and development of agricultural infrastructure are established in order to promote the investment projects and programs.
This paper work contains information regarding: the distribution of the land according to their use;the classification of the land according to their destination and utilization; the classification of natural units of ground-land.

Keywords: agricultural cadastre, agro-productive capability, digital plan, database, legislation

PREVENTION AND FLOOD PROTECTION IN PRUT RIVER BASIN, THROUGH THE IMPLEMENTATION OF A MODERN MONITORING SYSTEM WITH AUTOMATIC STATIONS

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Abstract:

The prevention and protection against floods is important because it can be anticipated, intervened and avoided in the shortest time the loss of human lives and the significant reduction of material damage.
The study consisted of monitoring the frequent changes in parameters of the dam in order to improve the functionality of the Stanca Costesti hydrotechnical construction. Since there is no such centralized database for dam parameters, so they face problem regarding the availability of such sorted data.
The analyzed area was flooded in 2006, 2008, 2010 due to the normal malfunction of the hydromechanical equipment, because the concrete walls that make up the maneuvering tower were not perfectly sealed, because the energy dissipator and the combined walls find areas degraded and because a well-developed information system is not found.
The scope of this paper is to describe one of the most modern monitoring technology to prevent and to protect against floods the urban zones. The parameters that are monitored are rehabilitation of hydromechanical equipment at high water discharge; rehabilitation of electrical equipment at high water discharge; modernization of the information system and hydrological forecast; creation of training courses in data processing and communication primary, in cartographic and dispatcher applications.
After the implementation of the project, a tendency of approximation of the monitored parameters with those of the reality was observed, which leads to the idea that this system is of major importance, and this Project advocates for increasing the efficiency of the warning, alarm and reduction system of damages caused by floods through awareness citizens on the risks of building construction in potentially affected areas.

Keywords: monitoring, hydromechanical, parameters, dissipator

DATA ACQUISITION TECHNIQUES FOR FOREST ECOSYSTEMS

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Abstract:

Between the forest ecosystems and the carbon in the nature there is a close interdependence, the increase of the forest biomass leading to the storage of carbon in the terrestrial atmosphere, and the diminution of the biomass to the increased emissions. In other words, to have a CO_2-free atmosphere and to minimize climate change, forest conservation must be essential.

For the proper management of forest biomass, both cheap and fast techniques are required. The main techniques of measurement of terrestrial biomass are based on field measurements, GIS (Geographic Information System) and remote sensing. Those based on field measurements are accurate, but laborious and destructive. GIS-based methods are difficult because of an indirect relationship between auxilliary data (land cover type, site quality, age) and biomass determined in an area and the overall impact of environmental conditions on biomass accumulation. The method based on remote sensing is the fastest, because it does not directly measure biomass, but uses the statistical relationships between the parameters of the trees extracted from the aerial images and the measurements in the field. Photogrammetry can often obtain elevations only at the top of dense canopies although LiDAR may have low penetration rates through a canopy dense, provides a direct measurement of the height of the ground under the crowns of trees.

With the advent of LiDAR systems, the analysis can be extended to the third dimension through direct quantification of vegetation characteristics, such as tree height, height trunk or volume and can help with an improved estimation of biomass. Data provided by remote sensing, from optical to microwave and also to LiDAR, have demonstrated great potential in estimating biomass at all scales.

Keywords: biomass, forest ecosystems, GIS, Light Detection and Ranging, techniques of measurement

ANALYSIS OF BEHAVIOR OF THE WATER SUPPLY SYSTEM IN IASI CITY

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Abstract:

Ensuring a continuous functioning of Iasi City’s water supply system is becoming more and more a mandatory condition because the nowadays daily activity cannot be conceived without a permanent water supply. The system’s component elements, completed 20 to 40 years ago, show and advanced degradation, and from a technical and functional point of view the system no longer match designed parameters. In this context, the rehabilitation, refurbishment and modernization of the system is the only solution to ensure its proper functioning (that is, optimizing the system’s operating and maintenance costs). Particular importance is given to distribution networks. The implementation of a SCADA type information system (Supervisory Control and Data Acquisition) will improve the operation of distribution network. In certain areas of distribution network, electromagnetic probes and flow meters have been installed, in order to monitor in real time the entire process of drinking water production and distribution.
The monitoring system is designed to provide information on flow rates, pressures, water quality, pipe failure, etc. This paper will analyze the behavior of Iasi City’s water supply system based on data from period 2014-2018.

Keywords: distribution networks, modernization, SCADA, rehabilitation, water supply

BOOK OF ABSTRACTS

SECTION 4. Electrical engineering; Energy engineering; Electronic engineering, telecommunications and information technology

A SHORT OVERVIEW ON NETWORKS

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Abstract:

We have reached a point in which the reliability of a device is crucial. Now all of our devices are built using nano-technologies, so it is very important to focus on methods that can enhance the reliability of these devices. This paper brings a fresh approach on modelling and understanding the 3D hammock networks. In this new approach we start from the definition of 2D hammocks offered by Moore-Shannon and then we take inspiration from our previous models made for 2.5D, respectively 3D hammocks. We analyze them in order to evaluate their reliability, and in the end we compare the previous results obtained with our fresh results. The source of inspiration for this paper is the structure of microtubules found inside real axons, these microtubules are beeing placed in a hexagonal shape and are connected with each other with the help of tau-protein. For this paper we tried to replicate the data transmission inside an axon. In the axons 2 adjacent microtubules are joined toghether at a certain point by tau-protein, and this pattern is repeated throught the length of the axons with various microtubules. The connectivity can be simulated by using a hexagonal shape with a center, containing 7 vertices, each vertex corresponds to one microtubule, and at each section there can be placed randomly matchsticks, with the role to connect 2 micrtotubules, each matchstick is a representation of how tau-protein connects microtubules, that can touch each other in one or more vertices, simulating one or more connections. The maximum number of matchsticks on a layer is 12, but because a hammock network can have a maximum of 50% connectivity the simulations presented are for up to 6 matchsticks, displaced randomly, and as a pattern. The simulation is based on the computational methods for the first non-zero coefficients, and we present a comparison for the values of the first coefficient when a vertex is allowed just one or multiple connections. For the random disposal we also have a Monte Carlo analysis. As a result we observe that the disposal of the connections between the vertices matters a lot.

Keywords: 3D hammock network, algorithm, reliability, two-terminal network

EVALUATION OF SEVERAL PID CONTROL TUNING METHODS FOR SPECIFIED PERFORMANCES OF A DC-DC BUCK CONVERTER APPLICATION

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Abstract:

The Proportional-Integral-Derivative (PID) controller is an intensively studed control scheme due to its simple structure and ease of design while maintaining acceptable performances and robustness. A significant number of researches that investigate the PID control targets DC-DC converters systems. These types of circuits are widely used in the consumer, industrial, automotive and communications power supplies; thus, they are attractive from the control designing point of view due to the variety of requirements imposed in different applications.
For a good transient behavior of the DC-DC Buck converters, the control loop should be designed appropriately taking into consideration perturbation signals such as reference or disturbances variations. Thus, a variety of feedback loop tuning methods were developed in the literature that guarantee specific closed-loop behavior of a system. Some of them are based on linearized models and provide formulas for a stable system as Ziegler and Nichols, Cohen and Coon, Åström and Hagglund while others use a more general approach i.e., pole-zero matching and pole placement.
In this communication, a comparison between the performances of different tuning methods is presented with special focus on a DC-DC Buck Converter with software control loop as a case study. A nonlinear model for the converter was developed in Matlab/Simulink environment in order to draw the conclusions of this work. For the analyzed system three input stimuli of interest were applied: reference voltage, input voltage and load current.
A pole-placement method was delevoped in order to obtain specific time domain performances for the point tracking or disturbance rejection. In this work, we also show how the proposed method is placed related to the results of other state-of-the art methods.
The aim of the study was also to point out the time domain performances trade-offs, namely overshoot and settling time, when different methods are used for tuning the control parameters in order to present the advantages of each tuning methods at different input stimulus variation.

Keywords: DC-DC converter, PID control, pole-placement method, time domain specifications

THE USE OF FORMANTS` CORRELATION IN ASSESING THE SADNESS STATE OF THE SPEAKERS

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Abstract:

The purpose of the study is to develop a comparative analysis of the variations in the correlation coefficients of the formants for the Romanian vowels during emotional speech. Two main directions of research integrating most studies on emotions, providing valid scientific data and thus, allowed the establishment of two explanatory theoretical models: 1) discrete theories and 2) dimensional theories of emotions. In the former, the first contributions were Darwin's empirical observations on the evolutionary role of emotions and their universal character. P. Ekman proposed the model of the six basic emotions that are innate and universal: joy, sadness, anger, fear, surprise and disgust. Plutchik added acceptance and anticipation to the category of fundamental emotions emphasizing their primary role in mobilizing adaptation resources. The authors who support this paradigm analyse a relatively low number of emotions characterized by specific patterns of responses at the physiological level and in the speaker's voice signal. This justifies my interest in only a few emotions in the doctoral research and in this study.

This current analysis focuses on the influence that sadness has on the vocal signal. An annotated speech database was created composed of recordings of the speakers’ pronouncing the short sentences /*mother is coming*/ (/vine mama/), /*last night*/ (/aseară/) and /*who did that*/ (/cine a făcut asta/). The sentences were first pronounced on a neutral tone of voice and then expressing sadness. The vowels were delimited in the recording and the formants and the fundamental frequency (pitch) of each vowel have been extracted. I applied statistical analysis techniques in order to verify whether the variation of the correlation coefficients calculated for F0 and F1-F4 presents significant oscillations or if they tend to be homogenous. The analysis was performed under the following conditions: (1) same speaker – same vowel – different sentences; (2) same speaker, same vowel – emotional neutrality vs. sadness; (3) different speakers – same sentence – same vowel.

The preliminary results are in line with the previous studies that found emotion-dependent variations in the local correlation between formants. The correlations between formants are emotion-dependent; subjects differ in the correlation level of the formants; some of the vowels exhibit stronger variations of the correlations between formants under emotions. The preliminary results have to be statistically validated during the final stages of the study.

Keywords: correlation, emotions, formants, speech database, romanian language

ASPECTS REGARDING MACHINE LEARNING PRINCIPLES

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Abstract:

In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search and a vastly improved understanding of the human genome. In current times machine learning is so present in our day to day lives that we used dozens of times a day without consciously thinking about it.
There are several different types of learning algorithms. The main two types are what we call supervised learning and unsupervised learning. In supervised learning, we are given a data set and already know what our correct output should look like, having the idea that there is a relationship between the input and the output. Supervised learning problems are categorized into "regression" and "classification" problems. In a regression problem, we are trying to predict results within a continuous output, meaning that we are trying to map input variables to some continuous function. In a classification problem, we are instead trying to predict results in a discrete output. In other words, we are trying to map input variables into discrete categories. In contrast, in the unsupervised learning problem we're given data that does not have any labels associated with it. What we do is we give this unlabeled training set to an algorithm and it finds some structure in the data usually in a clustering manner.
In this communication we present several basic machine learning algorithms and applications together with some practical know-how needed to quickly and successfully use them. Topics briefly discussed are as mentioned supervised learning such as parametric/non-parametric algorithms, support vector machines, kernels and neural networks, unsupervised learning such as clustering, dimensionality reduction, deep learning and best practices in machine learning such as bias/variance theory and innovation process in machine learning and AI.
In the end we discuss some specific applications regarding design and optimization of analog integrated circuits such as operational amplifiers.

Keywords: ASIC, machine learning, integrated circuits, neural networks, supervised learning, unsupervised learning

HEAD GESTURE RECOGNITION BASED ON CAPACITIVE SENSORS USING DEEP LEARNING ALGORITHMS

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Abstract:

Human Activity Recognition and Classification are among the most interesting research fields, especially due to the spread of wearable devices such as mobile phones and smartwatches that are present in our daily lives. Determining the human body's motion and activities through wearable devices has contributed to different domains such as medicine, entertainment, health monitoring, and sports training. The current paper proposed and investigated the head motion recognition idea based on four capacitive sensors and deep learning models. We further develop the head recognition gestural system, previously developed and presented in another paper during this study. The proposed system was designed to empower a tetraplegic person to control a remote device or an intelligent wheelchair. The capacitive sensors were placed around the neck, using a necktie, being easy to use by each volunteer that participated in this experiment. The computational steps were performed offline based on the five deep learning architectures. Each computational algorithm was trained based on 2 databases acquired from five volunteers from two days. The training of each deep learning algorithm was done twice over 100 and 1500 training epochs to conclude each model's classification performance. The results show that the best-proposed deep learning model can determine each activity with a classification equal to 88.39 % using capacitive raw data. Also, during the experiment, the deep learning models provided accuracy in the range of 68.75 % 88.39 %. This study provides a good overview of the cheapest non-contact wearable sensors' classification capability that can have an excellent potential to be included in diverse human-computer interaction (HCI) solutions. The current study's main objective was to design, investigate, and evaluate the classification performance provided by classic and hybrid deep learning models capable of recognizing with accurately each predefined head motion commands. Also, this study provides a good starting point for further research, where such sensors can be included in intelligent systems to facilitate the interaction between humans and smart devices as an alternative to complex or expensive sensors.

Keywords: HCI system, head motion, head gesture, deep learning, intelligent computational model

POWER DISTRIBUTION NETWORK OPTIMISATION - EFFECT ON CONDUCTED AND RADIATED EMISSIONS

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Abstract:

So far, there are rather few research papers that discuss the effects of Power Distributions Networks (PDN) on regards of conducted and radiated emission (CE/RE) of electronic systems. The main scope of this research is to propose an optimum PDN that assure the functionality of the component integrated circuit (IC) according with the catalogue specifications and, at the same time, reduce at certain frequencies dictated by the EMC standards, the current consumption from the system supply by integrating the optimum configuration of the decoupling capacitors.
Simulations tools like CST, which were used on our case study, can be used to reproduce the model of the electronics that contain the relevant parts of the system used directly for tests on EMC laboratory. The scope of the investigations was to determine by simulation the quantitative and qualitative results of the current sink by the IC by adding in the simulation setup the effect of the IBIS models of the circuit buffers. In the simulations, two main cases are considered. First, considering a minimum circuit load, such that when only the clock signal is consumming current from PDN, can be determined the minimum dynamic current. Then, on the other worst-case scenario side, when all the gates are simultaneous switching, the IBIS models will determine the maximum dynamic current. The difference of these two is just the maximum transient current that will offer information about the minimum quantity of charge, so practically the minimum sum of filtering capacitance distributed in discrete chip capacitors. This part is solving the PDN requirements. Then the qualitative information, obtained by direct investigation of the sink current at maximum load is offering information about the spectrum of the current. As long as the goal is, at the same time, to minimise the current coming from battery system at certain frequencies, we have to choose the right capacitors combination so that a minimum part of this current, is sink only from capacitors. The paper contains as well the results of applying a design flow on a real example.

Keywords: conducted emission, power integrity, power distribution network, radiated emission

VIDEO IMAGE PROCESSING USING THE JETSON NANO DEVELOPMENT KIT

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Abstract:

In the context of the global pandemic, embedded systems can be used to support us against COVID-19. There is an increasing emphasis, lately, on technological solutions, which use artificial intelligence to identify and process certain information taken from specific audio or video sensors. This data can be processed to generate a solution to certain problems or act to achieve a particular goal.
The present paper aims to use a built-in system, the Jetson Nano development kit - a small computer capable of running artificial intelligence applications supported by the embedded GPU's parallel processing capabilities. Data taken from a peripheral (a video camera) or a video recording is processed locally (internally), which provides a better security level and a faster speed of operations.
This approach aims to use the Jetson Nano board through which recording images are taken from a video file (in the first stage) or in real-time by a video camera. The goal is to identify a specific object (e.g., a car) or human detection. Subsequently, in supervised learning, the algorithm is driven by a data set that is already labeled and has a predefined result. Based on this machine learning algorithm, a model is generated, which provides conclusions that can be processed less and less depending on human intervention.
In the built-in system, the code is written in the high-level programming language Python, a very powerful open-source and is used to implement the artificial intelligence algorithm. For image and video processing applications, the OpenCV platform is used. The entire software component runs on a modern Linux-Ubuntu operating system.
The final goal is to drive a semaphore based on the number of cars, the number of people waiting for the green light, and the distance between the human subjects. When the imposed social distance is no longer respected, the traffic light will allow pedestrians to cross to minimize the risk of transmitting COVID disease.

Keywords: artificial intelligence, Embedded systems, Jetson Nano Developer Kit, machine learning, OpenCV, Python

ON THE USAGE OF ARTIFICIAL NEURAL NETWORKS IN POWER ELECTRONICS COMPONENTS FOR VEHICLE ELECTRIFICATION

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Abstract:

This paper presents an analysis on how ANNs (artificial neural networks) can be used in control alogorithms of power electronic systems used for vehicle electrification. The electrical motor, the dc-dc converter and the energy management system are main components of a hybrid or electrical vehicle. The ANNs appear as an interesting alternative to optimize the respone and the costs of the system. The paper will focus on how ANN can be used in the area of temperature prediction, fault diagnosis and control the systems to satisfy the desired requirements. In an electrical drive system, for induction machines, there is a need for wide operating range and fast torque response which leads to the need of advancend control techniques in order to meet the real demand. As a result, several control strategies have been developped for induction motor drives and some of them are based on ANN, as they will be presented in the paper. A comparison will be made between PI controller and advanced techniques of control based on ANNs. In the analysed work it is shown that the advantages of the proposed neural control include a faster response speed and fewer oscillations compared with the conventional Proportional Integral (PI) controller-based vector control strategy. In particular, the neural network control technique can provide better harmonics reduction ability. It is important to monitor and detect sensor faults, especially in drives with an increased safety level. The paper will present the usage of the neural network application in detecting stator current sensor faults in the vector control algorithm. For the diagnosis algorithm for permanent magnet synchronous machines (PMSMs), the fault diagnosis can be based on a current signature analysis. Here the ANN can support the feature extraction with classification method and a convolution neural network that includes a softmax layer. ANNs can also be used to implement a sensorless controll strategy to estimate the rotor’s position and speed of induction motor, with the aim at reducing the cost of drive and enhance the reliability. In PMSMs temperatures monitoring is crucial to ensure safe operation and maximum device utilization while reducing the cost of the materials. Therefore, neural networks featuring memory blocks (LSTM) or deep recurrent and convolutional neural networks with residual connections are investigated upon their suitability to give accurate temperature time series prediction inside PMSMs or similar motor types. In the last part of the paper the fesability of using ANNs methodology for controling the output voltage of a DC-DC converter is analyzed.

Keywords: artificial neural network, automotive systems, DCDC converter learning, deep learning, electric drive, electrical vehicles, power electronic, power inverters, motor control

SYSTEM FOR DETECTING THE TRANSMISSION ERROR RATE DURING WI-FI COMMUNICATION WITH CC3220SF LAUNCHPAD

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Abstract:

The present paper proposes and evaluates a method to detect the ratio of total number of data units in error to the total number of data units transmitted during Wi-Fi transmission in different environment conditions (e.g., line-of-sight vs. various obstructions such as walls, high or low interferences, low or crowded AP access etc.), using the CC3220SF LaunchPad development board. The goal is to find the best applicability of this system for future IoT researches.
In this paper, the proposed experimental setup is composed of several components. The first one is the CC3220SF as the main platform that acquired data from peripheric sensors and transmits this data through a Wi-Fi connection. A windows application represents the second component. The last one is a NodeMCU system – used to simulate a device that requires concurrent and asynchronous access to CC3220SF.
The proposed solution evaluate data provided by CC3220SF to the windows application, and NodeMCU system thought a Wi-Fi connection in different real condition. For each request of data, generated by windows application or the NodeMCU development board, the CC3220SF will encapsulate data with a unique index. The proposed solution for evaluating the the ratio of total number of data units in error to the total number of data units transmitted through the Wi-Fi connection is simple, easy to implement and can be used to check performances in complex IoT systems. The main focus of this paper is to demonstrate capability and transmitting performances for this new generation of Texas Instruments development board and the possibility to obtain a quick and straightforward method for evaluating Wi-Fi rate transmission for future IoT researches ideas.

Keywords: CC3220SF LaunchPad, development board, error rate, smart system, Wi-Fi

DIGITAL COMMUNICATIONS LINKS COOPERATING WITH THE ANALOG 4-20 mA STANDARD FOR MARINE APPLICATIONS

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Abstract:

The maritime industry makes a significant contribution to the globalized economy. One of the most important parts of the maritime industry is transport. Maritime transport by ships is the dominant mode of transport for industrial products and food. Modern ships are increasingly automated. A characteristic feature of automation systems is the use of distributed monitoring and control systems with large distances between field devices and controllers. Among many methods of signal transmission, both in measurement and control, the dominant role in relation to continuous signals is played by the two-wire 4-20mA current standard. Despite its advantages, this standard has limitations mainly due to one-way transmission of information in relation to one measurement quantity. Programmable transducers are an alternative to analog solutions. This carried research concentrates on the full assessment of the properties of the considered methods of information transmission used so far with particular reference to the two-wire 4-20mA standard. This assessement also takes into account the negative factors characterizing the sea-going ships, such as environmental conditions or problems resulting from the use of an isolated power grid. An additional condition considered in the analysis is the performance of measurements in potentially explosive areas. Furthermore, a description of the available digital methods used for communication in ship automation systems will be presented. Firstly, description will be provided for HART protocol (Highway Addressable Remote Transducer), Foundation Fieldbus and Profibus PA as communication protocols adopted by modern smart transducers as alternatives for classical analogue 4-20 mA transducers. Moreover, serial communication interfaces such as RS232, RS422, RS485 and Modbus protocol will be discussed as means of communication between automation stations.
Eventually, illustration will be provided for tank level measurement systems on a commercial ship as an example for measurement and control system mainly based on classical 4-20 mA current signal. Description will be provided for the problems associated with the system and their causes. Based on the conducted discussions, there will be recommendations of suggested solutions for such problems.

Keywords: 4-20mA standard, foundation Fieldbus, HART, Profibus PA, smart transducers

RELIABILITY ANALYSIS OF AUTOMATIC SYSTEMS OF MONITORING THE CONCENTRATION OF METHANE IN THE MINING UNITS IN THE JIULU VALLEY

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Abstract:

This paper presents a systematized assessment of the real performance of the automatic control system of CH_4 concentration in mining works in the Jiu Valley, equipped with telegrizometric control panels. The main problems of protection against the potentially explosive atmosphere from firedamp hazardous mines in which there are electrical installations are highlighted. In order to analyze them, a mathematical model has been developed that defines the probabilities of an explosion in firedamp hazardous mines, equipped with electrical installations, from the perspective of the two hypotheses: the situation in which there is no automatic methane concentration control system, interconnected with the electrical installation that have to be protected, respectively the situation in which such a system exists.

An automatic system is effective if, at a certain point in the mining operation, when a dangerous methane accumulation occurs or moves, the system detects this accumulation and transmits the disconnection command to the protected electrical installation which, it is de-energized in a sufficiently short time so that it is not practically probable to overlap the existence of a dangerous defect not disconnected by the electrical protections. The success states are dependent on: the correct positioning of the detector, between the source of release or the place of production of the displacement accumulated after the production, due to some modifications in the ventilation system and the protected electrical installation; operation of the control system, expressed by statistical parameters of technical reliability; the correct operation of the disconnection system, which implies the correct choice of the switching devices on which the impulse of disconnection of the protected electrical installations is given and the operation of these devices.

The analysis of these aspects revealed that it is necessary to develop control strategies at the local level, so that the rule is the need that, between any source of methane emissions, respectively space in which methane accumulations can occur which are subsequently moved for various reasons and electrical installations, to have, correctly placed in space detectors of control systems, systems to control the disconnection of electrical installations on the routes on which they can move methane accumulations.

Keywords: automatic monitoring system, equipment/event register, methane, reliability, telegrizometric control unit

PRECISION ANALYSIS AND MEASUREMENT TOLERANCES OF INTELLIGENT BATERY SENSORS IN THE AUTOMOTIVE INDUSTRY

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Abstract:

An IBS (Intelligent Battery Sensor) is a measurement system for battery management. This assembly measures the charging or discharging current flowing through the battery, the voltage across the battery terminals, and the temperature of the battery through the heat pipe between the battery pole and the IBS itself. All three of these measurements are taken almost simultaneously to ensure accurate measurements, even during periods when conditions change rapidly.
Knowing the health and charging of batteries is very important in modern vehicles. Innovations such as start-stop, drive-by-wire and the conversion of hydraulic systems once into electrical systems add an even greater burden to the vehicle's electric battery system, which drivers rely on for their safety and the safety of others around them. An IBS allows the vehicle to prioritize all these electrical loads on a scale, from "comfort" to "safety critical". The car can then turn off these systems in a logical order to warn drivers of an imminent battery problem, keeping them safe.
This analysis examines the tolerance induced effects on the electronic circuit caused by large potential variations and unknown variations of the components, beyond their initial nominal value. The cause of these variations are the influences given by the manufacture, aging or environment, they can cause the circuits to deviate from the specifications. To be able to avoid this variation I made a worst-case analysis. After completing the worst-case analysis, we found that the PGA (Programable gain amplifier) used for one for a gain of 4 has the highest (poor) resolution with the longest measurement range. About the linearity error and the offset error with respect to the ideal value of the converter, in our case the offset error remains constant over the entire measurement range, while the linearity error increases in direct proportion to the input voltage of the ADC (Analog to digital convertor), reaching its maximum value at the end of its scale.
This type of case study is carried out for market research and for evaluating the capabilities of different integrated circuit providers. For a prediction of product reliability, a mean time between failures (MTBF) analysis is recommended.

Keywords: analysis, battery, errors, IBS, measurement, monitoring, smart sensor

INFLUENCE OF BUNDLE CONDUCTOR CONFIGURATIONS UPON THE GENERATED ELECTRIC FIELD

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Abstract:

One of the commonly adopted solutions when it comes to High Voltage Overhead Power Transmission Line is the so called "bundle conductors". Essentially there are 2, 3 or 4 conductors (called here sub-conductors) that are mounted in parallel, these stranded conductors being used per the same phase. Even more so, in the case of very high voltages and currents, characteristic for the most developed economies (USA, China and Japan) are also networks where bundles consisting of 6 or 8 conductors (for 875 kV or even 1000 kV networks). This solution, despite mounting difficulties and the compulsory introduction of spacer-dampers, has some undeniable advantages. The most important is the reduction of losses during transport, both by corona effect and by skin effect. Other advantages would be to reduce the reactance of the electric transmission line and increase the capacitance to neutral (compared to single lines), with the first benefit being the improvement of the power factor.

This paper studies the influence of various configurations of bundle conductors on the lateral profile of the generated electric field, but measured at earth level, at the standardized height of 1 m. This somewhat less relevant aspect, very little studied up to present days, is starting to arouse a certain interest, especially from the perspective of increasing general concern about the effects of electromagnetic fields on human beings.

The magnetic field generated by the High Voltege Overhead Power Lines depends only on the total value of the current transmitted, so from this point of view, splitting a conductor into several parallel ones has virtually no influence. Things are different from the perspective of the generated electric field, which is the gradient of the electric potential. To a same given voltage, the smaller the conductor section, the more intense the electric field on the conductor surface. A higher field means a more significant voltage drop happens near the overhead conductor while fewer volts remain to “drop” near the earth.

In the first part of the paper we present our considerations regarding the calculation of Geometric Mean Radius, starting from Geometric Mean Distance (between subconductors), both for the twin configurations (2 subconductors) and for the triangle, quad, hexa and even octa configurations.

In order to compare the generated electric fields, a 400 kV double three-phase network was chosen, with 2, 3 and 4 subconductors respectively. The increases were only 17% (from 4.4 kV / m to 5.3 kV / m), at points located +/-10 meters (right-left) compared to the axis of symmetry of the network. This increase is within the limits imposed by ICNIRP for occupational exposure and cannot be balanced with the significant reduction of network losses, provided by bundle conductors.

Keywords: bundle conductor, corona losses, electric field

HEATING PROPERTIES OF GADOLINIUM MAGNETOCALORIC MATERIAL UNDER THE INFLUENCE OF A CONTROLLED MAGNETIC FIELD

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Abstract:

The magnetocaloric has excellent magnetocaloric properties to improve. The magnetocaloric effect has been known since in 1891 and is based on the entropy change. The testing of the thermal characteristics of the Gadolinium material was done under the influence of a magnetic field. Therefore I found once exposed to a magnetic field, the temperature change takes place. An alternative to conventional refrigeration based on vapor compression is the construction of environmentally friendly and efficient refrigeration technologies using magnetocaloric materials. A large number of magnetocaloric materials are being studied but Gadolinum seems to present the material with the best magnetocaloric properties. The magnetocaloric effect is a heating or cooling of a magnetic material when the applied magnetic field changes. We have a coil that has been connected to a power source. With two temperature sensors the ambient temperature and the coil under tension were measured to a constant temperature.
The Gadolinium material was placed on the outside of the coil to measure the heating capacity bellow the magnetic field of dispersion. With the help of two temperature sensors with probes were able to measure Gadolinium material and coil temperatures at different voltages. The current adjusted using on ATR 8.
The magnetocaloric material Gadolinum has been introduced in the circular magnetic flux in order to be apple to measure maximum heating temperature. With the help of an ATR 8 we fed the coil at different voltages then two temperature sensors indicated the coil and Gadolinium temperature.
Following the measurements made we found that the magnetocaloric material Gadolinium under the influence of the controlled magnetic flux increases its temperature being a good heat exchanger. Being introduced into the magnetic field increases its temperature and when disconnected from that magnetic flux a slow temperature drop occurs, which means that this rare earth material can be used in different fields of industry and especially of renewable and technology, heat and mass transfer.

Keywords: cooling temperature, entropy, magnetic materials, simulation, variation

THE EFFECT OF THERMAL CONDUCTIVITY AND THE COOLING CAPACITY OF THE MATERIALS

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Abstract:

This study investigated the effect transmiting maintaining and thermal conductivity of composite materials. The objective of this article is to carry out a comparative study of the main thermal properties of five thermal insulation materials. Composite preforms 3D were prepared by hot-pressing. The effect of thermal conductivity and the cooling capacity of the materials. Incorporating in the materials an electrical resistance connected to a power source.

Keywords: composite material, solid phases, thermal properties, thermal insulation materials

AFFORDABLE APPROACH FOR MONITORING THREE HUMAN VITAL FUNCTIONS

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Abstract:

One of the most topical challenges of contemporary health systems is the increasing efforts (and associated costs) in caring for patients suffering from chronic diseases. Monitoring and providing quasi-real-time healthcare info becomes an increasingly difficult issue when the number of patients is gradually growing. The development of technology allows a significant improvement in the quality of life in general and of health care, in particular. The main objective of this paper is to propose an accessible device for monitoring the vital functions, both for patients and caregivers. The three functional parameters to be considered can be: the electrical activity of the heart, the heart rate and the oxygen saturation levels in the peripheral blood. Additionally, the possibility of geo-tracking has been considered.
The ECG module is based on an instrumentation amplifier with several levels of filtering, aiming to be able to acquire a series of signals that correspond to a physiological graph, on a single channel. These signals are interpreted and transmitted to the microcontroller of the central unit. The data is then processed by an analog-to-digital converter, filtered and amplified for graphical representation or storage. The heart rate could be calculated by digitally processing the recorded electrical activity for additional information.
In order to be able to acquire and process the biological signal (ECG) we used an instrumentation amplifier in association with an analog-to-digital converter, ADS1292R designed to extract and amplify low value biopotentials. The converter has two channels with the resolution 24 Bits. The first channel is for displaying the electrocardiogram, while the second is for determining the respiratory function. The module also has filters for smoothing and useful attenuation during signal acquisition. The development of such a system is a field of research that involves medical and engineering knowledge, the use of microcontrollers and integrated circuits providing high accuracy.

Keywords: analog-to-digital converter, biological signal, data acquisition, ECG, microcontroller

APPLICATION OF S7-1200 PLC FOR TEMPERATURE MONITORING OF A RAILWAY SEPARATOR

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Abstract:

In industrial systems, there are various situations, in which it’s difficult to monitor the temperature at a key point of an electrical equipment such as high power breaking breaks, automatic entrances, current paths, contact lines, force contacts from normal separations or load medium or high voltage circuits in electric power train systems or electric traction systems. In this paper we present a system for on-line monitoring of the temperature on the contact high voltage surface from a medium voltage monopolar separator used in the electric railway traction. The separator is used to close or open electrical circuits when a current of a certain intensity, not applicable for the normal separators and of a certain value for the load separators is interrupted. The separator must be able to withstand long-lasting current under normal circuit conditions and also withstand current for a specific duration under abnormal conditions, such as short-circuit conditions. An infrared temperature transducer is used which converts the temperature value into an electric signal in the 0-10v range. This electrical signal is used as an analogue input size for a Siemens S7-1200 PLC. To ensure the accuracy of the temperature measurement it is introduced four Type K thermocouple connected to analog inputs of the PLC using K Type Thermocouple to 0-10V Converter. An application was developed that monitors online temperature on the strength of the contact force of the railway separator, allowing the HMI monitor to view the temperature value, the actual size, and also the graphical evolution of the temperature values over a period of time. It also shows the experimental installation, the electrical drawing, the temperature value must fit within a certain acceptable range. In this design, the PLC consists of a Siemens S7-1200, HMI KTP700 for monitoring the value and an infrared temperature sensor. The real-time display of the data is implemented on the screen and data are recorded in a trend. The communication between PLC and HMI is realized by PROFINET and the temperature values are scaled from 0-10Vcc trough the analog input of the Siemens PLC.

Keywords: analog input, infrared temperature sensor, railway separator, thermocouple

EFFECT OF FAILURE TIME DISTRIBUTION ON RELIABILITY ANALYSIS

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Abstract:

The higher importance in the last decades of the reliability engineering in the last decades can be attributed to the fact the reliability influences directly, the quality and the cost of a product and indirectly, the quality and the cost of services associated with that product.
The reliability is the probability of the parts, components, products or systems to fulfil their designed functions without failures, for a certain period of time with a certain level of confidence given.
In practice, we need to study the reliability as the behavior in time, so we can state that an element, product or system is reliable if it performs the designed functions over time. Using methods which can make a qualitative and qualitative assessment, the reliability engineers can increase the reliability of a system or of a component.
There are few methods which offer both qualitative and quantitative approaches and one of them will be described further in this paper: Fault Tree Analysis (FTA). The internal structure of the Fault Tree is a combination of logical operators organized in a pyramidal shape. A FTA is a logical diagram which sets the relation between Top Event (TE) and the multitude of primary events / failures. The FTA can be an efficient method to determine the reliability function of a system using the components / subsystems failure rates (λ) and repairs rates (μ). The failure rate can be defined as the number of failures in unit of time. The repair rate is the probability that an element which was faulty until “t” moment of time to be repaired in the next “dt” interval of time.
Along with FTA, some instruments, as minimal cut sets, was created to develop this method. A cutest describes a group of components which if it fails simultaneous will lead to failure of entire system (if the system was available until that moment of time). A cut set that cannot be reduced without losing its status as a cutest is defined as „minimal cut set”. Similar, we can define a „path set”. The path set describes a group of components which if are available will ensure that entire system will be available.
The paper will develop various studies that consider different probability density functions of basic events that are involved into main logical gates of FTA.

Keywords: failures, fault tree analysis, reliability

ASSESSING METHOD FOR THE POTENTIAL INDUCED DEGRADATION IN PHOTOVOLTAIC SYSTEMS

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Abstract:

The photovoltaic means electricity from the sun light. It produces electrical energy without harmful substances, i.e. without CO_2 emissions and is therefore an important cornerstone of our future energy supply worldwide.
A problem that has gained great importance in recent years is the so called potential-induced degradation (PID) on poly-crystalline and mono-crystalline solar modules.
Since the potential of induced degradation on solar modules is very gradual, it is difficult to highlight or localize it, even if monitoring is daily, by using data logger, evaluating and comparing the results.
The main difficulty is the always changing weather: bright or gloomy. Which means that it is very difficult to recognize PID at short notice or to determine it immediately only by loss of earnings; this might have other, various objective reasons.
In this paper we present our results (and images) regarding the identification of PID as a result of the electro-luminescent effect. Just like diodes begin to shine through electrical current, the behavior of a solar module is the same; it starts to shine in about 1100 nm spectral range when there are established leaky currents caused by PID infection.
Since this "glow" is in the light spectrum not visible to the human eye, it can only be made visible by means of electroluminescence cameras.
There are discussed the mandatory parameters of the electroluminescence camera, an important criterion in order to create usable images or to obtain working comparative results.
There are processed the acquired results within a period of around 9 months, it is about a demonstrable loss in earnings of around 4 to 8%.
There are many indications that the effects of PID on solar modules depend very much on what type of soil (dry or moist and therefore low-resistance) is used for earthing. According to our measurements, there is a tendency that the moist soil increases the PID effect rather than a dryer one.
Finally, as a result of the determinations here performed, it is proposed a solution to reduce PID in the case of wet soils or rainy autumns.

Keywords: electroluminiscense, photovoltaic, potential induced degradation

NEW SOLUTION FOR CEREALS, VEGETABLES AND FRUITS STORAGE

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Abstract:

This work addresses the storage problem of cereal products, in particular of vegetables and fruit, from the point of view of storage time, transport simplicity and time and fuel economy. A mobile container shall be produced for the transport, storage and preservation under optimum conditions of cereals, vegetables or fruit. The new storage solution will be a modified Abroll-type hopper to maintain optimum conditions for cereals, vegetables or fruit. For road transport of drop-down container, a lorry with chain or hook device tested to the rail (also referred to as "roll-off") is required, allowing loading, unloading and reloading. The railway companies provide the car ACTS a rotative framework. The rotating guide rails on the wagon allow for easy reloading of ACTS containers.These containers shall be placed directly at the disposal of the supplier and replaced as necessary. It shall consist of: air conditioning station, temperature and humidity monitoring system, aerator tube, perforated floor, temperature sensors, moisture sensors, temperature and moisture sensors, aerator fan. Digital sensors for temperature and humidity allow the use of common comunication wires,and the location of all of the sensors along the cable are known through individual ad-dresses. Digital humidity sensors also work on the capacitive principal to measure the permittivity of a known hygroscopic dielectric material. A humidity sensor and a temperature sensing element are produced as a single unit. Digital temperature sensor-based cables have measurement accuracy within 0.5 degrees. By monitoring grain temperature in real-time, any slow gradual rise in grain temperature can be used as an indicator of on early stage of grain spoilage, and corrective action can be taken by switching on aerations fans at appropiate times to cool the grain. The aerator lines which will help you to bring the optimal parameters into the container shall be under the perforated floor. Depending on the type of grain, vegetables or fruit stored in the container, we can program the air conditioning unit to certain appropriate temperature and humidity parameters for long-term safe storage. Once the air conditioning unit is switched on, the aerator lines will send air through the perforated floor with the moisture and temperature previously programd according to the density and type of applications stored. The fans on top of the container will remove and extract the wet, hot or cold air. The temperature and humidity sensors will give the control to the air conditioning unit and the ventilation fans when the temperature and humidity have reached the optimum setting. When these conditions are met, the air conditioning unit and the fans will stop turning and stagger until the temperature and humidity change again. For long-term storage we need a low temperature first depending on the product we want to deposit. That is why the temperature sensor woll be adjusted to the temperature at which we want to bring it into the container, after which it will stop. Moisture is an important factor in the preservation and conservation of cereals, vegetables and fruit. For their storage we need low humidity according to the desired assortment. So we adjust the humidity sensor to the value that is suitable for keeping the product in optimal condition and see the time needed to reach the required value. In some cases, in the grain especially, when their humidity in critical parts we need a high temperature to dry them and to decrease moisture. While we raise the humidity temperature, it will decrease to the required value and then we will reduce the temperature to the retention value. The advantages of the proposed solution would be: small cap of storage halls compared to concrete silos and metallic ones requiring a solid foundation; no equipment required for handling and transporting cereals in silos, heating systems for the drying of cereals are of low power owing to the cereal coating of a maximum height of 2.5m, so low energy consumption; easy monitoring of modules and their independent operation; ventilation and aerator systems, low-power heating, thus energy saving; time saving to transport modules in storage hall that can be built close to farming land; the use of machinery much less than today, therefore maximum transport efficiency; their safe unloading within the very short period approximately 2 minutes; less drivers and cars engaged in the agricultural campaign and eliminating the wasted time when the machines are being unloaded.

Keywords: easy monitoring, economy, efficient storage, moisture, mobile container, temperature

NONINTRUSIVE ELECTRICAL LOADS PATTERN DETERMINATION

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Abstract:

The paper presents a possibility of determination the electrical patterns of the loads by monitor their operating regimes. The internal services from the power substation represents a set of electrical equipment (synchronous motors, converters, relays, heating resistors, lighting installations, etc.) powered in continuous and alternating current, which contributes to a proper functioning of the main systems of the substation.
The parameters that define the electrical pattern of a load are: applied voltage and absorbed current, the harmonic components extracted from the alternating current waveforms, the phase shift between voltage and current, the level of the power absorbed and the functioning intervals.
In order to identify the electrical pattern of the loads from the internal services installation analysed, are acquired the evolution of the voltage and current waveforms for different time intervals on the basis on which is determined the level of the power absorbed, the harmonic components and the phase shift: therefore the loads are classified in categories (inductive, resistive, capacitive or combination of them).
By determining the electrical pattern it can be monitored the normal or the malfunction operating regimes for the different categories of the loads and it can be established the load curve of the electrical installation.
In order to establish the profile for each load in an accurate manner, the paper include the simulation of the loads, performed in the EMTP-Electromagnetic Transient Program, and the correlation of the information extracted from the tool with the experimental results.
The electrical installation utilised for the experiment contains the following loads: one heating resistor, an asynchronous motor and a lighting module. These loads are powered in alternating current at a voltage value of 230 V. The acquisition of the electrical parameters is realised by using the MetaWATT energy analyser.
The information for the applied voltage, respectively the absorbed current are obtained using voltage and current transducers.
From all the inputs acquired, the energy analyser allowed the determination of the instantaneous and effective values of current and voltage, apparent and active powers, the phase shift between voltage and current, the harmonics of the current signals, connection and disconnection of the loads (energizing intervals).
The numerical results obtained from the simulation were compared with the experimental results for the validation of the loads models used in the simulation.

Keywords: electrical pattern, harmonics, nonintrusive, phase shift

ISSUES RELATED TO MOBILE ROBOT CONTROL BY MEANS OF BRAIN-COMPUTER INTERFACES

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Abstract:

The Brain-Computer Interface systems are a hot topic in today’s field of research as an innovative hands-free input periferic or as a potential assistive medical device. The electrical signals produced by the human brain and recorded from the scalp being used as a stand-in for the muscles has been on the minds of many scientists since this possibility first emerged in the 1970s. The research of this subject became more interesting in the recent years thanks to various breakthroughs in technology. The once tedious calculations involved in this research are now a piece of cake for the processing power of today’s computers. The specialized devices used in the brain-computer interface systems, like the g.TECs USBamp, are powerful devices that can record physiological activity from the brain, eyes, heart, muscles and more.

The BCI have successfully translated brain waves into control commands for external devices or applications like the P300 BCI spellers, the possibility of playing a computer game only with ones’ mind, or even for the control of a neuroprosthesis.

In this paper are presented the control of a mobile robot by using a Brain Computer Interface as a precursor for the control of a robotic wheelchair and also the ensued results of its research until now. The method employed in this paper is called the Steady-State Visually Evoked Potentials (SSVEP). This potential is a resonance phenomenon observed on the occipital lobe of the brain when the user is presented with a light source that flickers at a certain frequency. The EEG signal acquired from the brain is amplified and filtered, until the frequency of the flickering light is recognized. This study uses four different LEDs, each flickering at different frequencies corresponding to a direction that the robot can move to. When the user focuses on on of the flickering LEDs, the frequency appears among the harmonics of the EEG signal. The recognized frequency is then translated into a specific task for the mobile robot.

The tests performed with this equipment on two volunteers have shown a 1.15 seconds mean response time (from the moment that the user started focusing on a certain task (e.g. steer left, steer right) until the robot started to execute the planned task). This result may serve as a first step towards a shared control between an intelligent robotic wheelchair and a BCI user.

Keywords: assistive robotics, Brain-Computer Interface, rehabilitation, robotics, steady-state visual evoked potentials

PRIOR ART DOMAIN STUDY OF THE SYNCHRONOUS MACHINE WITH VARIABLE GEOMETRY

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Abstract:

The document is related to an electric motor/generator with adjusted magnetic field embodiment as it’s rotor has a special design in order to be able to squeeze the permanent elastic magnets from the rotor side. In this way the magnetic field is deforming due to a squeezing stroke parameter and in this way is variable the flux density of the magnetic field, the width of magnetic field and the length of magnetic field. The variable magnetic field is sweeping the statoric coils flowed by the currents and due to the higher flux density and wide and longer magnetic field will result higher torque or/and rotation speed even at low currents values. As results will be higher mechanical power due to demand and lower temperature from heat Joule dissipation.
The electric machine named Synchronous machine with variable geometry (motor/generator with adjusted magnetic field (EMGAMF)) is a specific machine from synchronous motors/generators having permanent magnets class with specific aspect as the rotoric magnets are elastic ones.
These elastic rotoric magnets are done from ferrite rubber. This ferrite rubber is describing in paper “Magnetic and dynamic mechanical properties of barium ferrite–natural rubber composite” [1].
The design of the rotor embodiment is described in the paper of EP3447888 patent [2] and WO2019038079 [3].
The elastic magnets are squeezed radially by an axial cam and in this way the properties of them are modified: the flux density of the magnetic field B, width and the length of all magnets in same time.
Also, it is modified the statoric coils number. In this way the electromotor force and at the end the torque is increasing in case of motor state machine.
[1]https://www.sciencedirect.com/science/article/abs/pii/S0924013604008532
[2]https://data.epo.org/publication-server/rest/v1.0/publication-dates/20190227/patents/EP3447888NWA1/document.pdf
[3]https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2019038079

Keywords: adjusted magnetic field, elastic magnets for rotor concept; power

NEW HARDWARE AND SOFTWARE INTERFACE FOR GRIP FORCE TRACKING SYSTEM

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Abstract:

The aim of this paper is to present a new hardware component and software interface for Grip Force Tracking System. This system will help the patients with neuromuscular diseases to evaluate and train their grip force control.
The main cause of long term disability is most likely provoked by a stroke. A very good rehab program in many situations is the best method for these people to bring back some of their reflexes and mobility.
This particular subject is approached by a Grip Force Tracking System (GFTS) that uses a biofeedback training method. The GFTS inputs are the signals provided from two grip-measuring devices for different types of physical forces. The trail is kept as simple as possible. A tested person applies a finger or a punch force depending on the GFTS attached device. Then, according to a visual feedback (e.g. sinusoid line) from the graphic user interface the user tries to overlap it with a virtual target signal having the purpose to decrease the error between them. The amplitude of the user controlled point is in accordance with his/her voluntary controlled force (e.g. of pinch).
At this moment, the user interface requires an old operation system and the hardware device needs a parallel port for communication which is no more used on computers, nowadays.
The goal of the paper is to present a new hardware and software interface that can be easily used by any operator on any computer and also to upgrade it with new functionalities.
The graphic user interface is created in LabVIEW which is an engineering software system for applications that require test, measurement and control with rapid access to hardware and data insights. In the core of the hardware device will be a digital signal processor that will convert the analogical signal to a digital one, afterwards the data will be send to the computer via USB.
The LabVIEW program is used to implement a new improved user interface. The setup installation is easier and the data acquisition will be much faster.
This device is innovative also in term of developing other types of exercises for people with neuromuscular diseases.

Keywords: data acquisition, Digital Signal Procesor, Grip Force Tracking System, LabVIEW, neuromuscular diseases

AN APPLICATION TO ESTIMATE THE POTENTIAL OF ROOFTOP PHOTOVOLTAIC POWER GENERATION FOR A RESIDENTIAL BUILDING

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Abstract:

Electricity can be produced from several sources, each with its advantages and disadvantages. Availability and environmental impact are two of the most important criteria that will tip the scales in favor of renewable energies, to the detriment of fossil fuels, depletable resources, and environmental pollutants. The most sustainable and clean renewable energy source is solar energy. The energy produced by the sun can be transformed into electricity for our consumption, and the surplus can be stored in batteries or injected into the network.

In the last ten years, the price of photovoltaic systems has fallen steadily amid increasing use. Today we find photovoltaic cells on the garden lighting system, on external batteries for mobile phones, boats, even on trains or planes. The increasing marketing of this technology, the advancement of research in the field, and the fact that more and more states have already implemented or are implementing policies to finance solar energy systems contribute to even greater accessibility of this technology.

The investment in such technology recovers in about 7 years by decreasing electricity bills, as well as by increasing the market value of the building where they are located. In general, photovoltaic panel manufacturers offer a 10-year product warranty and a performance guarantee that ensures an output power greater than 80% of the initial power value for at least 25 years.

Every hour, enough energy arrives on Earth to ensure the consumption of the planet for a year. Even if today we can transform into electricity only a part of this free energy from the sun, in time we will be able to optimize it and use it more and more, producing it with much lower costs compared to conventional energy and also storing it easily. If we consider a piece of unshaded land of 50 m^2, it would reach 70,000 kWh per year, considering the southern area of Romania, with a potential of 1,400 kWh/m^2. In 14 days, enough energy arrives on a roof to be able to supply a house for a year. On a roof with an area of 50 m^2, ideally oriented to the south and at a fixed inclination of 34°, the energy that will reach the roof will be 82,000 kWh/year. Depending on the orientation, the values vary greatly. The optimal angle of the panels with south orientation is 53° in winter and 25° in summer, and for a fixed system, the optimal angle is 34°. Photovoltaic panels currently have an efficiency between 13-18%. An ordinary system with an installed power of 3 kWp, with an efficiency of 15%, on an area over 100 m^2, can convert 3,720 kWh / year into energy annually.

The amount of solar radiation that a certain surface of the Earth receives is defined by the term insolation. The higher the exposure to the sun, the solar panel receives on its surface the greater amount of radiation that will in turn generate more electricity. When you decide to use solar energy, you will want to know how many real hours of sunshine you have on average (per day or year), depending on the geographical area you are in to make the best estimate of the production of your solar system. The application made by me: www.acoperisultausolar.com calculates the required number of solar panels, the solar energy potential of the location, but also the impact that your annual energy consumption has on the environment.

All these calculations were made based on information from „Top Panouri Solare” website (www.toppanourisolare.ro), with the help of the Harvard article: "The Equation of Time" by David W. Hughes of the University of Sheffield, B.D. Yallop and C. Y from Hohenkerk Royal Greenwich, accompanied by data from the European Environment Agency, NASA POWER Data Access Viewer, and „Simulation and design of solar systems” website(www.photovoltaic-software.com). The results were validated against Solargis Prospect Project. Solargis data has the best accuracy and reliability amongst available solar databases. This has been confirmed by several independent studies and has been validated at 1000+ locations globally.

In the study presented in this paper, we analyze my residential building, using data of consumption from the previous year. The building where I live holds 19 apartments with a standard consumption of 152 kWh per month, this indicates consumption of 2,898 kWh per month for the entire building, and in money approx. 2,000 lei per month. The most important input for the calculation of the solar potential is the available rooftop area, which was computed using Google Earth Pro software applying the polygon option. The resulted value is 416.95 m^2. To fit the condition of 14m^2 panels, just 406 m^2 from the rooftop will be used. With that being said, our building is eligible for 29 solar panels, each one with an output of 100 kW, to be able to cover the consumption for all 19 apartments.

According to geolocalisation, the potential is 3.23 kWh/m^2/day of insolation on a horizontal surface. For 1,179 kWh/m^2 annual average irradiation on tilted panels (shadings not included), and 406 m^2 total solar panel area the photovoltaic system can produce 53,851 kWh/year considering 15% solar panel yield and 0.75 performance ratio(coefficient for losses). The total power of the system with be 60.9 kWp.

With this consumption, we can save 58 trees and around 12 tonnes of CO_2. The constants used in the calculation are 306g CO_2 eq/kWh and 158.4g CO_2 eq/km based on European Environment Agency Data. How closer the energy production is to the place of consumption, the transmission/distribution losses are lower and, implicitly, we can save money. One solution to eliminate these costs is to go for decentralizing the production system by creating small producers' cooperatives. Small cooperatives mean the decentralization of the national system, not at the individual level but community-level, in our case my residential building.

Currently, there are 7,470,000 homes in Romania, of which 3,360,000 could be suitable for the installation of photovoltaic systems. Solar energy had a contribution of only 2.55% in 2017, but the development potential is very high. The largest increase in Romania's solar energy capacity was recorded from 2012 to 2014 when it went from 41 megawatts to 1,293 megawatts. By 2019, Romania's solar energy capacity has reached 1,386 megawatts. On January 19th, 2021, in the report provided by Tomorrow from Copenhagen, Romania has a share of 39% consumption of renewable energy, 57% consumption of fossil fuels. According to the latest reports, we need even more ambitious targets because the goal is to reduce CO_2 emissions by 100% by 2050, in order to meet the 2˚C global warming limit. However, all this effort needs the involvement and responsibility of each of us.

Keywords: coefficient for losses, electricity, insolation, performance ratio, photovoltaic panels, solar radiation, solar panel yield

AUTOMATED METHODS FOR SEARCHING OPTIMAL SOLUTION IN STREET LIGHTING DESIGN

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Abstract:

This paper introduces an automated method for street lighting calculation using DIALux 4.13 softwarewizzard. The study presents how a very big number of calculations can be done in a very short amount of time, considering the following parameters to be variable: distribution curves, distance between poles, height of pole, boom angle and length of the bracket arm. Other parameters are considered, but these are static: distance of the pole to roadway, type of arrangement. For the advantages of the method and increased calculation speed to be acknowledged, a case study regarding lighting class parameters and the way of selecting the lighting class considering different standards is presented. To reduce the number of calculations this method is used to try to determine the best solution possible. For the results to be more precise, the case study is done for two very different road arrangement, one of 16m and one of 40m width. The Standards considered in the case study are: Romanian Standard, European, U.S.A. and from Denmark, which after extensive studies are to be considered the standards with the biggest differences. The first conclusion of the paper is that the automated solution can do endless number of calculation variations in a relatively small amount of time, but there are limits for the program, which crashes if the number of distribution curves is very high. The second important conclusion based on the case study is that lighting classes with the highest consumption and the most restrictive standard when selecting the lighting class for footpaths is in Romania.This actually gives the maximum W/m2/lx of road almost all the time and is a clear point that the standard is old and not in accordance with the new trends in ennergy efficiency that should be a very important criteria when doing any standard for designing anything that involves energy-consuming equipment and should be updated to the other european standards.

Keywords: cylindrical illuminance, dialux wizard, illuminance, lighting class, overall uniformity, vertical illuminance

EVALUATION OF DIELECTRIC PARAMETERS OF BIOLOGICAL CELLS ON THE BASIS OF BROADBAND DIELECTRIC SPECTROSCOPY

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Abstract:

Identification, separation and characterization of biological cells on the basis of electrical properties evolution is a matter of increasing interest at the level of academic society. The herein study is aimed to present an in-depth study of evaluation of various cancerous cell lines in respect to evolution of different dielectric parameters. Evaluation of cancerous cells’ dielectric properties was performed with the help of dielectric spectroscopy (DS). Biological cells as mixture were firstly suspended within consecrated suspention solution and were dielectrophoretically sorted afterwards. The differentiation in respect to electrical properties was highlighted in respect to behaviour of the main dielectric dispersions noticed, with emphasis on β-dispersion. This dispersion if the result of interfacial or Maxwell-Wagner polarization which occurs in MHz domain mainly as of charges displaced at the level of the cell’s membrane and are dependent on cells’ structure. The results allowed differentiation between various cancerous cells as of quantitative difference of electrical parameters evolution against frequency.

Keywords: biological cells, dielectric spectroscopy, electrical properties

ASPECTS REGARDING THE SPECIFIC NUMBER OF OUTAGES IN OVERHEAD POWER LINES

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Abstract:

The paper is focused on the lightning protection on overhead lines. Part of the distribution system, overhead power lines are most vulnerable to lightning strokes. Their large expansion creates a bigger capture area for this atmospheric discharges, becoming subject to lightning caused power interruptions. An overview for various analytical models that follow the behavior of overhead power lines over-surges is presented. Although the over-voltages caused by direct strokes to the line are much more severe, those induced by nearby lightning have a higher frequency of occurrence and are responsible for a greater number of line flashovers and supply interruptions. Furthermore, the specific number of outages is presented and analysed.

Keywords: lightning strokes, oversurges, protection currents, specific number of outages

USE OF RF ELECTROMAGNETIC ENVIRONMENT ASSESSMENT BY MEANS OF FIXED MONITORING STATIONS

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Abstract:

Due to the large diversity of electromagnetic field generating sources, associated measurement methods cover a large multiplicity. Electromagnetic field monitoring can be performed either by fixed sensors (broadband method that involves the use of an isotropic sensor) or by mobile ones, (narrowband method, based on the use of a directional antenna).
In Romania, managed by the National Authority for Administration and Regulation in Communications (ANCOM), a broadband monitoring system of the RF electromagnetic field has been operating since 2015. Currently in our country this monitoring system is composed of 150 fixed stations (in Bucharest and 62 other cities), operating in the 100 KHz - 7 GHz frequency range. Aiming to measure the intensity of the electric field there are used isotropic triaxial probes.
In this paper we present and process the performed assessment of human exposure to electromagnetic fields over a period of four months, between October 2019 and January 2020. There have been permanently acquired measurements provided by the four fixed stations located in Iasi, at 4 points with assumed heavy electromagnetic traffic. The stations are of type NARDA AMB-8059, the system being integrated through a web application. EMF Observatory. The supplied map of EMF measurements also allows permanently survey of the measurement results.
The measurements contained in the map are performed in compliance with the recommendation ECC (02) 04 regarding the methods of measuring non-ionizing electromagnetic radiation.
The maximum values of the RMS value of the electromagnetic field intensity and of the power density measured by these stations have been compared with the reference threshold set by ICNIRP for every considered frequency range. More precise: a broadband domain (100 kHz - 7 GHz) and three narrowband domains, frequency ranges specific to mobile communications: 925 MHz - 960 MHz, 1805 MHz - 1880 MHz, 2110 MHz - 2170 MHz. These values have been summarized in the Excel tables for processing and comparison with the values imposed by the European and national standards in force.
As can be seen from the analysis of the data obtained from these recordings, it is found that no monitoring station from the analyzed ones recorded values of the field higher than the imposed by ICNIRP guidelines.
Never the less, this conclusion should not relax the monitoring process; on the contrary, narrowband methods, much more precise than broadband, should be used.

Keywords: electromagnetic environment, fixed stations, monitoring

ESTIMATION OF THE ELECTROMAGNETIC POLLUTION IN URBAN RESIDENTIAL AREAS FROM CITY OF IASI USING THE NATIONAL AUTONOMOUS EMF MONITORING SYSTEM

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Abstract:

In recent decades, we have witnessed an explosive development of applications that integrate the electromagnetic environment in everyday life (communications and mobile telephony systems, broadcasting, computer systems and wireless interconnected data transfer, remote control and security for public and private spaces, radar detection and GPS location, home appliances, toys, etc.). For these reasons, various international and governmental organizations and national bodies have taken into account the issue of occupational exposure, but especially the uncontrolled exposure of the population. at radiation from electromagnetic field (EMFs).
Since the beginning of the twentieth century, worldwide, internationally recognized organizations have conducted studies on the effects of electromagnetic fields on beings living. Based on the recommendations of these studies, national regulations and legislation are established. One such organization is the International Radiation Protection Association (IRPA), which was founded in 1965 and has as members governmental and non-governmental associations from 65 countries. Similar studies have been carried out by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), established in 1992 and specializing in the publication of reference guidelines for the exposure of the general or professional population to non-ionizing radiation, which are reference and in European Union legislation, including national law.
With that being said, monitoring the electromagnetic fields generated by a diversity of communication systems and other sources of radiofrequency electromagnetic fields (RF-EMFs) should be a priority in our days.
An Autonomous Broadband EMF Monitoring System with multiband sensors represent one of the major innovations in this area. The EMF Monitoring System continuously measuring the total EMF from all surrounding sources and is able to performing a real-time dissemination of the assessment results to the general public. The continuous monitoring of the electromagnetic field is very important to realize to reassure the general public who is in an area of ambiguity regarding the exposure to electromagnetic radiation generated by various sources of radio frequency electromagnetic fields in our country. The exposure to RF-EMFs is a cause of concern for many people in nowadays and should be a priority area of investigation, especially regarding the emergence of new communication technologies, like 5G NR.
In Romania, the issue of exposure to electromagnetic fields is regulated by law and the limits recommended by ICNIRP and the European Commission are valid, the exposure limits for the general population being 50 times lower than the limits for which there are scientific results on health effects (so-called effects thermal effects).
In the study presented in this paper, we analyze realtime monitoring data for the month of December 2020, using the National Broadband EMF Monitoring System. Continuous monitoring of the radio frequency electromagnetic field with the help of an autonomous monitoring system is performed in our country by ANCOM – The National Authority for Administration and Reglementation in Communcations. In present the system totalizes a number of 150 active stations across different cities. We will take in consideration and analyze the measurements data only for the stations located in the city of Iasi. The results of our analysis suggest that the exposure levels to RF-EMFs are well below the reference levels defined by the national legislation for general public.

Keywords: ANCOM, EMF measurements, exposure limits, monitoring systems, radiofrequency electromagnetic fields

ASPECTS REGARDING THE USE OF ELECTRONIC POWER DEVICES IN POWER GRID

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Abstract:

Due to the difficulties that appears in the construction of news transmission line or/and power plants and also due to the increasing of the consumption request of the electric power, existing power transmission systems are more and more stressed. A possible way in order to solve these problems is to use the electronic power devices. Electronic power devices used in power networks can be used in both transmission networks and distribution networks. In the transport networks there is the possibility of using FACTS (Flexible Alternating Current Transmission Systems) devices. In distribution networks there is the possibility of using devices similar to FACTS devices, which improve the quality and reliability of the energy transmitted to consumers. Some of these devices are DSTATCOM devices or Dynamic voltage restorer (DRV). Even if the use of electronic power devices in the transmission and distribution networks improves the performance of the power system, their presence changes the parameters of the electrical networks. These changes can affect the proper functioning of the power grid.

Keywords: costum devices, electronic power devices; FACTS devices

PHOTOVOLTAIC SYSTEMS MAXIMUM POWER POINT TRACKING ALGORITHMS

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Abstract:

Solar photovoltaic cell is the smallest unit of solar photovoltaic power system, which converts the light energy into electrical energy. The phenomenon of this conversion of light energy into electrical energy is known as photovoltaic effect. The power delivered by a photovoltaic cell generator depends on the operating point at which works. In order to maximize the energy supplied by the PV system, the generator must adapt to the load so that the operating point will always correspond to the maximum power point. Usually, when a PV module is connected directly to a load, its operating point is rarely at the maximum power point. The operating principle of the maximum power point tracking is to place a converter between the load and the PV array, to adjust the output voltage (or current) of the PV array so that the maximum available power is extracted. In addition, a power converter is required to regulate the energy flow from the PV array to the load.
Important aspects for these algorithms are the speed of convergence and the ability of the algorithms to identify the maximum point under different environmental conditions, or rather disturbances, as well as in the situation where we would have to provide the same results in rapidly evolving conditions, such as be sudden climate change. In most cases the optimal algorithm is chosen according to several criteria, such as: implementation complexity (autonomous systems, connected to the network); the type and number of sensors needed; the ability of the algorithm to detect local maximum points; cost; response time; type of implementation (analog, digital, mixed).
Several well-known direct control algorithms are used to perform maximum power point tracking (MPPT). There are many distinct methods of MPPT control algorithms, with different variations in implementation and performance. The best known classic MPPT algorithms are Perturb and Observe (P&O) and Incremental Conductance (IncCond). These methods are based on the same technology, adjusting the voltage of the PV array to track the optimum set point, which represents the voltage at the optimum operating point. P&O algorithms are widely used in tracking the maximum power point due to their simple structure and the small number of measured parameters required.

Keywords: maximum power point tracking, photovoltaic panel, MPPT

A DECISION-MAKING METHODOLOGY TO REPLACE THE AGING TRANSFORMERS FROM THE ELECTRIC DISTRIBUTION NETWORKS CONSIDERING THE PENETRATION DEGREE OF THE PROSUMERS

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Abstract:

The strategy “Europe 2030” for a smart, sustainable, and inclusive growth has as specific objectives the greenhouse gas emissions (reduced by 40% compared to the year 1990 levels), the energy efficiency (improved by at least 32.5%), and the electricity from the renewable sources (least 32% of the total electricity). Increasing the energy efficiency in the electric distribution networks can be accomplished by the Ecodesign Directive from the European Commission, entered into force in 2014, which requires a maximum level of power losses in the distribution transformers. The reduction of electrical losses and the clarification on the performance indications represent the main objectives for transformers underlying the Ecodesign Regulation. The first stage of the application started in 2015 (Tier 1), and the second stage (Tier 2) takes effect beginning in July 2021. Also, the new transformers should be sized considering the prosumers’ integration in the networks. In Romania, the entry into force of Law no. 184/2018 has created the premises to establish the regulatory framework by the Romanian Energy Regulatory Authority (RERA) for the renewable electricity generation systems installed at the consumers with the installed power of no more than 27 kW. In these conditions, the Distribution Network Operators (DNOs) should align with these directions and develop the planning strategies to sustain the above targets. In the paper, a decision-making methodology to replace the aging transformers in electric distribution networks has been developed starting from a transformer fleet assessment and developing the scenarios related to the prosumers’ penetration degree from the supply area. The aging degree (evaluated through the performance standard) and maximum loading level have been considered in the choice of transformers included in the analysis. The hourly load of transformers is estimated based on the curves current and voltage measurements (CVMs), performed with the power analyzers, and the injected energy typical profiles of the prosumers associated with various penetration degrees integrated into the planning scenarios of the supply area. Each analyzed scenario led to a planning strategy having a certain confidence degree, influencing the replacement order of transformers. A transformer fleet with aging units having the operating time very close or above the lifetime has been used in testing the proposed methodology. The obtained results highlighted the importance of integrating the energy injected by PV prosumers into the sizing process of transformers, influencing the replacement order.

Keywords: ecodesign, electrical losses, prosumers, planning strategy, replacement order of transformers

OPTIMAL OPERATION OF A TRIGENERATION SYSTEM DESIGNED TO SUPPLY AN ELECTRICITY, HEAT AND COLD CONSUMER

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Abstract:

Residential, commercial and industrial consumers generally need different forms of energy provided by separate production facilities. Until recently, these installations are, in most cases, analyzed and operated separately. Combining the production of different forms of energy can bring some benefits, which is an opportunity to improve the operation of the system. Therefore, some systems of distributed production with multiple energy carriers can be developed, intended to supply consumers with different types of energy, which operate optimized according to certain criteria such as energy efficiency, fuel cost, emissions, security, availability, etc.
This paper aims to present the optimization of the operation of a distributed generation plant intended to supply a complex consumer with electricity, cold and heat. This type of installation, which can be considered as an energy hub, is capable of simultaneously managing the generation and consumption of electricity supplied from or to the grid, centralized heating and/or hot water and air conditioning or refrigeration installations. The authors present the results of an optimization study for an energy hub with two input components (electricity and natural gas) and three output components (electricity, heating and cooling). The optimization procedure aims to determine the optimal operation of the hub components, in order to minimize the cost of the primary input energies, based on consumption load patterns of different consumers.

Keywords: distributed generation, energy hub, energy sources, power plant

SMART CHARGING OF MULTIPLE EVS IN SMART GRID RADIAL LOW VOLTAGE DISTRIBUTION NETWORKS

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Abstract:

The Electric Vehicle (EV) numbers are growing exponentially, in 2018 alone the EV sold worldwide, were around 2 milion EVs, according to Bloomberg. The energy consumed by an EV for driving based on the medium energy consumption of 0.25 kWh/km and the medium driving distance of a personal car in EU of around 40 km/day results in a medium energy consumption of around 10 kWh/day.
The most dificult situation for power supply will be seen in suburban energy distribution networks, where the energy consumption will be higher due to longer driving distance and where due to lower energy consumption density, Distribution Network Operators are opting for radial structure of the network.
In this paper we study the impact of EV penetration in this type of networks and the impact of the energy consumption produced by these, over the network voltage levels, power consumption and energy losses. It is clear that EVs should use an algorythm by which to regulate the energy consumed from the network. In this paper we are proposing an algorythm which takes into account the EV’s needs and the voltage level of the network. The results will be compared with the base scenario, in which the vehicles are charging at medium power needed.
To visualize better the impact of EV’s charging over the network the simulation results are dispayed between 12 PM until 12 PM next day. The EV are arriving and connecting to the network to charge around 4 PM and disconnecting from the network around 8 AM. What can be drawn as a conclusion is that the EVs are capable of adjusting their power consumption to the unregulated power consumption of households. The total charging power of EV’s adapts to the total available power that can be consumed from the slack bus, this power is limited by the transformer. The lowest Voltage level results around 8 AM in the morning, but it is not produced by the EV’s power consumption, but by the normal peak load of households. The power consumption in the network varies greatly, around 3 PM the increase in power consumption is due to normal evening peak load combined with arrival of EV’s.

Keywords: electric vehicle, energy consumption, network voltage, power supply

PHASE LOAD BALANCING ALGORITHM BASED ON A COORDINATED CONTROL OF THE PROSUMERS IN THE ACTIVE DISTRIBUTION NETWORKS

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Abstract:

Directive 2012/27 / EU of the European Parliament and the Council represented for the Distribution Network Operators a direction vector of progress towards energy union where energy efficiency has been seen as a source of energy in itself. The phase load balancing (PLB) is among the measures to increase energy efficiency adopted by the DNO in the last years, having an enormous potential for energy saving. The problem of load imbalance in the low voltage distribution network appears due mainly to a single-phase (1-P) random distribution of the consumers on the phases. This aspect negatively influences the optimal operation of the electric distribution networks. It causes additional power losses, voltage drops in neutral conductors, and unbalanced voltages.

The applied solutions in the traditional distribution networks, without the distributed generation sources, refer to the consumers’ switching on the phases or switching the lateral branching. Thus, all 1-P consumers, especially those with non-linear characteristics, are uniformly distributed between the phases based on some switching devices, leading to close values of the phase current flow on the network sections. The situation is complicated in the low voltage distribution networks where small-scale distributed generation through production systems installed at consumers (mainly photovoltaic panels - PV) has gained widespread use. The inverters used in PV systems are generally single-phase, and an uneven distribution of them on the phases can cause, in their turn, unbalances, leading to the neutral point moving towards dangerous values.

In the paper, a coordinated control algorithm of the prosumers' switching operations on the phases to obtain a phase load balancing at the SP level is proposed. The DSO should manage all prosumers from its supply area to control these operations adequately, to implement successfully the switching scheme associated with the algorithm. The algorithm has been verified in a test network belonging to a Romanian DNO containing 1-P prosumers and consumers integrated into the Smart Metering System. The energy savings generated by increasing the flexibility of the network have been addressed in the analysed scenarios. The obtained results have been compared with others PLB algorithms applied at the consumer level, and the conclusions highlighted the technical benefits quantified through the energy savings and the voltage quality indicators.

Keywords: active distribution networks, algorithm, energy efficiency, phase load balancing, prosumers

AN OVERVIEW OF HOME ENERGY MANAGEMENT CONCEPT

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Abstract:

The most used sources with a high energy potential are photovoltaic sources. This paper focuses to modelate the flexible loads of a residential area, base on a classification of eligible appliances. Thus, in order to use the photovoltaic energy with a higher efficiency, the methods of traditional load management are involved in residential sector in order to ensure an optimal balance between demanded load and photovoltaic generated power. The concept of Home Energy Management System (HEMS) is an action taken by the consumer and it is part of the concept for Demand Load Management, concept that refers to the process of balancing the power supply to the grid with electric charge by adjusting or controlling the load rather than by leaving the power plant. This action of balancing can be made by the distribution systrem operator, which involves directly management of the load. These actions involve the directly management of each electric receiver by means of intelligent devices. With this concept of HEMS, this paper improves the self-consumption and self-sufficiency indices of residential prosumers. In order to increase the self-consumption indices, a load management system has been proposed to be integrated into low-voltage utility grid in order to manage the deficit and excess of power from photovoltaic panels. In the utility grids, without a load management system, the profile of the demanded load curve does not fully match with the profile of the power curve generated by the photovoltaic panels. If the consumption is higher than the generated power by the photovoltaic system, the deficit of power and energy will be drawn from the electrical grid, whilst in the case of local consumption lower than the photovoltaic output power, the excess of power and energy will be injected into the electrical grid. The most important thing in implementing this algorithm is to perform a classification of the electrical appliances in order to minimaly affect the user's comfort.

Keywords: demand load management, Demand Side Management(DSM), Home Energy Management System (HEMS), photovoltaic sources

TRANSIENT RESIDUAL VOLTAGE INFLUENCE ON THE DYNAMIC LOAD TRANSFER

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Abstract:

The operation of AAR systems when lowering the voltage below a certain value (25% One) does not guarantee safe operation without affecting sensitive consumers. The speed of downloading the remaining voltage from the bar depends enormously on its configuration. A residual voltage of high values present on the bar for a long time interval (of the order of seconds) can lead to the disconnection of all-important consumers. In this paper, we will analyze the effects of the remaining tension and an unsynchronized connection of the vital source.

Today the electrical parameter monitoring systems have achieved incredible performance, so we can monitor, anticipate and control what happens in the electrical energy systems. Consumer switching systems from one source to another are ultrafast (Fast Transfer) that even synchronous engines or generators do not feel or are affected by this transfer. The usefulness of these systems is very high in industrial electrical energy systems because there are processes that cannot be interrupted and the continuity in the supply of electrical equipment is interesting. The efficiency of these equipment is analyzed in, leading to performance that greatly helps continuous flow processes reducing the number of interruptions.

The outdated methods of using MBT systems, that is, when the residual voltage on the bar drops below 25% of the nominal value, create big problems nowadays, when the sandable equipment triggers and stops the entire production.The automatic switching on of the backup power supply (MBT) aims at increasing the safety in operation, ensuring the continuity in the power supply, simplifying the power supply schemes for safety switching, reducing the operating personnel.MBT means devices that, in the event of disconnection of the main power supply for any reason, automatically connect the backup power supply.AAR devices are designed for substations and substations that have at least two supply paths on the bars that, left without voltage, would create interruptions in the supply of important consumers. The commissioning of the MBT system is done with the control of the presence of the voltage on the way of the reserve supply; this will necessarily be conditioned by the prior disconnection of the normal supply path and it can be achieved:

- Timed, when the voltage on the supplied bar disappears; the control voltage is chosen so that the MBT system does not occur at a voltage drop caused by a fault on another bar.
- Quickly when one of the main power switches is triggered.

Dynamic load transfer can be done without power failure (hot) or with power failure (cold). The first case involves putting the two sources in parallel: backup sources are connected to power the motors before the first source is disconnected. The power supply of the dynamic load is never interrupted. The second case does not involve paralleling the two sources: the first power supply is initially disconnected and then the second is connected. During these maneuvers, the engines remain without power, even if for a short time, they change their operating mode, turning into generators with t.e.m. and decreasing speed, individually, depending on the inertia of their own moving masses. Connecting the second source requires monitoring the parameters and controlling the timing of the command launch.

Keywords: fast transfer, dynamic load transfer, motor bus transfer

BOOK OF ABSTRACTS

SECTION 5. Mechanical engineering; Industrial engineering; Materials engineering; Engineering and management

COMPARISON BETWEEN THE EFFECT OF MOLYBDENUM ADDITION TO ALUMINUM GRAIN REFINED BY TITANIUM PLUS BORON ON ITS HARDNESS

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Abstract:

Aluminum and aluminum alloys are the second used materials in engineering and industrial application particularly in aircraft and automobile industries due to their specific properties, e.g. high strength- to- weight ratio, electrical and thermal conductivities in addition to their good corrosion resistance. These alloys could be very attractive but the large columnar grains appeared during solidification have a negative influence on the hardness and surface quality. Therefore is essential to refine their structure to avoid these defects. In this study, a systematic comparison of Mo addition to Al-Ti-B alloy is made between specimens before and after the addition of rare materials (Ti, B and Mo) in the aluminum casting to investigate the ductility enhancement that can be achieved. Ductility tests are conducted for the (Al, Al-Ti-B & Al-Ti-B-Mo).
The master alloys and binary alloys were used for preparing the following three different microalloys, with the chemical compositions (wt%): 1- Al-0.05%Ti–0.01%B. 2- Al–0.05% Ti–0.01%B–0.1%Mo and finally the prepared Specimen as in the following: Pure Al, Al-3% Mo, Al-0.15%Ti, Al-0.05%Ti-0.01%B & Al–0.05% Ti–0.01%B–0.1%Mo.

Keywords: aluminum, boron, effect, hardness, master alloy, titanium

TRADITIONAL TECHNIQUES AND NATURAL CONSTRUCTION MATERIALS IN ROMANIA

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Abstract:

In the context of environmental protection, by reducing pollution and energy consumption, the field of constructions stands out as having negative effects on the high degree of energy consumption and the production of a large amount of waste.
As a result of the globalization process, there is a small number of building materials at a global level, in countries of all kind of level of development, which leads to a standardised process of construction and the neglect of the local resources. The contemporary tendency to use construction techniques and materials brings architectural influences specific to it. By analyzing the small height constructions, it can be observed a gradual disappearance of the local values and traditions as these contemporary tendencies grow. Local building materials are replaced with other materials from distant countries with a totally different climate or other materials fabricated with a high level of energy consumption.
By changing the optics on the required materials for small height constructions we can help the growth of environmental protection and the revival of the local natural and cultural values.
Romania benefits from natural riches especially natural resources and a long and beautiful history with cultural witnesses that can be found not only at national museums but also in the rural parts of the country. History shows that romanian vernacular architecture has cultural value starting from small rich wooden decorations to complex wooden joints of a wall, or complex wattledry from wool, hempseed and twigs.
From all this Romania’s richness, the paper focuses only on the natural architectonic aspect, namely the natural resources exploration, fabrication process and the methods of using them in construction in a ecological way responsible for the wellbeeing of the environment highlighting the romanian tradition.

Keywords: constructions, earth, materials, straw, techniques, traditional, vernacular, wood

FAILURE MODES OF PUMPS’ MECHANICAL PARTS AND COATING SOLUTIONS FOR WEAR PROBLEMS

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Abstract:

The failure of mechanical parts of pumping stations usually happens in various forms (abrasion, corrosion, cavitation, erosion, pitting, adhesive wear etc.), conducting to the out-of-service state of the entire pumping station and even of the whole water treatment plant. The paper presents the working conditions in designed parameters, the problematics of different pumps, and some solutions found in literature, emphasizing the possibility of refurbishing of worn mechanical parts by applying different anti-wear coatings. Regarding the wear resistance of coatings deposited by Atmospheric Plasma Spay (APS) method, a case study of previous research carried out by the authors is also presented.

Keywords: Al_2O_3, Atmospheric Plasma Spay (APS), coatings, mechanical parts, pumps, wear

APPLICATION OF HOLLOW GLASS FIBERS STRUCTURES AS HIGH PRESSURE STORAGE SYSTEM FOR HYDROGEN

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Abstract:

Glass has different outstanding material-specific properties which offer theoretically the application of thin-walled hollow fibers in the field of high pressure gas storage. Especially the storage of hydrogen as renewable and environmental friendly energy carrier is possible. Glass is an amorphous and brittle material which is characterized by a theoretical strength much higher than this of other materials. However, in practice the strength is decreased significantly by defects on the glass surface or in the material and its network structure.
In our study we will conduct mechanical testing of different glass systems, volume defects and inclusions surface will be characterized.
A calculation of the failure-causing defect size from measured burst pressure is possible. Dependent on the dimension and determined burst pressure value of each single fiber defect sizes of less than one micron were calculated. The influence of the dimension of hollow glass fibers on their resistance against inner pressure load is the ratio between wall thickness and inner diameter which was investigated as well as the combination of different glasses and the utilization of their disparate coefficient of thermal expansion which lead to pretension of the hollow glass fiber. Using the hollow glass fibers for hydrogen storage system for automotive industry will be described in our research.

Keywords: automotive industry, environmentally friendly, glass fibers, hydrogen storage system, volume defects

RECENT RESEARCH ON Mg-BASED BIODEGRADABLE ALLOYS-REVIEW

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Abstract:

Metallic biodegradable materials represent a topical approach in the medical field, especially in orthopedics. Magnesium based alloys such as Mg-Ca, Mg-Si, Mg-Y, etc. have been the subject of previous research, in order to establish optimum concentrations, from the microstructural, mechanical and wear resistance point of view. Among the major advantages offered by Mg-based alloys are: low modulus of elasticity (similar to biological bone) and high biocompatibility, and as disadvantages, it is identified: high degradation rate and subcutaneous hydrogen release. Also, Mg-based biodegradable alloys have superior advantages over other types of biodegradable alloys, such as Zn or Fe-based biodegradable alloys.
The purpose of this review is to identify and compare microstructural analysis, mechanical characteristics and electrochemical results of the various systems of biodegradable magnesium based alloys.

Keywords: biodegradation, corrosion, magnesium alloys, mechanical properties, microstructural analysis

A COMBINED MATERIALS SCIENCE AND MECHANICAL APPROACH TO THE STUDY OF HYDROGEN EMBRITTLEMENT OF STRUCTURE MATERIALS

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Abstract:

The hydrogen embrittlement in structure materials is more often investigated from material science point of view. In this paper, the study is focused on better understanding of hydrogen mechanics in the selected material. Specifically, the study addresses the hydrogen compatibility of the natural gas pipeline for transporting the hydrogen.
The object of this study is to develop fracture criteria with predictive capabilities against the degradation of materials in the presence of hydrogen. Design criterias reffering to the hydrogen effect on material safety and reliability are also studied.
In order to investigate the material microstructure, optical analysis, Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) were used. The interaction between hydrogen and defects of material is studied using the Thermal Desorption Spectroscopy (TDS).
The approach is to integrate the mechanical property and microstructural analysis of deformation processes of materials at micro and nano scales. For this, the Finite Elements Analysis is needed in order to investigate the influences of the hydrogen on the fracture processes.

Keywords: fracture, hydrogen embrittlement, mechanical approach, material microstructure, thermal desorption spectroscopy (TDS), transmission electron microscopy (TEM)

TRAINING PROCEDURE FOR DEVELOPING FREE-RECOVERY AND WORK GENERATING SHAPE MEMORY EFFECT IN BENDING, AT $Ti_{50}Ni_{45}Cu_5$ SMA LAMELLAR SPECIMENS

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Abstract:

Equiatomic NiTi is the most commonly used shape memory alloy (SMA) within medical applications. Owing to the elevated carcinogenic risc, associated with the accidental release of Ni atoms, various attempts were reported, aiming to substitute this chemical element with other metals, such as Cu, Nb, Ag, V, Co, etc. All these substitutions are meant to enhance the biocompatibility while preserving the high values of mechanical properties. In the case of Ni substitution with Cu, up to a maximum of 10 at.%, the basic shape memory properties were not affected, in spite of the occurrence of two martensitic transformations. $Ti_{50}Ni_{50-x}Cu_x$ can be used in various clinical applications such as implants of biomedical devices. The present experiments used specimens made from $Ti_{50}Ni_{45}Cu_5$ SMA ingots, obtained by levitation induction melting and hot rolling with instant water quenching. After obtaining a sub-milimetric thickness, hot rolled billets were cut by wire-spark erosion into lamellar specimens, with martensitic structure. The presence of a unique reversible martensitic transformation was emphasized by differential scannning calorimetry (DSC). Various lamellar specimens were subjected to a thermomechanical training, consisting in the application of free-recovery shape memory effect (SME). During training, martensitic lamellar specimens were bent at room temperature (RT) against a cilindric calibre and held in this clod shape for a definite period of time. After this, the circular specimens were heated and they recovered their linear shape, by free-recovery SME. Finally, the specimens were water quenched, to recover their martensitic state. The entire procedure was resumed during 20 cycles. After, several traing cycles, the specimens began to partially recover their bent shape, during water quenching, thus developing two-wau shape memory effect (TWSME). Shape recovery degree was calculated based on the dimensional evolution of the specimens after RT-bending, heating and water quenching. The evolution of shape recovery degree with the number of free-recovery SME training cycles was plotted and discussed. The capacity to develop work-generating SME was analysed by subjecting the 440 mg-specimens to loads as high as 250 g, fasted at their free end. During heating, the load was lifted and the variation of spceimen’s free end with temperature was recorder and discussed by cinematographic analysis.

Keywords: cinematographic analysis, reversible martensitic transformation, shape memory alloys, shape memory effect, training, two wat shape memory effect

ANALYSIS OF THE OPERATING BEHAVIOR OF SOME MIXTURES: WATER, IONIC LIQUID, NANOPARTICLES

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Abstract:

A new class of heat transfer fluids has been developed over the last decade, and these new fluids combine two phases, namely ionic liquids and nanoparticles, known as IoNanofluids.
IoNanofluids are of interest to researchers due to improved thermophysical properties compared to the classical heat transfer fluids, e.g. water or ethylene glycol, but also because of their applications in heat exchangers, in the electronics industry or in solar collectors and beyond. The large diversity of nanoparticles that can be added to different ionic liquids transforms them into complex heat transfer fluids. As can be seen from the specialized literature among the thermophysical properties studied for IoNanofluids, there are thermal conductivity, density, specific heat and viscosity. These properties were also determined by these authors for mixtures based on water, ionic liquid and nanoparticles in order to determine some possible theoretical methods for evaluating the heat transfer between the studied IoNanofluids and the fluid used as the base for comparison.
In this paper, an analysis of the improvement of the thermal transfer, with reference to the convective heat transfer will be carried out using the IoNanofluids based on alumina, which have as their basic fluid a mixture of ionic liquid and water.
The analysis will be performed using several tools that are highlighted in the specialized literature, such as the analysis of the thermal transfer using Prandtl, Mouromtseff and with the equations of Gnielinski and Prasher. Further on, for the data interpretation several FOM (figure of merit) will be evaluated and compared.
In conclusion, complex studies of these new thermal transfer fluids are needed for a correct description of them and to demonstrate that they have a beneficial behavior in the heat transfer if compared to the basic fluids (i.e. water or glycols), obtaining certain advantages in terms of thermal efficiency.

Keywords: ionic liquids, nanofluids, nanoparticles, thermophysical properties

STUDIES ON PHASE CHANGE MATERIALS IMPROVED WITH NANOPARTICLES

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Abstract:

In the last years, thermal energy storage is among the highly efficient approaches to overcome the energy crisis. Currently, cooling operations represent a small part of energy consumption, but demand is constantly increasing, due to climate change and global temperature rise.
Recent research has been carried out on improving heat transfer using a phase change material (PCM) which has a high fusion temperature and, by melting and solidifying at a certain temperature, is capable of storing and to release large amounts of energy.
PCMs can be divided into solid–solid, solid–liquid, solid–gas and liquid–gas types, while the solid–liquid ones are the most widely applied in various applications. Several types of PCM with distinct characteristics and different ranges of melting and solidification temperature have found their way in various industries. However, commercialized PCMs generally suffer from low thermal conductivity which limits their application. In this idea, different nanoparticles, such as CuO, TiO_2, Al_2O_3 and graphene can be added to PCMs to improve their thermal properties. For the development of these new materials it is necessary to understand the effect of adding different types of nanoparticles on the thermophysical properties of PCM. The articles published so far reveal that nanoparticles dispersed in PCM improve charge time, heat transfer rate and thermal conductivity. Also, some authors observed an improvement of the thermal conductivity of 4.6 % and 11.0 % by adding 1 and 2 % wt of CNTs and the overall heat transfer rate between the HTF and the PCM increases with adding nanoparticles into the HTF. It should be mentioned that the improvements made by PCM nanoparticles, depending on the size, shape and volume of the nanoparticles added.
Concluding, this paper aims to build on previous research on PCMs as potential materials for heat storage. Particular attention will be paid to experimental studies on PEG 400 materials as well as improving their properties by adding nanoparticles.

Keywords: nanoparticles, phase change material, property

CREEP BEHAVIOUR OF AN FeMn SHAPE MEMORY ALLOY

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Abstract:

Slow deformation of metals in time under constant load, known as creep, has been in the centre of attention of the specialists in structural applications for more than half a century. Especially in the case of metallic parts, subjected to service temperatures that constantly increased with the advance of technological progress, creep control has become one of the most important engineering issues. In the specific case of shape memory alloys (SMAs) which have a martensitic structure comprising movable plates, at low temperatures, creep occurrence has the potential to develop marked structural changes. The present paper is focussed on FeMnSiCrNi SMAs obtained by powder metallurgy (PM). These alloys are corrosion resistant and present fair workability at room temperature (RT). The specimens were prepared from PM 68Fe-18Mn-3Si-7Cr-4Ni (mass %) which were pressed and sintered under controlled atmosphere. Hot rolling was applied in order to increase compactness and to decrease the cross section, such as to avoid intergranular incompatibilities. Hot rolled billets were cut into lamellar specimens (1 x 4 x 50 mm) by wire spark erosion. The critical temperatures for creep tests were determined by temperature scans performed on a dynamic mechanical analyser (DMA), equipped with dedicated software both for dynamic testing and for creep. Creep tests were done by means of a dual cantilever specimen holder, four different forces being applied at five critical temperatures, respectively. Total creep time was 2000 s. The variations of bending deflections with time emphasized the presence of two stages: (i) initial/ transitory creep and (ii) secondary/ stabilized creep. Creep rates were determined for each stage, force and temperature. The structural evolution of martensite plates, from initial state to the final state resulting after the application of the largest force and temperature, was analysed by scanning optical and scanning electron microscopy. Based on experimental data, a fractal model was developed which was able to predict the bending creep behaviour of PM FeMnSiCrNi SMA under the effect of various forces and temperatures.

Keywords: creep, creep rate, dynamic mechanical analysis, modelling, shape memory alloy

NANOTECHNOLOGIES AND NANOMATERIALS USED IN HERITAGE CONSERVATION AND RESTORATION: FROM RED IRON RUST TO BLACK MAGNETITE DUST

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Abstract:

In this study is investigated the state of the art in the field of nanotechnology application and the use of nanomaterials in the conservation and restoration of cultural heritage. The use of nanomaterials in this area is not recent, considering that the first gold plating experiment by electrodeposition has ever been recorded since the beginning of the century. XIX, immediately after the invention of the Volta battery. Among the first nanomaterials used it can mention colloidal gold or metallic pigments used in painting. Among the most recent concerns in the field are those under the aegis of ICROM, promoting technologies and using nanoproducts that are already used in the restoration of objects from materials such as paper, wood, glass, stone, ceramics, marble.
This paper aims to identify whether the synthesis of magnetite (and especially the synthesis of magnetite from precursors such as rust) is already used in the preservation and restoration of archaeological iron, and to what extent. Iron green rust, the one that contains divalent ions (Fe^{2+}) is already studied as a precursor in the synthesis of magnetite. The synthesis of magnetite by simultaneously heating (frying) the mixture of siderite and hematite is also studied and reported in different publications. However, applications of these studies in the field of heritage conservation and restoration are unknown.
State of the art clearly showed that iron corrosion products are investigated using the latest methods for a variety of purposes. These are chemically stabilized, impregnated, or removed as appropriate. It seems, however, that it is not yet the subject of some applications of nanotechnologies that convert them from vulgar (not necessarily harmful) patina to noble patina. There are mentioned cases where, after removing the vulgar patina, a patina (of magnetite) is restored, by anodizing, but which uses the metallic iron of the object and not the corrosion products already existing.

Keywords: conservation, cultural heritage, magnetite, nanomaterials, nanotechnologies, restoration

STRUCTURAL ASPECTS AND CHEMICAL ANALYZES ON CUTTING PROCESS OF METAL-CERAMIC MATERIALS

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Abstract:

In this article we present few preliminary results on the behavior of metal-ceramic system during the cutting process. The ceramic layer was obtained, after sandblasting of the substrate, through air plasma spraying in two thicknesses 30 respectively 60 µm on a metallic (steel) substrate. Layers are chemically homogeneous, without cracks, pores or crevices. The thinner layer (30 µm) present discontinuities with uncovered surfaces were the substrate is in contact with the environment. Cutting process was realized on marking fiber laser equipment (Boron), of 30 watts maximum power and wave length of 1064 nm. There were obtained two different grooves on the test pieces with the following parameters: laser double pass at speed of 500 mm/sec, pulsed laser of 20KHz frequency and the beam power was set at 50% (around 15W) for the first groove) and at 80% (around 24W for the second groove).
Structural, morphological and chemical evaluation of the cutting kerf was realized using optical microscopy (OM+digital camera MotiCam), scanning electron microscopy (SEM, Vega Tescan LMHII, SE detector, 30 kV, 15.5 mm WD) and energy dispersive spectroscopy (EDS, Bruker X-flash) using automatic/element list mode, Point, Mapping and Line features. This analysis highlighted the type of defects along the cut, respectively the phenomena occurring at the ceramic - metal interface

Keywords: ceramic layer, cutting, EDS, plasma spraying, SEM

ANALYZE OF CUTTING EFFECT ON CERAMIC COATED STEELS

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Abstract:

Ceramic coating applied to a metallic base increases its properties such as thermos-stability, corrosion resistance and surface hardness. Ceramic materials inherent brittleness properties implies many difficulties in their mechanical machining processes when a proper shape is required, fact that limit their applications. The complex system analyzed in this paper is formed by a metallic substrate and an alumina ceramic layer obtained through atmospheric plasma pulverization. Laser cutting was performed in order to analyze the behavior of the ceramic layer of 30 and respectively 60 μm in the cutting process. Structural, morphological and chemical evaluation of the cutting kerf was realized using optical microscopy (OM+digital camera), scanning electron microscopy (SEM VegaTescan LMH II, SE detector) and energy dispersive spectroscopy (EDS Bruker X-flash). This analysis highlighted the type of defects along the cut, respectively the phenomena occurring at the ceramic – metal interface.

Keywords: ceramic coating, laser cutting, plasma coating

CHEMICAL AND STRUCTURAL ANALYSIS OF EXPERIMENTAL BIODEGRADABLE ZnMg ALLOY

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Abstract:

Beside biocompatible classic metallic materials, biodegradable metals (BMs) like alloys of zinc (Zn-based) present a high potential as an alternative solution for permanent implants elements generally being applied for fractures restorations or other similar medical conditions. Zinc-based biodegradable alloys exhibit a corrosion rate between Mg- and Fe- based alloys being proper for many medical applications. These alloys possess different processing and economic advantages, a very good ability to be poured, fluency, and other metallurgical and mechanical properties which are very competitive with other ferrous and non-ferrous materials. Zinc material represents an essential trace element in biological environment and human body. In case of an adult biological system which has approx. 2–3g of Zn, is many biological functions from enzymatic catalysis to cellular neuronal systems, Zn plays as factor in all 6 groups of enzymes, also in several classes of proteins for regulatory processes. In the same time zinc element have contributions in blood pressure regulation in the arteries.

An experimental alloy, ZnMg, was obtained using an induction furnace from high purity materials (Zn: 99,995 and Mg: 99,95), in Argon atmosphere. Microstructure of the alloy (after mechanical grinding and polish plus chemical etching) and chemical insights (before chemical etching) were taken using optical microscope (Zeiss+Motic digital camera for image acquisition) scanning electron microscope (SEM VegaTescan LMH II, SE, 30 kV, 16 mm WD) and dispersive energy spectroscopy (EDS Bruker, PB ZAF, Automatic mode of analyze, Point and Mapping features). The experimental alloy was five times re-melted in the induction furnace using a ceramic crucible. The experimental alloys present a good chemical homogenization without porosity, metallic inclusions or segregations.

Keywords: biodegradable alloy, EDS, metallic materials, SEM, zinc alloy

STUDY OF THE NEW ZnMgY ALLOY FROM A STRUCTURAL, CHEMICAL AND MECHANICAL POINT OF VIEW

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Abstract:

Biodegradable metals are studied with great interest by the researchers. An important field of use of these metals is the medical field, for different applications such as stents, screws, rods and many others. Metals such as iron and magnesium are studied intensive. A new biocompatible metal proposed for medical applications is zinc. Few studies of zinc as a biocompatible metal are found in the literature compared to Fe and Mg. Zinc has poor mechanical properties, and this was the main concern when it was proposed for use in medical applications, instead exhibiting a corrosion rate between Mg and Fe. To improve the properties, the alloying of zinc with other metals such as Mg, Ca, Cu, Ag and others was pursued. Starting from the ZnMg binary system, we designed a new experimental alloy by adding the element yttrium. The aim was to improve the mechanical properties. The alloy was obtained by melting using an induction furnace in Ar atmosphere. The materials used were Zn (99,995% purity), a ZnMg master alloy (70% Mg and 30% yttrium) and pure Mg. The ingots obtained were mechanically processed (grinded), cut into 10mm pieces, polished, and analyzed. The ZnMgY alloy was studied both, individually and by comparison with pure Zn and the ZnMg system. The microstructure was analyzed using SEM (scanning electron microscopy) VegaTescan LMH II, SE, 30 kV, 16 mm WD, as well OM (optical microscopy) using Zeiss+Motic digital camera for image acquisition, and the chemical composition by EDS (energy dispersive spectroscopy) EDS Bruker, PB ZAF, Automatic mode of analyze, Point and Mapping features and XRD (X-ray diffraction). Was followed the corrosion and electro-corrosion behavior (potentiostat with three electrodes cell) after immersion for 72 hours in Dulbecco buffered saline solution, Ph variation and linear and cyclic potentiometry. We observed a modification of immersion behavior and of the electro-corrosion resistance. The mechanical results showed an increase in microhardness of the experimental ZnMgY alloy compared to pure Zn and ZnMg.

Keywords: biodegradable, corrosion behaviour, Dulbecco, microhardness, SEM, Tafel

MAGNETIC PULSE WELDING OF DISSIMILAR MATERIALS. A REVIEW

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Abstract:

Conventional welding processes are limited by high working temperatures, thermal and metallurgical incompatibility of materials, environmental pollution, etc. Magnetic pulse welding (MPW) is a method of innovative high-speed welding, primarily used to join dissimilar conductive materials (without heat or consumable materials). The metal is accelerated to a speed that will form a metal joint between the two materials without the addition of filler metal, with the appearance of a wavy interface or a flat interlayer. The processing at high speed and under a certain angle creates a jet along the surfaces of the material that removes surface contaminants and eliminates the need for pre-welding preparation of surfaces. MPW welding has high structural strength because the welding interface does not melt and thus preserves the material properties. However, that the welding area achieves high strength only if the distance selected between the pairing members is large enough to allow the workpiece to achieve sufficient impact velocity and kinetic energy before the impact with the target workpiece occurs. The formation of an intermetallic phase in the case of welding dissimilar materials may lead to cracking inside and around the welding area. In recent years, there has been an increased interest in the potential applications of MPW and on optimizing the welding parameters for increasing resistance, especially in the case of dissimilar materials joining. The objectives of this paper are the description of the MPW process, highlighting the optimum working parameters of the electromagnetic installation, the metallurgical characterization of the magnetic pulse welding.

Keywords: dissimilar materials, intermetallics, magnetic pulse welding, microstructure, wavy interface

INVESTIGATION ON THE PROPERTIES OF IRON BASED BIODEGRADABLE MATERIALS

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Abstract:

Biomaterials used in implants for medical applications have experienced a new approach by studying the rate of corrosion. The biodegradation mechanism is analyzed by researchers in order to obtain an alloy that fulfills the healing function of a diseased tissue and subsequently degrades without harmful effects on the human body. Very important aspects of these studies are focused on biocompatibility and physical-mechanical properties required in cardiovascular or orthopedic applications. Obtaining a certain structure by the obtaining method, the chemical composition and the alloying elements in different concentrations represents a real challenge for the scientists. The most popular systems studied as biodegradable materials are those based on Fe, Mg, Zn. The development of biodegradable metals aims at a very good biocompatibility, mechanical stability and control over the degradation process as their very important properties. The acquisition of data on the properties of biodegradable metals during the degradation process could be obtained from studies on the interaction with the human body. This paper presents important aspects of the in-vitro degradation process of Fe-Mn alloys for implants in medical applications. The experiment involved immersing the samples in Ringer's solution (a chemical composition close to human blood) for different time intervals at a temperature of ± 37°C. The pH variation in the electrolyte solution was monitored by means of a probe connected to a mini-Arduino board for data acquisition with pH transducer and digital display. The recorded values varied due to the reactions during the process at the metal / medium interface. The samples were weighed initially, after the removal from the corrosive environment and after cleaning the surface in an ethyl alcohol bath with ultrasound. Thus, it was possible to differentiate between stable and unstable compounds formed on the surface as well as an appreciation of the corrosion rate. The chemical composition was determined using Esprit PB-ZAF automated X-ray spectroscopy (EDX) software and the list of items analyzed with the Bruker module detector connected to the electron microscope scanning equipment (SEM) -VegaTescan LMH II (30 kV, detector SE, high vacuum). Standard deviations were provided for all chemical determinations. Corrosion compounds formed on the surface of the samples were also studied by optical microscopy (OM) and electronic microscopy (SEM). The samples were subjected to the electro-corrosion process, degreased and washed with distilled water before the experiment. The Ringer working solution at room temperature was used as electrolyte, the corrosion process parameters were purchased and the linear and cyclic polarization curves resulting from the Tafel diagrams were interpreted. The in-vitro study of Fe-Mn-based alloys provided results that may indicate good biodegradability properties in medical implant applications. Subsequent tests will be performed for further confirmation.

Keywords: biomaterials, corrosion rate, in vitro degradation, FeMn

AN OVERVIEW OF FEW THEORETICAL AND EXPERIMENTAL STUDIES ON TRIBOLOGICAL AND THERMAL BEHAVIOUR OF NANOPARTICLE ENHANCED OILS FOR AUTOMOTIVE APPLICATIONS

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Abstract:

This paper aims to provide an overview of several studies regarding the rheologic behavior of engine oil enriched with various quantities of nanoparticles. Plus, this paper also provides a summary of some of the most relevant material properties in regard to nanoparticles, lubricants types, tribo-test conditions, test-equipment and characterization techniques.
The today challenge for the automotive manufacturers is to achieve a significant reduction of the toxic emissions level and to obtain an overall increase of the engine energy efficiency, and this objective can be attained by considering nanoparticle enhanced oils as new lubricants. The concept behind these new lubricants is the same noticed for nanofluids (i.e new nanoparticle enhanced fluids for heat transfer applications). Current state of the art clearly shows that the most commonly used nanoparticles for developing nanolubricants are (Al), copper (Cu), silver (Ag), iron (Fe), titanium (Ti), silicon (Si), zinc (Zn), magnesium (Mg), carbon nanotubes (CNTs), graphene and graphene oxide.
From state of the art study it can clearly notice that particle size, concentration, type, shape and structure, as well as the stability of the manufactured dispersion and the tribological condition have a direct effect on improving the performance of the oil based nanofluids.
In this context, the purpose of this paper is to summarize the latest progress in regard to the studies of nanolubricants, such as viscosity and rheological behavior, thermal conductivity, density, specific heat, as well as the antiwear and friction coefficients. In this idea, many researchers have studied different lubrification mechanisms which refer to ball bearing mechanism/rolling mechanism, tribo-film protection mechanism, polishing effect mechanism and mending effect mechanism. Most identified studies describe two methods used to obtain nanolubricants, namely, one step method known as the bottom-up approach and the two-step method known as the top-down approach which is the most widely used method. For properties estimation, most studies considered temperatures ranging from 25 °C up to 50 °C and different solid volume fractions. The experimental results, identified in the open literature, indicated that nanolubricants have superior properties if compared with base oils. More exactly, the viscosity decreases with increasing temperature and rises with an increase in the solid volume fraction. The results the thermal conductivity of lubricants indicated considerable enhancement by adding the nanoparticles and this enhancement determines a heat transfer enhancement. Concluding, the rheological performance and the reduction of antiwear and friction coefficients of nanolubricants is increased significantly by adding nanoparticles. Nevertheless, all these studies need a more coordinated approach, as well as a deeper phenomenon understanding.

Keywords: lubricant, nanofluid, nanoparticle, rheological behaviour, viscosity

PROFILING OF THE GENERATING RACK OF AN ORDERED CURL KNOWN IN DISCREETE FORM BY THE VIRTUAL POLE METHOD

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Abstract:

Situations encountered in „reverse engineering” are relatively common in which, to address a problem of profiling generating tools for processing an orderly curl of surfaces (cylindrical or helical teeth), data known by measuring the existing product (gear, toothed tools etc.) are used.
In this case, the numerical representation of the surface can be done in the form of a points cloud. The coordinates of these points can be determined using coordinate measuring machines or three-dimensional scanning equipment. The sequence of identifying these points can thus also be chosen to be ordered along a curve that is part of an ordered vortex of profiles, for example the sidewall of a gear.
This ensures that a series of points are obtained that have the property of being in the same plane. That plane can be chosen in this way and be perpendicular to the axis of the teeth, thus making it possible to treat the problem of winding the plane by fundamental methods such as the normal method, also known as the Willis theorem or the Gohman method.
Another acceptable solution is that in which points measured on successive surfaces lead to ordered clouds of points, which allow the polyhedral modelling of the inspected surface.
In both cases, the modelling is an approximation, but it has the advantage of allowing the definition of a local norm in a point belonging to the surface.
This allows the use of a complementary theory such as: the theory of substitute circles, the method of minimum distance or the method of plane generation trajectories.
The profiling algorithm proposed in the paper is based on the possibility of measuring surfaces and their representation through an ordered cloud of points. The algorithm uses the complementary theorem of the virtual pole, for profiling the rack tool generating a piece that has an ordered curl of profiles.
The methodology is not limited to the profiling of the rack tool but can be extended to the problem of profiling the primary peripheral surface of some screw-type tools, generating the ordered curl of surfaces.
The paper also presents a numerical application developed based on a specific software product.

Keywords: discreet profile, enwrapping generating method, generating rack, reverse engineering, virtual pole method

CRITICAL ANALYSIS OF THE METHODS FOR EVALUATION OF THE SEISMIC EFFECT GENERATED IN BLASTING WORKS

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Abstract:

In this scientific article, a critical study of the main methods of assessing the seismic effect generated during the blasting works was carried out, starting from the premise that, both nationally and internationally, there is a continuous trend of scientific challenge regarding to the best practices in the field, regarding the most appropriate technique for estimating and assessing the seismic effect through the specificity of the evaluated parameter (eg the oscillation speed of the soil particles, the oscillation frequency, etc.).
Given the difficulty of modeling the "propagation medium", as an acceptable analytical solution it is recommended to admit some simplifying hypotheses and take into account the 4 fundamental principles of wave propagation, in parallel with neglecting the elements whose influence on the phenomenon as a whole can be considered secondary, under these conditions ”the propagation medium” being reduced to a perfectly elastic, homogeneous, isotropic, continuous and uniform pattern.
In order to have an image as close as possible to reality, the assessment methods prior to the start of the blasting activity with the help of explosives for civil use, must take into account as much information as possible about the blasting conditions, type of explosive, demolition technique, environmental characteristics in which the explosive detonates and the environment in which seismic waves are generated, etc. The method for evaluating the seismic effect has as evaluation parameter “the oscillation speed of the soil particles”, the level accepted in NSPM code 71 (repealed) being of maximum 0.5 cm / s for repeated shots. In this case, the centralization of the evaluations highlighted differences in approach in setting the accepted level, as being dangerous for certain types of constructions. Thus, the instruments used in the evaluation, have as reference parameter the speed of the soil particles, measured on frequency intervals, on three components (radial, vertical, transversal). Also, the use of the parameter "oscillation speed" versus "frequency of oscillations" makes it possible to perform an appropriate assessment, which is not subsequently restrictive for blasting conditions, so that high values of the oscillation speed (> 0.5 cm / s) has to be accepted if they are measured in the ranges of frequency 20-100 Hz.

Keywords: blasting technology, explosives, oscillation frequency, oscillation speed of soil particles, seismic effect

DEVELOPMENT OF THE TECHNICAL INFRASTRUCTURE FOR TESTING PYROTECHNIC ARTICLES

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Abstract:

Pyrotechnic articles fall into the field of dangerous products, Class 1 risk - explosives.
At European and national level, there is Directive 2013/29 / EU of the European Parliament and of the Council of 12 June 2013 on the harmonization of the laws of the Member States relating to the making available on the market of pyrotechnic articles and Government Decision No 1102 of 10 December 2014 the conditions for making pyrotechnic articles available on the market. These documents set out the essential safety requirements that these products must meet and which must be taken into account, both in the design and manufacture phase of the products and in third-party tests and evaluations (carried out by a notified body for a product certification with an accredited laboratory). The development of the technical and qualitative level in the testing of pyrotechnic articles is based on a series of researches that have consisted of specialized documentation in the field of pyrotechnic articles security, both from the perspective of analyzing legal and technical requirements on specific parameters and operation, and the evaluation of the existing technical and methodological infrastructure at the level of the INSEMEX Explosive Test Site, in order to establish the technical requirements and the preparation of specifications for the purchase of state-of-the-art specialized equipment (climate testing chamber in variable temperature and humidity conditions; trinocular metallurgical microscope for optical examination of material fragments and specific accessories; total stations for analysis and determination parameters for spatial trajectory measurements;sound level meters intended for measuring and determining the impulse noise generated by the operation of pyrotechnic articles).
The scientific article highlights the results of tests carried out on a category F4 pyrotechnic product using an updated test procedure in conjunction with the variant of the principle scheme for the measurement and determination of ascent height, customized for where the horizontal deflection angle β_1 și β_2 are different from 0 and the video cameras are placed at the same level as the launch point, as well as the possible cases encountered in practice regarding the measurement and determination of the ascending height of pyrotechnic articles of category F4.

Keywords: applicable reference, operating parameters, pyrotechnic article, technical testing infrastructure, test procedure

ADVANCED REASEARCHES FOR ESTIMATION AND EVALUATION THE CAUTION LEVEL IN TAKING DECISIONS ON DIAGNOSIS AND PROGNOSIS OF HEARING IMPAIRMENT RISK

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Abstract:

Going from theory to practical aspects, this paper intends to underline, in an objective manner through advanced studies that rely on the modern tools of mathematics for the risk due to noise emitted during work process, the structure and process components that allow to determine with a sufficient accuracy the relative weight of identified hazards, as well their impact over health and safety of exposed personnel. At the same time, they provide options and valid solutions for a continuous sustainability of safety in operation of the analysed work systems. The paper is a methodological approach for analysis and probabilistic and statistical evaluation of risks related to hearing impairment based a hazard considered as risk prognostics so as to establish the means to evaluate the caution limits associated to acceptability intervals. The statistical approach relies on the rational quantification of the current aspects that can be noticed the probabilistic part of this aspect comprises an overlapping over what might reasonably result from this statistical information in order to be able to evaluate the probability of occurrence of hearing impairment. The scientific novelty is given by the interdisciplinarity and complex aspects of the results proving a current possibility for their implementation with the view to estimating the exposure risk to occupational noises.

Keywords: hearing impairment, occupational noises, probabilistic and statistical evaluation, risk exposure, risk prognostics

DEVELOPMENT OF THE IT INFRASTRUCTURE FOR THE ESTIMATION, ON THE BASIS OF THE CHEMICAL COMPOSITION, OF THE PROPERTIES THAT DEFINE EXPLOSIVE SUBSTANCES

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Abstract:

This scientific article presents a series of numerical simulations of thermodynamic and energetic parameters, in order to estimate the performance indicators specific to explosive products subjected to computer tests.
Considering the provisions of the regulations in effect regarding the field of explosives for civil use in various specific activities in which their use is necessary, from the perspective of using the integrated concept of total security in technical infrastructures for storage of explosives for civil use, as well as in other types of operations with these products (the use of certified products with predictable performance intended for appropriate blasting technologies, the safe and secure movement of dangerous products on the European market), the expected investment is characterized by a high degree of IT technology, being able to meet , at the highest level and in conditions of economic efficiency, the technical requirements imposed by the applicable international / European and national regulations.
This specialized prediction software is necessary for the development of IT and methodological infrastructure in the field of evaluation of parameters that define explosive substances, being intended for estimating, based on the chemical composition of explosive substances, the parameters that define these types of substances (speed detonation energy, detonation energy, detonation pressure, etc.) and their probability of explosion.
Among the main applications that can be made with the help of this specialized software, we can mention: the prediction of the potentially dangerous substances explosion possibility; determination of the energy properties of simple compounds or mixtures and an indicator of the ideal and non-ideal explosives and propellants performance as well as the pyrotechnic composition based on the chemical formula, the heat of formation and the density; safety management in specific laboratory activities with hazardous substances of an explosive nature; numerical modeling of energetical materials, formation of new energetic compounds and optimization of industrial detonation operations; calculation of the equilibrium composition and thermodynamic properties of the state of explosive products at a given state (p, V, T) applying free energy minimization techniques; determination of the explosion probability of an explosive substance based on the gases volume and energy resulting from the reaction, etc.

Keywords: IT infrastructure, numerical simulation, thermodynamic / energetic parameters, thermo-chemical prediction, speed / energy / detonation pressure

MODERNIZATION OF THE VALIDATION INFRASTRUCTURE OF THEORETICAL MODELS THROUGH SIMULATIONS AND COMPUTERIZED MODELING FOR THE EVALUATION OF SAFETY PARAMETERS SPECIFIC TO EXPLOSIVES FOR CIVIL USE

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Abstract:

Researches in the field of explosive for civil use in various industrial and civil applications requires an in-depth knowledge of areas such as explosion phenomenology, behaviour of materials in shock waves, structural dynamics, seismic engineering etc.
The design of these types of processes requires the consideration, with a relative approximation, of the degree of danger due to the throwing of fragments resulting from detonation, vibrations, pressures, tensions created in the space affected by the explosion, generation of explosion gases, etc. Estimating the maximum values of the induced demands being of essential importance, the implementation of a priori experimental IT solutions allows the study of a large number of scenarios, the limit being mainly dependent on the time allocated for the computer simulations.
In this context, research in the field, the acquisition of experience and knowledge as well as the validation of results by comparison with previous practical experiments and those specified in the literature, become relevant and necessary requirements.
Starting from these theoretical and practical considerations, it becomes imperative to focus the research on the development of conceptual and experimental models and the verisimilitude of which is guaranteed by a whole series of scientific solutions characterized by validated results through numerical modelling and simulations.
The methods used to determine ballistic and safety parameters, analysed by classical and computer means are relevant for the interpretation of the nature of explosive materials in terms of their classification in terms of the effect they may have on the environment of use in case of explosion according to the legislation in force, being an important indicator regarding the classification, handling, storage and transport in the assessment and management of the risks related to these operations.
The results of the research undertaken, accredits the idea of developing the computer applications for obtaining virtual models capable of reproducing the conditions for determining the safety parameters specific to explosives for civil use, using the ANSYS Multiphysics package.
This scientific article presents a series of computer simulations, both of the ballistic parameter on the working capacity of explosives and of the safety parameters (sensitivity to friction and impact).

Keywords: computer simulation, explosive for civil use, sensitivity to friction/impact, technical validation infrastructure, virtual model,

THE IMPORTANCE OF THE SOLID SUBSTANCE DANGER ASSESSMENT FOR EXPLOSION RISK

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Abstract:

In this scientific article, a synthesis study was conducted on the assessment of the solid substances hazardous level, taking into account their behavior to external stimuli.
The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), concluded in Geneva under the auspices of the United Nations Economic Commission for Europe, entered into effect on 29 January 1968, being amended and corrected several times as knowledge in the field and social needs in relation to the manifestation of risks related to dangerous goods, evolves.
The classification of products in different classes of the United Nations Recommendations (Orange Book) is based on tests that are grouped into procedures and methods validated by series of tests, which lead, after evaluation, to the exact classification in the class, division and compatibility group.
Test kits that are intended to classify / verify the presence of a substance (presumably explosive nature) provide clear evidence of classification, and their performance requires testing of significant amounts of material (of the kilograms order), which can be found records of membership in "Class 1 - Explosives".
Carrying out tests on a scale close to that in which accidents / disasters can occur for solids, in terms of behavior to detonation and deflagration stimuli, is essential in diagnosing / confirming classification in risk class 1 according to the United Nations Recommendations and which it is useful for national authorities or other Member States in dealing with the management of the transport and storage of these substances.
The topic addressed in this paper aims to expand the scope for dangerous goods classified as classified in class 1, according to the United Nations Recommendations, a particularly important global issue on the transfer and movement of goods that present various risks such as: explosion, toxicity, radioactive contamination, chemical contamination, biological contamination, etc.
It is known that certain solids may have a specific behavior at explosive stimuli of a detonating nature with restrictions on their transport and storage, the danger of explosion being one of the main industrial risks in the economy, being present in all units producing, using, handling, stores and transports solids with a high degree of danger.

Keywords: ADR, dangerous goods, detonation / deflagration stimuli, explosion risk, Orange Book

EVALUATION OF HUMAN RESOURCES PERFORMANCE

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Abstract:

The scientific article presents summary, a functional model of scale for individual evaluation of human resource performance. Performance measurement is an important specific activity in the field of human resources management, materializing in the estimation of individual and group performance. In any organization, daily, informal evaluations take place through which managers and subordinates evaluate each other. The evaluation of professional performances refers to the formal and systemic determination of the way in which the members of the organization fulfill their tasks specific to the position they hold in relation to the established criteria, evaluation standards, methods used and quality of employee results communication.

Not all evaluations have a positive effect and that is why evaluation activity is sometimes seen as one of the most hated activities. For example, those performed for awards, dismissals or even for disciplining staff are perceived by employees with fear, apprehension and can create feelings of insecurity. The same happens when employees do not know or understand the criteria that are used for their evaluation, when they think they are compared to others or when they see evaluation as a critical event than a moment that can lead to an improvement in their professional and moral activity within the organization.

Staff evaluation is a cyclical process that requires the implementation of an evaluation system that must specify: the purpose and objectives of the evaluation; what is being evaluated; who needs to evaluate; what method is used for evaluation; when the evaluation is made; how the results of the evaluation will be communicated; how to correct the unfavorable situations found.

The data obtained in this process must be objective and provide feedback by communicating the results tothe members of the organization at a time and in an appropriate manner.

Also, performance evaluation is a process that determines how a person performs his tasks, his duties in that position and as a result, ideally, a program is established to improve his performance.

Keywords: evaluation system, feedback, human resources management, organization, professional performance

OCCUPATIONAL RISK ASSESSMENT IN THE USE OF PYROTECHNIC ARTICLES FOR PROFESSIONAL USE (CATEGORY F4)

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Abstract:

This scientific article has carried out an assessment of the risk of exposure to occupational noise generated during the use of pyrotechnic articles for professional use, through the "Noise Safety Document", which is detailed in the paper.
Testing of pyrotechnic articles for professional use (category F4) requires the use of a last generation test infrastructure and a methodology based on the specific requirements contained in the series of harmonized standards SR EN 16261.
This infrastructure consists of: video surveillance and results processing system, consisting of 2 cameras fixed on a tripod type HDR-PJ530E which ensures adequate accuracy in determining the ascent height, the magnitude of the breaking effect and any angular deviations from the optimal trajectory; laptop type DELL Inspiron 3537 for information processing; stopwatch; anemometer; analytical balance; climate chamber / oven; class 0 integrating sound level meter used for measuring noise, which is a high-performance device, ensuring a precise determination of peak sound pressure values; shock absorber; device for measuring the effect, ascent, break and fall from a height; goniometer etc. The data recording and processing system is at a higher level, being tested in an inter-laboratory test program with similar European bodies, obtaining plausible results, the deviation from the average of the tests being below 2%.
The importance of the risk assessment specific to the testing of category F4 pyrotechnic articles lies in the following considerations: compared to pyrotechnic entertainment articles of categories F1, F2 and F3, these products present a significantly higher level of risk due to the mode of operation and the amount of material explosive involved, requiring authorized personnel as a pyrotechnician; the regulations in effect at national level do not have explicit provisions for this type of products with a high level of danger, and the implementation of the family of European standards harmonized with Directive 2013/29 / EU offers the possibility of testing, evaluation or expertise at a technical level suitable to the current scientific knowledge level.

Keywords: logic diagram, occupational risk, noise safety document, professional use pyrotechnic article, test run

COMPUTERIZED ASSESSMENT OF THE RISK OF TERRORIST ATTACK AT THE LEVEL OF AN INDUSTRIAL LOCATION ACTIVATED IN THE FIELD OF CIVIL EXPLOSIVES

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Abstract:

In this scientific article was presented in summary, the assessment of the risk of terrorist attack at an explosives depot, located on an authorized industrial site.
The implementation of the SEVESO Directives aims to prevent major accidents involving dangerous substances and to limit their consequences for man and the environment. According to the definition in art. 3 of the Directive, “major accident” means “adverse phenomenon such as major emissions, fire or explosion, resulting from an uncontrolled events, during the operation of an objective (eg explosives depot) covered by the presence of the Directive and which poses a serious danger to human health and / or the environment, immediately or late, inside or outside the target, involving one or more dangerous substances ”.
In the activity of configuring the scenarios of occurrence of an undesirable event covered by the SEVESO directives, such as a major accident involving dangerous substances, the following steps are followed: the identification, assessment and prioritization of risks, based on in-depth knowledge, must take into account their maximum level of occurrence, their simultaneity and their development in the chain, aspects which determine that planning takes into account both each risk, as well as situations of combined or interconditioned manifestation, in order to ensure a rapid response of preparation, protection and reduction of effects.
DIRE Version 1.0 - is a specialized automated analysis software for assessing the risks and vulnerabilities that may result from potential terrorist acts or other explosive incidents, which ensure the determination of human vulnerability to: Overpressure / impulse, which can cause lung rupture, dislocation of the whole body and cranial fracture; Damage to the building including remnants of projected material and fragments of glass; Scrap material: soil, rock, concrete and / or steel fragments resulting from the explosion.
The software can provide grapho-analytical results that express the evolution of severity parameters (number of deaths, major and minor injuries, as well as the percentage of building collapse and window shattering) in relation to the amount of explosive used to make the improvised explosive charge, the nature of this event (mass explosion or bomb explosion, with fragment design), the level of human exposure, and the distance to the site and detonation of the charge.

Keywords: explosives, major risk, specialized software, susceptible vulnerability, terrorist attack scenario

ASSESSMENT OF THE RISK OF INJURY AND / OR OCCUPATIONAL ILLNESS AT THE CONTROLLED DEMOLITION USING EXPLOSIVE FOR CIVIL USE AT CIVIL / INDUSTRIAL OBJECTIVES

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Abstract:

The decision to carry out the demolition of buildings involves a series of recommendations aimed, naturally, at choosing a high-performance demolition method and technique, which will ensure the fulfillment of this goal in achievable safe and economically efficient conditions.
Due to the fact that, following the use of explosive charges to destroy the elements of the resistance structure of buildings, in addition to the desired effect of dislocation of construction material, there are also undesirable effects that are manifested by long distances, which can affect neighboring buildings, it is necessary to take all measures to protect them and the environment. Thus, the correct assessment of the effects generated by a controlled demolition on the environment is an extremely complex issue and difficult to address from an analytical point of view, due to the multitude of factors involved in configuring the resistance structure and in describing and defining the action of aerial effects. seismic effects of the explosion and the geology of the land from the construction site that is the object of the demolition work.
In order to assess the professional / technological risk specific to the demolition activities of industrial / civil objectives with the help of explosives for civil use, we have developed an innovative methodological tool, such as a generalized model that can be customized for both occupational and technological risk, being provided with grapho-analytical tools for quantification and reduction of risk parameters, represented by "Risk Analyzer", "Risk Reduction Diagram", and "Risk Analysis and Reduction Form". The results of the risk assessment provide relevant data and information specific to the demolition of industrial / civilian objectives with the help of explosives for civilian use, in order to improve and stimulate the process of substantiating policies in the field of preventing and combating causes that may pose security threats, the health of workers, people in the neighborhood, as well as the environment.
In this scientific article was presented in summary, the occupational risk assessment for explosively controlled demolition of the industrial objective called "Chimney", based on professional / technological risk assessment grids using specialized databases.

Keywords: explosive controlled demolition, innovative methodological tool, professional / technological risk, risk analyzer, risk reduction chart

INFORMATION SECURITY RISK MANAGEMENT IN THE CONTEXT OF ITS INTEGRATION AT THE LEVEL OF THE GENERAL MANAGEMENT SYSTEM OF ECONOMIC OPERATORS ACTING IN THE POTENTIAL EXPLOSIVE FIELD

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Abstract:

In this scientific article was presented in summary, the result of the study conducted on information security management, in the context of its integration into the general management system of economic operators operating in the potentially explosive field.
From a practical point of view, work systems within economic operators operating in potentially explosive industrial areas are not entirely free of specific risks and, consequently, not all the controls implemented can eliminate them permanently.
The purpose of information security risk management is to analyze the critical scenarios of a process, application, system or other element to determine the most prudent method of secure operation, in order to achieve full and effective control. In this regard, the risk assessment team analyzes these technical process assets with business objectives as their main consideration. It is undesirable or can not use a control mechanism that would virtually reduce the risk to zero, because a security program that would aim for 100% security will cause the organization to have 0% productivity.
The information security risk assessment process has two key objectives: the implementation of reasonable and prudent controls, as well as the guidance of proper document management.
Managing this type of risk is the process that allows business managers to balance the operational and economic costs of prevention / protection measures and make a profit, in the ability to accomplish the mission by protecting the business processes that support the business objectives or the mission of the enterprise. Structurally, information security risk management consists of four distinct processes: risk analysis, risk assessment, risk mitigation, vulnerability assessment and control assessment.
Thus, the paper presents a technical perspective of vulnerability assessment defined as a condition of a guarantee or control that is missing or not effectively administered, which allows a threat to occur with a higher impact or frequency or both.

Keywords: information security, management, risk assessment process, threat, vulnerability

MANAGEMENT OF THE EDUCATIONAL APPROACH OF THE CHEMICAL ENGRAVING PROCESS

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Abstract:

The chemical engraving process is based on the chemical reactions developed between a chemically active substance and the unprotected surfaces of the workpiece. Thus, various symbols, texts and images could be made especially on metallic parts, but sometimes on parts made of other materials. Different objects on which certain surfaces have been made using chemical angraving processes could be encountered in the environment in which people live. Chemical engraving is considered as one of the processes included in the larger group of nonconventional machining processes. Among the various nonconventional processes, chemical engraving could be materialized under simpler conditions and could facilitate familiarization with the interpretation of chemical and physical phenomena and with the specific problems of using a machining method to obtain useful objects. The components of chemical engraving considered likely to be understood by children, including chemical engraving equipment and its use, were addressed. The conditions for explaining the chemical engraving process to the children were analyzed. The problems of managing the educational process were addressed taking into account the different ages of the children and their levels of understanding, with an additional focus on the aspects that might be considered interesting for children. The involvement of children in the development of an experiment on the chemical engraving process was discussed. The different risks that could correspond to the experimental part of the educational process concerning the chemical engraving were considered. An analysis was made of the environmental aspects involved in applying a chemical engraving process. The research developed in relation to the management of the educational approach to the chemical engraving process has allowed to highlight some aspects that could be taken into account when explaining and familiarizing the children with the aspects related to the chemical engraving process. Some directions for further research in the future have been identified.

Keywords: chemical engraving process, children, educational process, equipment, experiment, management

PRELIMINARY APPROACH IN THE STUDY OF THE PROCESS OF MANUFACTURING BY ELECTROCHEMICAL EROSION

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Abstract:

Electrochemical pocessing relies on the electrolysis phenomenon, this being caracterized by the chemical reaction between the semi-manufactured material and an electrolyte solution. Both, the electrode and the semi-manufactured material are connected into an electric circuit, charged by a continuous sourse of energy. The semi-manufactured sample is used to get some complexed forms of carites into pieces of electrically material or other hard materials, which could not be processed eficiently by the other means.
In this thesis there are presented the results of some researches related on the development of an equipment concept which highlights the variation of some output parameters of the process in function of the value of the input factors in the process. It has opted for creating a device for the study of erosion process of a value (like an aquarium with transparent walls), where different substances (water, vinegar), with a voltage sourse with variable adjustment (auto battery charger).
Taking into account the experiments done, using different materials for half-finished material with various properties, different materials for the electrode, more working substances and the changing of the amendaments of the eletrical characteristics adding the supply source and the collected datas after this experiments, the aim is to get an emphiric references.
The practice of the method of electrochemical erozion process presents some advantages. It could be mentioned the fact that the results of the process are not conditioned by the hardness of semi-manufactured material, or by the shape of processing profile, that can obtain surfaces with difficult configurations and high level precision that superficial layer of the process surface can have different properties from whit classical process, that the process dosen't occured important forces that implies deforms of the technologic system elements.
The analysis of some information identified into the speciality literature has allowed a clarification of input and output parametres of the processing through electrochemical erosion, as well as, the shape of pictures reffering to the structure of an equipment designed to allow the study of this process of electrochemical erosion processing.

Keywords: electrochemical erosion, input frotors, output parang, processing equipment, unconventional technologies

ORDERING THE INFLUENCE FACTORS OF THE END MILLING PROCESS

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Abstract:

Milling is a processing method that belongs to the group of processing methods characterized by removing the material from the workpiece. It involves the use of a rotary cutting tool that has many cutting tips and a feed movement in a plane perpendicular to the axis of rotation of the cutting tool. Certain features of the milling process are of significant technological interest and, as a result, the milling process is applied when a high material removal rate, average machining accuracy and average roughness of the machined surfaces must be ensured. There are many factors capable of exerting influence on the parameters of technological interest of the milling process. Some of these factors are the type of the workpiece material and the physical-mechanical properties of the workpiece material, the cutting tool material and the physical-mechanical properties of the cutting tool material, the geometry of the active zone of the cutting tool, the values of the cutting parameters (depth of cutt, feed rate, peripheral cutting tool speed), rigidity and stability of processing equipment, etc. As parameters of technological interest, the rate of the process of material removal, the accuracy of the machined surface, the values of the roughness parameters of the machined surface, the thickness of the surface layer affected by the milling process, the wear of the cutting tools are taken into account. In the case of the experimental researches regarding the influences exerted by the input factors of the milling process on the values of the parameters of technological interest, in order to have a reasonable duration of the experimental research, only some of the input factors of the milling process are considered. There are several methods that could be used to determine the main factors capable of affecting the values of the input parameter of the milling process and whose values could be modified in a factorial experiment. In order to sort these factors, the rank correlation method was applied. The method involves taking into account the opinions expressed by experts in the field of interest and the statistical processing of the opinions formulated by experts. In this way, it was possible to order and to select the main input factors of the milling process.

Keywords: end milling process, method of rank correlation, ordering of the process input factors, parameters of technological interest, process input factors

INFLUENCE OF NOZZLE PARAMETERS IN 3D PRINTING UNDER THE MANUFACTURING TIME

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Abstract:

Nowadays, Fused Deposition Modeling is one of the most popular Additive Manufacturing technology among ordinary users because of the low-cost equipment and the great variety of materials available on the market. Even is mostly used by a great variety of users, not all of them are aware of the advanced parameterization of process, preferring default presets with a small interference over the basic parameters such as layer height, number of perimeters, and infill. Regarding the nozzle diameter, serval advantages and disadvantages are implying the relation printing time-surface finish. Many users avoid the usage of nozzles with larger diameter because they offer a worse resolution of small details, support more difficult to remove, or because of the additional amount of material required. The usage of larger-diameter nozzles present advantages such as reduced manufacturing time, low risk of clogged nozzle, more durable prints thanks to the extra material, and more. Even using nozzles with a larger diameter led to coarse products, there are many structural parts with relatively simple geometries that can result in having an excellent surface finish. For those parts, the usage of a nozzle with a larger diameter can reduce the printing time up to two times. However, it was possible to obtain the same effect with a small diameter nozzle by adjusting the extrusion parameters such as extrusion multiplier, layer width, extrusion temperature. By doing so, rough surfaces and loss of details have occurred by going with similar configurations for larger nozzles. The main goal of this study was to investigate if there is imperative the usage of larger-diameter nozzles for speeding up the manufacturing process, or the same effect can result in using nozzles with a smaller diameter. Secondly, the surface finish of the manufactured parts had taken into consideration by analyzing defects like gaps between infill and outline, blob, zits.

Keywords: extrusion parameters, Fused Deposition Modeling, manufacturing time, nozzle diameter, surface finish

DIFFERENCES BETWEEN THE MASS OF THE COMPONENT OBTAINED ON THE 3D PRINTER AND THE MASS OF THE COMPONENT RESULTING FROM THE MATHEMATICAL CALCULATION OF THE PRINTER SOFTWARE

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Abstract:

The present article encompasses a series of comparisons of mass parameter measurements of components obtained by Fused Deposition Modeling (FDM) or Fused Filament Forming (FFF) technology. Therefore the components obtained through the above-mentioned technology are subjected to the mass parameter measurements using a laboratory scale with a measurement accuracy of 0.01 [g] in order to determine the degree of accuracy in terms of the ability of the machine to melt wire faithfully reproduces the component in terms of its mass. Forthwith the study was carried out using a 3D print produced by the company CraftBot PLUS with a resolution of the layer deposited of one hundred microns and a positioning accuracy on the x and y axes of 4 microns, respectively the z-axis of two microns, with a total construction volume of 250x200x200 millimeters. In the study, there were used many three software because it was desired to obtain and the differences of calculation between the partition programs made available at this time in the free version to the average users so that a difference can be observed. Through the use of a number of software and not just one, the most popular programs among the line users of 3D printers in brief research are: Simplify 3D software, Cure 3D software, and not least Slicer 3D software. During the study, several 60 mass determinations of the specimens with different internal structures and variable filling degrees were performed; more precisely, twenty specimens were performed using each sectioning program. In conclusion, only 5 types of internal structures were used out of the 13 made available in the sectioning programs, and the degree of filling of the specimens was varied from twenty-five percent to twenty-five percent, thus reaching up to one hundred percent filling degree. After analysis of the data obtained, a series of differences were found between the slicing programs but also between the slicing programs and the physically obtained components.

Keywords: 3D printer, fused filament deposition, fused filament forming, slicing software, weighing

CONTAINER FOR TESTING THE OPERATION OF ELECTROMECHANICAL DEVICES WHEN CHANGING EXPERIMENTAL CONDITIONS

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Abstract:

In principle, electromechanical devices have the role of contributing to the transformation of electrical energy into mechanical energy, but also ensuring a control of the mechanical energy generated in this way. The use of electromechanical devices in many fields has led to the need to solve problems related to their proper functioning and the possibility that some external factors may affect their operation. In the research whose results are presented in this paper, the influence of factors such as temperature and humidity on the variation of some operating characteristics of electromechanical devices was taken into consideration. The purpose of the developed research was to design and materialize a solution for testing the functioning of some categories of electromechanical devices. The methodology used considered, first of all, the application of a method of stimulating technical and scientific creativity to identify a container solution to ensure the fulfilment of the main requirement, that of revealing the influence of input factors on the operating characteristics of electromechanical devices. The method of the ideas diagram was preferred for use. The method involves identifying the different versions of the container components and establishing the most convenient combination of these versions, starting from predetermined criteria. The application of the ideas diagram method has led to the identification of several container solutions. During the search for solutions, the requirement to control the temperature inside the container by appropriate means was also formulated. Taking into account the available conditions to materialize the container, it was adopted a solution that allows the study of the influence of temperature and humidity inside on the use characteristics of some electromechanical devices found in the structure of computer systems. The actual materialization of the solution revealed the need to solve problems related to the location of its various components. Preliminary experimental tests have tested the proper operation of the equipment.

Keywords: electromechanical devices, ideas diagram method, influence factors, operation, preliminary test, research container

CONTRIBUTIONS REGARDING THE ELABORATION OF THE TECHNICAL DECISION OF CHOOSING A DEVICE FOR COLD PLASTIC DEFORMATION BY ROLLING, USING THE THEORY OF UTILITIES

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Abstract:

Based on the existing technical literature consulted, there are an increased number of possibilities for the manufacturing process of a device for cold plastic deformation by rolling.
Burnishing is a process by which a smooth hard tool (using sufficient pressure) is rubbed on the metal surface. This process flattens the high spots by causing plastic flow of the metal.This proces improves the finish and size of surfaces of revolution such as cylinders and conical surfaces.
Roller burnishing is a surface finishing technique where hardened rollers cold work surface imperfections to reduce surface roughness. Roller burnishing differs from abrasive surface finishing techniques in that material is displaced rather than removed.
This will require at some point to make a decision about the usage of a such device or a similar one for the surface processing of a workpiece. It is not only hard but also wrong to come with a decision without doing any kind of research beforehand. Based on the research results and some applied criteria a final decision will be made.
In this regard we resort to **Von Neumann–Morgenstern “utility function”**, defined for the first time in the year of 1947 which represents an extension of the theory of consumer preferences that incorporates a theory of behaviour toward risk variance. It shows that when a consumer is faced with a choice of items or outcomes subject to various levels of chance, the optimal decision will be the one that maximizes the expected value of the utility (i.e., satisfaction) derived from the choice made.
The purpose of this research is to help me of choosing the optimal solution for a device for cold plastic deformation by rolling, for inner cylindrical surfaces at minimum execution costs and providing the maximum hardness during the manufacturing process.

Keywords: cold deformation, manufacturing, roller burnishing tools

FIXTURE DEVICES USED FOR AERODYNAMIC PROFILES

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Abstract:

The parts with aerodynamic profile are part of the category of complex shaped parts, characterized by low technology and high precision. These parts present special problems in the manufacturing process, due to the very high quality conditions, specific to the aerospace industry. In essence, the aerodynamic profiles meet in the construction of wings or blades / propellers.
In this paper are presented the current level and the main directions of development of the orientation-positioning-clamping devices in the structure of the jet engines. Unlike wing-type aerodynamic profiles, these parts are characterized by a compact structure. The blade-making technology means, first and foremost, to provide a seating surface that is consistent / conjugated to the aerodynamic surface. First of all, it is presented which are working operations to which the problem of the orientation-positioning of aerodynamic profiles is posed. These are: profile design, orientantion-positioning at the roughing operation, orientation-positioning at the finishing operation, orientation-positioning at the overrun operation, orientation-positioning at the check / control operation, orientation-positioning at the assembly operation. These supports are analyzed from the following characteristics: universality, uniformity of contact tensions, technology, convenient access of the tools to the surfaces to be processed, standardization degree, number of degrees of freedom taken over, the possibility of catching several pieces, the possibility of using multiple tools, the possibility of using the lading-unloading stations, etc. Also analyzed are the elements and mechanisms of tightening / centering-tightening that are used to preserve the optimal orientation-positioing scheme. These are evaluated from the following criteria: the size of the clamping speeds, the size of the clamping forces, the mechanical efficency, the degree of standardisation, the tightenin-release times, the possibility of tightening mechanization, the existence of self-braking properties, etc.
The work also analyzes the actuation systems, in correlation with the tightening mechanisms, the manual, mechanical, mechanical-hydraulic, electrical, magnetic, electromagnetic, vacuum systems. In essence, the orientation-positioning systems with oscillating elements, with plastics (oil, rubber or hydroplast), with elastic elements are studied.

Keywords: aerodynamic profile, blades, orientation-positioning, manufacturing

RESEARCHES ON THE INTEGRATION OF AESTHETIC PERCEPTION IN THE ERGONOMIC DESIGN OF WOMEN 'S CLOTHING

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Abstract:

We are all aware of the importance of dress attire, especially in an academic setting, at work or during business meetings. For example, Frith and Gleeson (2008) claim that clothing could be used strategically to manage the body appearance by hiding "problem areas", and emphasizing the "advantageous" parts. The visual perception of the clothing products is very important, because it represents the first contact of the consumer with the product and when it is supported by the ergonomic design, this makes it an up to date topic. As for the workplace, it is the space where people spend almost a whole day, so the outfit approached should inspire confidence and professionalism, and at the same time provide comfort.

Workplace appearance is an important issue, causing sometimes uncertainties between employers and employees about what constitutes acceptable dress code and appearance rules, according to Nath et al. (2016).

The formal outfit is generally characterized by simplicity and elegance. In addition, it can be mentioned that the outfit must inspire efficiency, in combination with a neat look. The jacket, one of the clothing products included in a business outfit, is considered an item that should find its place in everyone's wardrobe, being considered a classic product that is never outdated.

Future research will mainly focus on the visual perception of the women's business jacket and will integrate also the ergonomic design. Within the latter aspect, will be carried out studies aimed at solving some comfort problems by evaluating the opinions and preferences indicated by the participants involved in it.

Keywords: business, clothing, comfort, ergonomic design, jacket, visual perception

THE IMPACT OF 3D DESIGN TECHNOLOGIES ON THE DEVELOPMENT OF MADE-TO-MEASURE CLOTHING PRODUCTS

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Abstract:

Technological progress had a major impact in the textile industry. The manufacturing processes and technologies changed significantly. New solutions for digitizing processes and methods of developing new products, manufacturing processes and auxiliary processes are research constantly, such as logistics, production and resource planning, sales (SAP-Systems Applications and Products in Data Processing). In the textile industry, due to the diversity of the models and the use of flexible materials, there are still many unresolved issues that require thorough research. This paper proposes a theoretical evaluation of a new innovative method and process of virtual development of clothing products. For clothing companies, the advantages of this new process are represented by a reduced development time of products, lower manufacturing costs, reduced material consumption and reduced environment impact. The current global trend of consumers is to protect the environment, their demands being oriented towards sustainable products, shifting their habits from the "fast-fashion" concept to the "made-to-measure" concept.

The proposed method integrates 3D scanning and modelling technologies making the design process of textile products designed directly on avatars and the development of databases integrated into CAD / CAM systems as easy as possible. One of the major advantages of 3D operating systems is represented by the elimination of the manufacturing stages of physical samples.

To address and solve these challenges, the method proposed in this paper has the following work steps: 1. 3D scanning of subjects; 2. obtaining anthropometric data by 3D scanning; 3. 3D modelling of the virtual avatar; 4. virtual modelling of products on avatar; 5. transferring virtual products, 2D patternmaking and virtual testing (finite element analysis - Ansys); 6. defining and processing the constructive-technological parameters of product characterization using Machine Learning and Artificial Intelligence systems 7. obtaining Made to Measure (MTM) products according to the specific requirements of each user.

The elaborated working procedure, using the innovative tools and techniques listed above, will allow designers to reduce the time and costs required to develop a product.

Keywords: 3D design, avatar, modelling, patternmaking, scanning

ANALYSIS OF THE ASSORTMENT OF PRODUCTS FOR PEOPLE WITH LOWER LIMB AMPUTATIONS (CURRENT STAGE)

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Abstract:

The amputation of the limbs represents a serious intervention of a persons physical integrity. It modifies the initial form of the body and significantly affects locomotory abilities of a person.The loss of any limb has a strong influence over the patients. Persons who had their limb recently amputated face a set of complex tasks and problems which need to be overcame, including with the help of clothing.
The study presents the results of a thorough research of the range of products of clothes meant for the persons who have lost their inferior limbs due to ampitation, as well as their functionality. The timeliness of the theme is determined by the increase in the number of people with lower limb amputations and the increased interest of specialists in creating clothing for people with disabilities. This research is based on a complex process of analysis, of medical and technical literature and functional products that already exist developed both locally and globally.
The goal of this study is to establish the needs of persons with lower limb amputations, to identify the products and accessories of a complete set intended for a person with locomotor disability and to propose the directions of multilateral development of the functional clothing product assortment. This assortment must be functional both by its constructive-functional form, as well as by the materials used and the technological method of processing. It is also necessary to take into account wearers group’s specific needs of the wearer.
People who had their inferior limbs amputated present the reduced mobility and the limited abillity of self-service affects their interaction with the society. The usage of the functional clothes, as well as the whole set of accesories, increases the chance of social integration of people with amputations. This is why the research in this field can be continued throughout expanding the range of offered products and satisfying individual needs.

Keywords: adaptive clothing, amputation, clothes for people with disabilities, functional clothing

THE IMPACT OF PHYSICAL DEVELOPMENT OF PREMATURE BABIES ON DESIGNING FUNCTIONAL CLOTHES

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Abstract:

Currently, the problem of creating a system for monitoring the physical development of premature babies, especially those born with low or extremely low body weight, is becoming more and more urgent. The anthropometric indicators at birth reflect the traits and often the pathology of intrauterine development and, together with other factors, determine the harmony of the child's development in the following years of life. The evaluation of the physical development of a premature child is one of the stages in the assessment of the general condition of the child. Physical development is subject to fluctuations depending on geographical, ethnic, climatic, social, environmental factors. Therefore, the standards of physical development of children, including those born prematurely, require regular updating for each region (at least every 5- 10 years). The purpose of the study is to analise the indicators of physical development of the children born during the gestation period between 22 and 37 weeks. It aims to identify the morphological, conformational, functional and ergonomic features of premature babies. The degree of their development, in accordance with the gestational age and body weight, is considered as an important factor in establishing the morphological parameters. Given the characteristics of premature infants, it was proposed to develop functional and conformational morphological products suitable for each carrier group, with functional elements approved by neonatologists in intensive care to provide children with more comfort, safety, attention and parental love. As a result of the study, the physical development of the premature children and their impact on the elaboration of adapted and functional products with the corresponding requirements of the category of subjects examined was proposed.

Keywords: clothes, functional element, gestational age, premature babies, physical development

STUDY OF THE EQUIPMENT USED IN THE NEONATAL THERAPY UNIT FOR THE DEVELOPMENT OF FUNCTIONAL CLOTHING FOR PREMATURE BABIES

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Abstract:

The paper presents the results of a study conducted on methods and equipment of manipulation in neonatal therapy in order to identify the compositional and constructive particularities of the clothing products oriented to a target group of carriers - babies born prematurely and infants with reduced body mass.
Neonatal intensive care includes: diagnosis, prevention and treatment in the short, medium or long term of all acute insufficiencies of vital functions. Specific treatment measures are aimed at patients whose life threatens immediately, but whose prognosis is potentially favorable. Neonatal intensive care is practiced by a complex medical team (doctors, nurses, assistants etc.) who, based on specialized studies, provide assistance. The premature child will be closely monitored throughout the stay in neonatal intensive care. This means cables, tubes, patches, probes and machines. Insufficient information about equipment and handling methods is difficult to track the small premature baby situation involved in the development of corresponding textile products.
Knowing the equipment in the Neonatal Intensive Care Unit will make it easier and will help in giving the baby first aid. The methods and means of monitoring are designed to familiarize parents and healthcare professionals with the level and degree of growth and development of the premature babies.
An important factor for growth and development is the clothing products intended for the wearer group. Therefore, the correspondence with the functional and ergonomic requirements, and the inclusion of the following compositionally constructive particularities: shape, divisions, color, decorative elements and style, it was taken into account in the elaboration of the Clothes products for the premature babies. The compositional-constructive solutions, based on the conditions of care and the physiological and morphological features of the prematurely born children, were proposed.

Keywords: clothes, functional element, neonatal intensive care, premature babies

HUMAN BODY VIBRATION. STUDY ABOUT THE INFLUENCE OF KNITTED STRUCTURES PARAMETERS AGAINST THE NEGATIVE EFFECTS OF THE PHENOMENON

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Abstract:

The aim of this work is to present the effects of the mechanical vibration phenomenon on the human body and the importance of the textile materials as potential vibration absorbers or dampers. The human body could be naturally exposed to vibrations during the normal daily lives, coming from various sources e.g. in buses, trains, cars, airplanes, but an important percent of the population is also exposed to other agressive vibrations during their working time, by handling vibrating instruments or driving heavy vehicles. Exposure to vibration can cause serious clinical disorder: vascular (VWF- Vibration white finger, is the most common one) and nonvascular (pain in the joints of the hand, elbow or shoulder). Under these circumstances, the exposure to vibration risks has become a serious health problem and it is very important to evaluate, understand and minimize it. To reduce or isolate vibration represents a continuous concern for engineers, since the first industrial machines have been developed, and especially since motors have been used to power them. The paper focuses on negative vibrations effects, especially localized at the hands level. In the last decade, there was a large interest about the response to vibrations of a wide range of conventional materials (polyuretane foam (PU), rubber, gel) and an increasing number of experiments regarding textile materials. Because the conventional materials used in anti-vibration gloves production present some comfort disadvantages and cause serious problems for the environment in the view of difficult recycling process, knitted fabrics represent a versatile option to consider. The flexibility offered by this textile technology is geiven by the large number of variants which can be obtained, considering its variable parameters: type of technology (weft or warp), machine type and gauge, raw materials (nature, fineness), fabric structure (2D or 3D), finishing treatments, etc.
The paper is intend to summarise the existing solutions of the textile fabrics designed for anti-vibration purposes, outlining the potential of knitted fabrics for such an end use and further research direction.

Keywords: Hand Arm Vibration Syndrom (HAVS), knitted fabrics, natural frequencies, protective gloves

STUDY OF GREEN DEAL NEUTRAL CLIMATE TARGETS WITH RESPECT TO CARBON DIOXIDE EMISSIONS IN THE EUROPEAN UNION

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Abstract:

Climate change and environmental degradation have developed over the last decades, from a stiff concern towards an existential threat to Europe and the entire world. Throughout the issues and challenges overcoming this threat, a new growth strategy has emerged as the European Green Deal to make European Union (EU) economy sustainable, while turning this transition into an opportunity. One of the most imperative targets set is the lack of net greenhouse gases (GHG) emissions and making the EU climate neutral by 2050. In 2020 the climate and energy package passed a set of laws in the EU in order to ensure targets 20% reduction in GHG emissions in 2020 compared to 1990 levels and 55% reduction in 2030.
The EU emissions trading system (EU ETS) set up in 2005 as a development in the carbon market focuses on carbon dioxide (CO2) emissions from power and heat generation, industry sectors and commercial aviation, nitrous oxide (N2O) from nitric, adipic and glyoxylic acids production, perfluorocarbons (PFCs) from aluminium production and has driven emissions reduction by 35% between 2005 and 2019 which effectively covers around 40% of GHG emissions. The Kyoto protocol includes six gases (CO2, CH4, N2O, HFCs, PFCs, SF6) as Green House Gases, but CO2 emissions represent around 81% of the EU’s total emissions of GHG (Eurostat, 2019). In the context of reducing GHG emissions with emphasis on CO2, Germany just recently built a hard coal power plant in Datteln and is planning to build new coal power stations in Hamburg, Stade and extend the multipurpose lignite power station in Schkopau; Poland expanded lignite power plants in Turów and Bełchatów and hard coal capacity in Opole; Czech Republic has plans for an advanced lignite plant at Ledvice.
The main focus is underlining the pessimistic probability of meeting Green Deal targets for 2030 and the emerging difficulties of reaching neutral climate purposes for 2050 in an environment still depending on, building and expanding coal power plants in the EU, by creating a review of CO2 emissions in the EU with emphasis on coal power plants from two perspectives: a corelation between the closing of plants and the demands met by the European Green Deal for 2020 and future impact of CO2 emissions from the new and newly planned power plants towards reaching a neutral climate by 2050.

Keywords: carbon dioxide emissions, coal power plants, green deal, green house gases, neutral climate

ELECTRONIC TEXTILES AS POTENTIAL FUNCTIONAL PRODUCTS FOR PEOPLE WITH SPECIAL NEEDS

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Abstract:

Electronic textiles, also known as e-textiles, are textile products that enable electronic devices or components to be embedded into them. The range of textile products from this category is from fashion products to military and medical equipment.
A direction of potential research is the area of e-textiles designed for people with special needs or disabilities products, where highly functional products can improve the quality of life.
A general problem associated with wearable electronics is that of the electrical conductors. Because ofthe flexibility of textiles products, the conductors of an electrical circuit will be subjected to the same flexing and risk of losing functionality due to wearing over time. Several potential solutions are available, such as:
-conductive ink that can be screen printed or coated onto a textile or non-textile base;
-conductive thread that can be sewn onto the fabric and between electronic components;
-traditional insulated wires that can be incorporated into the base product;
-conductive wire incorporated into a fabric’s structure (knitted or woven).
Depending on the type of textile product and location on the product, several solutions are more recommended than others. Several of the aforementioned solutions used in the same product will provide a working functional textile product. The main problems consist of designing, prototyping and testing the products, due to a varied necessity of specific materials and equipment. Clothing that will incorporate electronic devices will also require design adaptations to allow the electronic devices, not only to function properly, but also to minimize deterioration over time.
In conclusion, a potential direction for research would be towards the use of electronic textiles, both sensors and apparel, in the case of benefitting individuals with special needs or disabilities.

Keywords: electronic textiles, medical and military equipment, disabilities

LIFE CYCLE ASSESSMENT STUDIES ON THE END-OF-LIFE SCENARIOS FOR TEXTILES – A REVIEW

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Abstract:

After their usage, textiles, along with their functional additives, generally follow different end-of-life approaches. LCA is a vital tool to study the environmental profile of a material entity. So, it is important to study the environmental impacts of the available end-of-life options for the textiles. New ways are discovered to bring the textiles in a closed loop. This review also describes the current potential of the textiles with respect to the various end of life scenarios, and discusses the restrictions and challenges in consideration to the environmental sustainability.

Keywords: end-of-life, environmental impacts, Life Cycle Assessment, recycling, textiles

TEXTILE PRODUCTS FOR PEOPLE WITH DISABILITIES BY BREAST CANCER (CURRENT STAGE)

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Abstract:

The paper presents the results of the study on the functionality of textile products intended for people with disabilities caused by breast cancer, as well as the structure of the current assortment of clothing products intended for post-mastectomy women. The timeliness of the theme is determined by the need for textile products adapted to the new structural, functional and psychological peculiarities arising as a result of radical treatment in breast cancer. The functionality of the clothing product is determined by its structure, namely, the textile structure, the constructive solution, the processing technology. The study includes a synthesis of the literature in the field in order to determine the aspects of clothing products for people with disabilities caused by breast cancer. The purpose of the study process is to set out new directions for enhancing the assortment of clothing for post-mastectomy women.

Gathering the necessary information for the process of elaborating the functional clothing is carried out at the "research of the project condition" stage preceded by studies in the related fields induced by the clothing functionality: the study of the wearers group’s specific needs, the frequency of illness cases, the raw material sorting, the apparel design, processing technologies, any other information that allows the final product working out meeting the preset comfort and functionality requirements.

The specialized and from other related fields literature points out the following study hypotheses: the post-mastectomy women perception; the social context; the attitude towards feminity, the concealment.

Following the studies, the next areas of functional post-mastectomy clothing use were pointed out: post-surgical period, medical recovery period, treatment period; sleep, leisure; sport activities; other activities.

Clothing for this lot of wearers still requires individualized research to optimally meet the physical and psychological comfort requirements of each person.

As a further direction of research it is recommended to evaluate the functionality of textile products intended for people with disabilities caused by breast cancer.

Keywords: comfort, functional clothing, functionality post-mastectomy clothing, post-mastectomy women

NEW TECHNOLOGICAL SOLUTIONS FOR ABDOMINAL WALL REPAIR INVASIVE MEDICAL DEVICES DEVELOPMENT

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Abstract:

The use of mesh products to surgically repair or reconstruct the parietal defects has been widely adopted. The surgical mesh devices currently available for use, are constructed from synthetic materials that can be found in knitted meshes or non-knitted sheet forms. Currently, applied surgical meshes possess most but not all of the desired characteristics. Therefore, the current research efforts are focused on providing solutions for the development of new invasive devices for abdominal wall repair in case of parietal defects. The manufactured medical devices will be experimented considering the bio functional characteristics, including evaluation of the physical-mechanical and physical-chemical properties of the product (mass, water permeability, elongation, density, resistance, evaluation of the influence of surface functionalization matrix on mechanical properties of the medical device structure).

Keywords: biomaterial, hernia repair, knitted mesh, parietal defects, surgical mesh

REVIEW ON DIFFERENT TYPES OF CLAYS AND THEIR USE AS ANTIMICROBIAL AGENTS FOR COSMETIC TEXTILES

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Abstract:

The traditional use of clay as medicine began in prehistoric times. Natural clays have been used in ancient and modern medicine, but the mechanism that makes certain clays lethal to bacterial pathogens has not yet been identified. Studies of the mineralogical and chemical compositions of natural clays that inhibit bacteria have allowed a better understanding of some of the specific properties that are toxic to a wide range of human pathogens.
Cosmetotextile or cosmetic textile represents a product category that combines the field of cosmetics with the field of textiles through a microencapsulation process, where microcapsules are directly fixed on textile fibres. On the other hand, textiles are an important interface between humans and the environment. The combination of cosmetics and textiles provides a distinctive platform for the delivery of cosmetic products, so it is a challenge to bring a noticeable performance to the field of cosmetics-textiles.
The paper provides a crytic analysis of textiles presented in the scientific literature, with functional properties obtained by using different clay formulations. Particular attention was paid to the distinction between the properties that make a clay "healing" and the properties that make it "antibacterial". To date, there is an abundance of reports in the literature of "healing" clays where in vitro tests have failed to demonstrate adequate bactericidal properties against pathogens. The main clay minerals used in the pharmaceutical and cosmetic industries are kaolinite, talc, smectites (montmorillonite, saponite and hectorite) and fibrous clays (palygorskite and sepiolite).
The use of clay minerals for cosmetic and pharmaceutical purposes has increased in recent years due to the growing success of natural remedies. In addition, clays intended for pharmaceutical and cosmetic products have been found to be non-toxic and non-irritating materials. For cosmetic purposes, clays are used for external applications such as facials and skin treatments.
As researches conducted so far regarding clays` properties indicate that certain natural clays could have noticeable and extremely specific effects on microbial colonies, further studies will be directed towards the characterization of the selected ‘clay-textile’ pairs.

Keywords: antibacterial agents, clay, cosmetotextile, dispersion, textiles

OPTIMISING THE FOOTWEAR BY SIMULATION AND EVALUATION OF THE DESIGN PARAMETERS

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Abstract:

The progress in computer science led to the emerging of solutions that facilitate the process of new product development through virtual prototyping and simulation, evaluation, and optimisation of the products. The optimisation uses several methodologies for the allocation, decision, and engineering of the footwear product. A design issue must be identified, and certain mathematical functions are required to maximise or minimise it, having possible constraints that limit the choice of optimal values for the proposed variables. A detailed evaluation of the virtual products and their optimisation could be done using various analysis and simulation methods. To optimise the footwear design parameters, developing precise foot and/or shoe models is required. An appropriate finite element method has to be chosen, and accurate simulation tools based on human behaviour models are necessary. This paper offers a short perspective on the design optimisation of footwear comfort through virtual analysis and simulation by varying shape, structure, type of materials, thickness, number of components, etc. Noteworthy is that most of these studies are focused on the footwear bottom components while optimising uppers' design parameters is almost not targeted. This study's conclusions confirm that it is necessary to design 3D models and create accurate loading patterns to evaluate and optimise all footwear performance by varying the product's upper design particularities.

Keywords: comfort, design, footwear, optimisation, simulation

INTELLECTUAL PROPERTY RIGHTS REGARDING THE KNITTING PROCESSES OR PRODUCTS

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Abstract:

Creativity is one of the main characteristics of the engineering activity, being also a professional obligation. The protection of intellectual property rights over one's own creation represents similarly a professional obligation. Often, the authors of certain creations are not familiar with the ways in which a novel product, process or service can be protected, due to the lack of a real culture regarding intellectual property.
The paper aims to present an inventory of the solutions available for the knitted products and their processes protection. The paper introduces first the general legal framework, domestically and internationally, regarding intellectual property rights. The ways in which the protection of intellectual property can be realized are summarised acc, respectively the patent, utility model, industrial design, brand, etc. Next, a knowledge matrix of knitting (KMK) is created and defined, comprising of the relevant aspects of the knitting process, which are exemplified through technical, economical and environmental parameters, which combined, will generate the obtaining of a certain knitting product or process. These parameters, as they are clusterised, are related to: technical properties of the knitted fabrics (structural parameters, thickness, weight, porosity, resistance and elongation at break, friction coefficient, rigidity, pilling, etc.), economic aspects (knitting time, consumption of raw material, productivity, etc.), comfort (air permeability, thermal conductivity, vapor permeability, thermal resistivity, etc.), aesthetics (shape, color, touch, etc.) and environmental parameters (energy consumption, carbon footprint, etc.) which characterize the knitted products and knitting processes.
Going further, the correlation between the intellectual property rights and the characteristics of the knitting products or processes that can be subjected to these rights, is performed. This correlation is expressed in the form of a grid that allows to identify the ways in which a knitting product / process can be protected. Finally, some examples of counterfeiting in the textile field are presented, analyzing which were the intellectual property rights violated in these cases.

Keywords: copyright, intelectual property, knitted fabrics, knitting process

PERFORMANCE CHARACTERISTICS OF APPAREL FOR MOUNTAIN RESCUE TEAMS

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Abstract:

Mountain rescue refers to search and rescue activities that take place in a mountain environment with technical access issues to the ropes, snow, avalanches, ice, cliffs, glaciers, alpine environments and high altitudes. Members of rescue team are equipped for search operation, offering the first emergency medical assistance in the mountain area and the transport of the person by stretcher from the mountains.
Protection equipment for mountain rescue members encompasses a wide range of products. At the core of this market segment are garments that may broadly be considered for hill walking but also cross into other outdoor pursuits such as rock climbing, fell running, mountain biking, and skiing. Although these garments suitable for a variety of demanding outdoor situations may share elements of design and fabric technology, they vary in their functionality aspects and shape according to the intensity and duration of the activity being undertaken.
A layered clothing system for safe and thermal adaptation in these specialized category of wearers is accepted to be used in practice. This allows the mountain rescuer to create a dynamic arrangement, which may be altered in response to changing comfort or weather demands over a considerable period of time.
Users of this kind of outdoor apparel have significant needs related to protection, fit, comfort, mobility and body movement while participating in search and rescue actions. The research directions related to performance appareal have highlighted a series of design solutions for these important characteristics.
In conclusion, a key for creating innovative products is understanding end-users needs and expectations.
This article aims to make a brief overview of the performance characteristics of apparel for the specific outdoor subgroup mountain rescue teams.

Keywords: clothing comfort, design solutions, mountain rescue, outdoor appareal, protection equipment

EMOTIONAL INTELLIGENCE AND OCCUPATIONAL STRESS, CONSEQUENCES IN HUMAN RESOURCE MANAGEMENT IN INDUSTRY

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Abstract:

This pilot study brings to the fore a topical issue in modern society, namely the importance of emotional intelligence in interpersonal relationships in an organization and its link to occupational stress. The article includes: elements such as emotional intelligence and emotional skills, managerial performance and the factors that lead to professional stress. The article also includes the objective, purpose, research hypothesis, conceptual basis and methodology, tools for measuring emotional intelligence and stress at work. Following the interpretation of the data obtained from the research, the relationship of interdependence between emotional intelligence and professional stress was established, offering suggestions for its reduction.
In the first part of the research will be discussed theoretical issues, and in the second part practical issues and case study on the company AllStar Prod SRL. The first part will discuss theoretical notions studied by other researchers, such as emotions, emotional intelligence, stress, forms and methods of developing emotional agility, empathy of the employee and the management team that has an above average emotional level.
The second part of the study presents the objectives, purpose and hypotheses of the research with data analysis. The objective highlights the emotional intelligence of the people involved in the organization, an objective applied at individual and group level leading to increased production quality. Time management is important in maintaining the institution and stress management on the market.
Methodology, methods: Questionnaires for measuring emotional intelligence, measuring stress in a group of 50 subjects.
The study focused on the link between emotional intelligence and stress and the results were correlated to test the null hypothesis.
Hypotheses were established:
O1 - The stress level is high in over 40% of the employees of the organization mentioned above
O2 - there is a positive correlation between emotional intelligence and stress
The high level of stress is positively correlated with seniority in the institution which was highlighted by significant correlation. Research indicates that the management team is empathetic, trying to reduce professional stress.
Following the interpretation of the obtained data, the interdependence relationship between emotional intelligence and stress was established, proposing methods to reduce stress in industry.

Keywords: emotional intelligence, emotions, empathy, manager, stress, stressors

CUSTOMER SATISFACTION IMPORTANT ELEMENT OF THE GROWTH AND ECONOMIC DEVELOPMENT OF THE A BUSINESS - APPLICABILITY IN INDUSTRY

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Abstract:

Sustainability is a way of economic development if it is implemented consciously by society. This work identifies the application of sustainability at the level of a firm through an innovative, successful vision. In a market economy where the customer sometimes becomes overloaded with offers on the market, the ability to keep the customer has returned to the attention of many expert analyzes. Businesses continue to seek sustainable sales and profit growth, strengthening relationships with current customers through an expansion of customer loyalty.

The general methodology of research was based on three types of research: Fundamental, applied and empirical. Analytical procedures such as observation and reasoning have been used. The analysis and synthesis method was carried out by studying basic concepts that make up different indicators or which form the basis for the formulation of methods and programs. Thus we are talking about the creation of the SPC indicator based on economic indicators such as productivity, cost. In this work, it was aimed at determining mechanisms for assessing customer satisfaction by applying own methods in correlation with different economic indicators, as well as developing and proposing solutions for growth and the economic development at the company level by increasing customer satisfaction

Based on these ideas, I have tried to bring to the fore a new system, in the form of an indicator that encompasses both traditional elements of customer satisfaction and economic elements that measure the activities that are taking place. This has led to an increase in both customer satisfaction and economic efficiency of economic operators.

No matter how the ways to measure customer satisfaction are sure, it requires both economic efficiency and satisfied customers to achieve business success.

Keywords: customer satisfaction, growth and economic development, sustainability

BIBLIOGRAPHIC STUDY ON THE USE RESEARCH ON THE MANAGEMENT OF THE PRE-SCHOOL EDUCATION INSTITUTIONS IN ROMANIA IN THE CONDITIONS OF DECISIONAL AUTONOMY

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Abstract:

From the thematic perspective, the title is supported by the research directions I proposed in the research project: 1. establishing a bibliographic reference regarding the autonomy of the decision-making process; 2. researching decision-making particularities in pre-school institutions in correlation with decision-making autonomy; 3. comparative study between state and private educational institutions by designing a model of correlational analysis with establishing comparison criteria (country - in EU and US); 4. designing a model for improving the decision-making autonomy in the state pre-school education institutions (designing, validating, the possibility of implementing the model and establishing indicators
for evaluating thedecision-makingautonomy). For the first research direction, the one on which this study is focused, the research project includes a presentation of the most important aspects regarding the decision-making autonomy. Specialized literature considers it either a process of "coordination of human, informational, physical and financial resources (J. O'Grady), or "a compound of the constants: power, authority and influence. "(David H. Hemphil), definitions which led us to Jean Gerbier's conclusion, for which management means "the art of leading, managing." The decision-making process is a complex of activities and operations through which a majority of the necessary information is collected and processed, according to which proceeds to the determination of the probable variables, of which the optimum variant is taken into account taking into account alternatives, context, actors, etc. and finally the decision is elaborated and the application procedure is followed, for its realization. Autonomy, as a phenomenon, expresses a degree of freedom and the ability to deliberate without influence by external factors, whereas, corroborating the definitions, we can say that the decision-making autonomy in the management of education indicates a certain mentality, an own way, but also an art of directing, of training the (human) resources, of the elements of the organization, which corresponds to the very consideration of education as science and art. In conclusion, by highlighting the relationship between the decision, the decision-making autonomy is underlined its major role in the management of educational institutions.
The stages of the study were structured as part of the research project with the theme: RESEARCH ON THE MANAGEMENT OF THE PRE-SCHOOL EDUCATION INSTITUTIONS IN ROMANIA IN THE CONDITIONS OF DECISIONAL AUTONOMY. The present study leads to the formulation of relevant conclusions that can contribute to the theoretical foundation of the researches for the elaboration of the doctoral thesis.

Keywords:

THE IMPORTANCE OF UNLEARNING FOR THE SUCCESS NEW IT PRODUCTS IN THE APPAREL INDUSTRY

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Abstract:

General context of research: The management of product development. The relevance of the involvement of distributors and final customers in the development of IT products for the Apparel Industry.
This paper is meant to help the reader better understand the behaviours and actions of customers from the apparel industry with regards to the introduction of new IT products in the production flow. The scope of the paper is to contribute to the clarification of *critical aspects for risk management in the development of IT products*, one of the objectives of the thesis.
Based on her extensive knowledge of the national and international market players and of their needs, the author seeks to confirm the hypothesis that consulting the customers and the product distributors reduces risks and facilitates product success.
Objective purpose: The objective of the paper is to highlight the impact of the deep-rooted/established working methods over the new products’ success in the apparel industry, while considering the reduction of the environmental impact.
Prior work: Analysis of customer cases, based on interviews with personnel from top and medium production management and on-site visits in production facility along with other potential customer interactions during fairs and exhibitions.
Design/Methodology/Approach: The paper is an analytical overview of the current manufacturing processes for digitally printed products. The participants selected for the referred interviews represent companies considered relevant players in the apparel industry sector.
Results: The article attempts to clarify the reasons why the new methods and technologies are difficult to implement and to explain how the (somewhat justifiable) bias in favour of methods and technologies already in place overcomes, in many situations, the need for progress, despite significant benefits of the new solutions.
Implications: The approach proposed by the paper that takes into account an important part of the nowadays trends in product development – the requirement for improving the balance between the needs of the manufacturing processes and the need for sustainability.
Originality/Value: the originality of the article is given by the utilization of a new, effectiveness-oriented concept – unlearning; the value of the article lies in the fact that it demonstrates why unlearning should be a mandatory process for introducing innovation in the apparel industry in order to facilitate a smooth transition from deep-rooted/established technologies to newly developed IT products.

Keywords: digitally printed apparel, existing methods bias, sustainable solutions, unlearning process

A BRIEF HISTORY OF DIGITAL MARKETING: THE EVOLUTION THAT STARTED IN THE 1980S

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Abstract:

The article presents current and future trends in digital marketing and the content is based on secondary data. Different articles, researches, reports, various websites have been studied. The current research is focused on the evolution of digital marketing, how this evolution was possible, and at the same time, we will analyze: theoretical as well as practical aspects that have led to the development of digital marketing.
We will identify different processes of technological progress, which have been the stages and how companies are helped by digital marketing. By understanding the history of digital marketing, companies can enter this field with the skills they need for future success. The advancement of technology combined with globalization of commerce has increased the importance of digital marketing or the practice of attracting consumers through a series of electronic platforms. With the increasing popularity of the internet, digital marketing has achieved exponential success through gradual evolution.
We will make a chronological analysis of the main technological discoveries and inventions, starting with the emergence of the first desktop computer (IBM, 1981), the first search engine (Archie), the Internet and how these technologies have driven digital marketing to the present level, we are talking about 2020.
The main purpose is to investigate what aspects have led to the evolution of digital marketing and why digital marketing is in some situations more advantageous and easier to implement by companies.
The Internet will make a difference, and companies that support digital marketing will have lower marketing costs, will know the value of the marketing department within the company, any marketing campaign will be quantifiable, and at the same time, companies will know what their marketing channels are. most advantageous, for a greater profit.
Communicating with customers will be easier, as companies can adapt to the needs of customers at the right time and place. In other news, digital marketing is the promotion of an economic entity through the Internet, mobile phones and other interactive channels.

Keywords: digital marketing, digital technology, evolution, internet, offline marketing, online marketing,

MOBILITY AND MIGRATION OF HUMAN RESOURCES

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Abstract:

Purpose: External migration is a strongly conditioned socio-demographic phenomenon. Starting from defining the concept of "migration" and its operationalization in dimensions and indicators, we will analyze the statistical-descriptive which is the impact of the net average wage on the external migration. Then, we will emphasize the influence of external migration on the phenomenon of aging of the population and on the workforce in Romania, for the period 2007-2017
Prior work: Until Romania's joining to the EU, when the Romanian economy was certified as having a "functional market economy", the external migration acted in order to adjust the demand and supply of labor force. After the effective joining to the EU (2007), the external migration contributed by the currency transfers to the economic growth and the limitation of the deficit of the external balance.
Design / mythlogy / approach: The departure of Romanians abroad increases the labor resources in the countries destination, contributing to the reduction of the labor cost.
Research limitations / implications: Within certain limits, external migration may function as a valve through which certain social frustrations are exacerbated, such as dissatisfaction with low incomes, precarious employment, lack of real possibilities for professional values and social affirmation
Orignality / Value: In the country of origin, Romania, there is already a crisis of the specialized workforce, in certain economic sectors. At present, the external migration of the active workforce represents a socio-demographic risk to the national security of Romania, together with the decrease of the number of people and the demographic aging. In the absence of active, concrete measures to reduce the flow of external migration, this social phenomenon will have socio-economic and demographic consequences in the medium and long term.

Keywords: aging demographics, external migration, labor force, migration, working population

BIBLIOGRAPHIC APPROACH REGARDING ORGANIZATIONAL INTEGRATION OF HUMAN RESOURCE WITH SPECIAL NEEDS

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Abstract:

People with special needs represent an important issue around the world as almost one in ten persons has a disability. An increased risk of unemployment is observed among people with disabilities in comparison with able individuals. The purpose of this paper is to clarify the organizational integration process of the human resource with special needs by developing, based on a bibliographic study, in order to future develop a research methodology associated to this issue. The paper research working plan was to consult existing data and information (research studies, peer reviewed articles, specialty books, national and international databases, private and public institutions data, regulations, and so on) regarding the human resources with special needs. On the basis of these, the following research goals and stages were identified: (i) associated concepts regarding human resources with special needs and their integration within Romanian organizations, (ii) education process particularities of the human resources with special needs integration (factors associated to the education process of human resource with special needs), respectively the endorsed skills (systemically) and acquired process of the human resource with special needs, (iii) the need, impact and strategies of organizations employing human resources with special needs. It was identified that there are plenty of policies that are aimed at integrating people with special needs on the workforce, especially for preventing their discrimination. Furthermore, in Romania, there is a quota for a proportion of employees in a firm to be people with disabilities. However, people with special needs are in various predicaments regarding labour (such as scarce use of their potential, inadequate arrangements to support their needs, along with others) that are not necessarily due to their disability, but rather due to shortcomings around coordination, organization and communication of the emplyees and employers, as well as relevant institutions. This paper highlights the importance of further developing methods and instruments to promote and aid better workforce integration and utilization of the human resource with special needs.

Keywords: discrimination, disability policies, human resources, special needs, workforce integration

VIRTUAL ORGANIZING – CURRENT TREND IN THE CHALLENGING SITUATION OF TODAY

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Abstract:

The need to respond to the challenges of the currently emerged global health crisis obliges all the organizations (public and private) to exploit better their own competences but at the same time to search for new solutions that can help them pass through the crisis easier. Focusing on the public sector, especially on that of education, the current economical context changes have motivated the author of this research paper to focus on the idea of virtual organization (VO), emphasizing its advantages that could open new directions of action. Since the 90s, the scientists as well as practitioners identified the VO as the enterprise of the future, which nowadays comes much closer to reality. A virtual organization is defined as a temporary collection of institutions or enterprises that cooperate and share resources, knowledge, and competencies through Information and Communication Technology (ICT), to better respond to business opportunities or to overcome situations imposed by crises of any kind. This paper is to present the both, base concepts of VOs (e.g., evolution from traditional organization, VO’s structure and characteristics, completed whith some examples), as well as its more advanced concepts (e.g., management, operational and virtual collaboration). A systematic review of the most encountered forms of VOs is also in the scope of this research: virtual team, virtual enterprise, virtual university (VU). Although the VU is often identified as distance learning, e-learning or online learning, by analogy with VO, the VU can be perceived as more than just a positive response to a technological driver and pedagogical need: a business model. Four main VU types (newly created institution; evolution of an existing institution; consortium; commercial enterprise) emerging from the case studies presented in the literature can be considered openers of new paths for university management. Thus, this research paper gives clear directions for the development of a VU model, based on the concepts identified in the literature and complemented by the already applied changes in the higher education, generated by the COVID-19 pandemic situation, directions that fit and respond to the Romanian educational challenges.

Keywords: higher education, virtual entreprise, virtual organization, virtual team, virtual university

SUSTAINABILITY VERSUS SUSTAINABLE DEVELOPMENT IN LITERATURE REVIEW

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Abstract:

Sustainability and sustainable development are some of the most ambiguous and controversial trends which are present into the development of human society. This article is an attempt to present a critical analysis of these notions from the perspective of economic, ecological and social systems.
The reference element in the research is represented by Jonathan M. Harris in his paper "Sustainability and Sustainable Development”, (2003, International Society for Ecological Economics), where he pointed out that sustainability implies that the choice of goods and technologies must be oriented towards respecting the integrity of ecosystems and species diversity, as well as towards social goals. In another approach that we consider fundamental, in 1987, the Brundtland Commission published the first volume of "Our Common Future" in which sustainable development is presented as an answer to "the needs of the present, without compromising the ability of future generations to and meet their own needs”. The identified controversy is that between the need of human society development, consuming resources, and the ecosystems affected by it, in terms of capital of resources, energy, economy, traditions and institutional change, in a global context.
In the evolution of these concepts we have come to recognize that sustainable development is the interface between ecological, economic and social sustainability, and the inherent results of sustainable development are found in the quality of human life.
The research goal of this article aims to critically analyze the currents, principles and objectives of sustainability and sustainable development, while identifying alternative trajectories for the evolution of human society from rich or poor countries . In this purpose a systematic research will be used, based on different studies, from different and diverse sources. The result of the approach will lead to the subsequent definition of a new research direction, through the importance of the factors of sustainability and sustainable development on the evolution of human society can be quantified.

Keywords: critical analysis, economic perspective, ecological perspective, social perspective, sustainability, sustainable development

PERCEPTION OF ORGANIZATIONAL OBJECTIVES IN PUBLIC SERVICES

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Abstract:

Considering that the intangible nature of the services and the complexity of the intellectual work results are important factors that determine the justified lack of a labor productivity measurement tool, the article aims to address the topic of the organizational objectives and the way of measuring them by the public sector managers. Under the current economic conditions, when the goods and services market is governed by the principles of competitiveness, economy and efficiency, the public sector is forced to find solutions to deliver competitive public services within the limits of public funding.
The purpose of the paper is to identify the perception of public sector managers about the importance of the process of measuring the degree of achievement of organizational objectives. A study on a sample of 30 public managers in the NE region was conducted within the article in view of identifying organizational objectives with a degree of repeatability in public institutions. The statistical processing of the obtained results identified the organizational objectives that have the capacity to exert a significant influence on the productivity of the employees' work. Managers can use the results to adapt their management policies to increase work productivity.
Quantifying the achievement of organizational goals and including results in the calculation and analysis of labor productivity at the level of public services is a novelty in the human resources management in the public sector in our country. Until now, scientific literature does not provide us with a method of calculating employee productivity in public services that takes into account the influence of organizational goals set by public managers. Our work presents the importance of establishing the organizational objectives and measuring the degree of their achievement in view of the results obtained in the calculation and analysis of labor productivity in public services.

Keywords: labor productivity, measurement, organizational objectives, public manager, public services

MANAGEMENT OF PRE-SCHOOL EDUCATION INSTITUTIONS - TRAINING AND INCREASING STAFF QUALITY

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Abstract:

From the directions of the research project: **1**. the bibliographic study on the current human resource at the level of pre-school educational institutions in Romania; **2**. the relationship between vocational training, increased competence (quality) and organizational behavior of the employee; **3**. outlining the relational parameters between the general activity climate, the effectiveness of the measures, the level and distribution of tasks and the type of manager; **4.**the study of the quality of preschool education through the degree of professional satisfaction of the teaching staff, an indicator that determines the personal motivation regarding the increase of the level of professional quality; **5**. researching the process of optimizing the performance factors in the educational act from the managerial perspective, through the prism of decentralization and the elaboration of new methods for increasing the approved skills acquired in order to increase the professional quality, we opted for the second direction that offers this study.
Research by David Reynolds, Robert Bollen, Bert Creemers, David Hopkins, Louise Stoll, &NijsLagerweij (2005), Ch. Hoy, C. Bayne-Jardine, and M. Wood (1999) James C. Craig & Robert M. Grant, (1993); Julia Balogun & Veronica Hope-Hailey, (1999); Adrian Haberberg& Alison Rieple, (2001); Andrew Campbell & Kathleen Sommers Luchs (1997); Paul Joyce & Adrian Woods, (1996); Robert Paton & James McCalman (2000); Gary Hamel & C K Prahalad, (1994); Bob de Wit & Ron Meyer (1999) mention among the indicators of an organizational nature not only the efficiency of the school management, but especially the professionalism of the teachers that determines the trust investment of parents and students in the management team. The specialized literature offers definitions of human resources management, different from the traditional ones: Buchanan David and Huczynski Andrzej (2013) aim to specify: "Personnel management is a specialized management function, responsible for determining and implementing the policies and procedures that determine the stages of the employment cycle. , in a way that contributes both to the well-being and quality of the work of the employees, as well as to the organizational efficiency. Thus, the deontology of the management is listed among the important principles that guide the management: the combination of the management but also of the personal responsibility with the collective one, the promotion of the cadres on criteria of competence and professionalism, operability and efficiency. The conclusion has, in some respects, an axiomatic value: the management of human resources is a scientific perspective, subsuming the theoretical and prescriptive dimensions arguing the need to establish a series of policies integrated by personnel in accordance with the strategy of the organization. This ensures the qualitative growth of the work process, increased commitments and performances from the employees, which, together, are capable of expressing an organizational efficiency in permanent ascension. The stages of the study were structured on the research direction 2. The relation between the professional training, the increase of the competence (quality) and the organizational behavior of the employee, part of the research project with the theme: MANAGEMENT OF PRE-SCHOOL EDUCATION INSTITUTIONS - TRAINING AND INCREASING STAFF QUALITY. The present study leads to the formulation of relevant conclusions that can contribute to the theoretical foundation of the researches for the elaboration of the doctoral thesis.

Keywords: communication, conceptual analysis, education institutions, external communication, management, pre-university

ENTREPRENEURIAL UNIVERSITY VERSUS ENTREPRENEURIAL EDUCATION: A REVIEW OF CONCEPTS AND APPROACHES

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Abstract:

The role of higher education institutions in developing and consolidating entrepreneurial ecosystems at local, regional or national level is a very used topic in the literature. In order to analyse the degree of efficiency and to evaluate the impact universities have in supporting, developing and modernizing of entrepreneurship, we must first address from the point of view of significance of a series of basic notions such as entrepreneurial education and entrepreneurial university.

The present paper summarises a series of approaches and definitions found in the literature as well as the perspectives from which concepts such as entrepreneurial university and entrepreneurial education have been considered and assigned in contribution to the development of entrepreneurship, thus making an updated radiography of these concepts. We intend to perform a comparative analysis of these two notions based on current approaches and also analyse the reports of subordination, complementarity, interference, namely distinctive elements, in order to be able to make a series of personal appraisals regarding the interdependence in terms of meaning and contribution to the development of the entrepreneurial ecosystems and the entrepreneurial climate of higher education institutions.

The purpose of the paper is to establish, beyond an approach from the point of view of the current literature, the elements that define a higher education institution as an entrepreneurial university, which are the parameters of the entrepreneurial education that contribute to cataloguing the entrepreneurial universities and the weight these two concepts have in the development of entrepreneurial ecosystems in terms of their independence and the need for complementarity.

Keywords: entrepreneurial university, entrepreneurial education, entrepreneurial ecosystem, entrepreneurial climate, entrepreneurship

BUSINESS ASSOCIATIVE STRUCTURES: SUCCESS FACILITATOR IN THE ERA OF NETWORKING AND DIGITALIZATION?

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Abstract:

The present research is focused on several main directions: identifying theoretical aspects regarding the notions of associative business structures, historical background, forms and types, their basic features and purposes. It is intended to identify the concept of association and associative business structures in all its known forms and manifestations at the level of the private market collaboration or in its known forms of public-private association, regarding the collaboration with the public and academic institutions, other public or economical-social bodies. Also, a classification of the benefits of the business association membership is made and why should a person, an institution, a small and medium enterprise (SME) or a big company would become a member in such an associative structure. Thought business associative structures have a long history and lots of examples regarding their impact for the development of a specific industry or for influencing legal aspects for making business (lobbying and other collective actions), we will analyse also the potential benefits and weaknesses of being a member today, in the era of networking and digitalisation. We will identify the area of interest and the impact of technology in developing new connections, accessing new markets and if it is easier today to access new clients and partners by learning to individually use the on-line market benefits, to invest on your own in new technologies or to combine resources with other companies and researchers in order to access global markets, enhance innovation and use the benefits of digitalisation to have impact at a greater level that your own profit or direct interest. We will analyse the mix of services and support (offline and on-line) that an associative membership can offer today, ranging from individual support, collective lobbying, social and networking events, internationalization possibilities to other benefits (special discounts, access to specific libraries and research materials, access to special funding and the possibility to work or cooperate in research-development projects).

Keywords: business associative structures, business community, collective actions, networking

BIBLIOGRAPHICAL STUDY REGARDING RESEARCH STRATEGIES, RECRUITMENT, SELECTION AND INTEGRATION OF EMPLOYEES IN PROJECT TEAMS IN THE REALIZATION OF THE HUMAN RESOURCES MANAGEMENT OF THE PROJECTS, AS INTEGRATED MANAGEMENT IN THE HUMAN RESOURCES MANAGEMENT IN UNIVERSITIES

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Abstract:

This paper refers to the impact of human resources management on the projects realized in higher education institutions in Romania. This is of strategic importance for universities, which by their nature of activity are project oriented. In carrying out the projects, the human resource is represented by the project team.
The bibliographic study necessary to realize the doctoral thesis with the theme:
RESEARCH ON HUMAN RESOURCE MANAGEMENT IN PROJECTS CARRIED OUT IN THE HIGHER EDUCATION INSTITUTIONS IN ROMANIA has been carried out on the following research directions:
1. Research on the types of projects and the particularities of integrating the human resources management from projects in the human resources management of the univesity;
2. Researching the strategies, recruitment, selection and integration of the employees in the project teams in the realization of the Human Resources Management of the projects, as integrated management in the Human Resources Management of the universities.
In this paper, the RESEARCH DIRECTION was approached Researching the strategies, recruitment, selection and integration of the employees in the project teams in the realization of the Human Resources Management of the projects, as integrated management in the Human Resources Management of the universities,the studied bibliography being structured on the following aspects: recruitment , employees in the project teams in the realization of the human resources management of the projects, as integrated management in the human resources management of the universities. It also analyzes the possibilities of improving the management of human resources projects according to the strategies in the field of human resources in universities.
The results of the bibliographic study are materialized in the following conclusions:
The main objective is to investigate the possibilities of improving the management of human resources in the projects realized in the institutions of higher education in Romania.The aim is to ensure a transparent framework of the process of recruitment and selection of personnel in projects financed from European funds non-reimbursable at the level of the whole university, aiming at hiring people who have competences corresponding to the requirements formulated in the job description in the project proposal.

Keywords: DRU Directorate / Department / Human Resources Service, HRM Human resources management, PM Project management, PMI Project Management Institute, PT The project team

NECESSITY AND LIMITATIONS OF ROBOTICS IN MANUFACTURING SYSTEMS IN THE CLOTHING INDUSTRY

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Abstract:

There are different points of view from production specialists that robotic sewing applications in the garment industry will never be done for fashion products. At the same time, we can observe the alignment of fashion with industry 4.0 which has, as main component the intercommunication of machinery within the product development process. This paper explores some of the new technologies in this field, with the intention of providing a different perspective, to improve traditional clothing development and manufacturing methods and to improve and provide a rapid answer to the challenges facing the business world. The industry will focus on achieving a high quality level in an environment with a high degree of customization.
The objective of this paper is to analyse the need to robotize applications in the garment industry, the achievements up to this moment and the limitations imposed by different influencing factors such as diversity of models, variability of sewing cycles and behaviour of flexible materials in inter and intraoperative transport processes.
The groups of operations will be analysed for a technological process of a simple product, from the point of view of the types of movements, amplitude and the level of precision required.

Keywords: automation, robotics in textile, workflow

ORGANIZATIONAL AGILITY: IMPLICATIONS, SIGNIFICANCE AND PARADOX

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Abstract:

The world has become a huge network where information, accessible and easy to distribute it instantly rewrites the future as quickly as it can be understood. In the study of the concept of agility in organizational context (AOC), the starting point is the understanding of the impact of technological and economic changes on business practices (Lucescu, L., Avasilcăi, S., Bagiu, N., 2018). Even management experts declare themselves agnostic about the business models that should be followed (Cannon & Elford, 2017), but they specify the imperative to create a living organization that will vibrate in spite of so many diverse threats. This paper aims to explore the significance and the paradox of agility in organizational context and it shows that while organizations adopt technological changes, they do not yet fully understand how to address these challenges that impact responsibilities, governance mechanisms and the conversations with the user community in turbulent landscape.

Keywords: agility, agile leadership, agility paradox, organizational agility

CRITICAL ANALYSIS OF THE MODELS OF ORGANIZING THE CIVIL STATUS ACTIVITY IN ROMANIA

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Abstract:

Civil status activity well-known as the ”producer” of the birth, marriage and death certificates, has a unique and special role for every country in the world because of its real outcome: population registration. The population is the demographic, psychological and spiritual dimension of the state, a territory with no population cannot be a country.
The civil status papers are authentic documents which shall be drawn up in the interests of the State and of the person and serve to know the number and structure of the population, the demographic situation, the protection of fundamental rights and freedoms of the citizens.
In Romania the civil status activity, considered less important until recently, is organised in every legal administrative unit, meaning in every communa, town,city and county, the organisational structure being defined by the size of the unit and its ruler way of thinking.
The changes that took place in Europe demanded a new and modern public administration in Romania, citizen-oriented, more eager to satisfy citizen’s needs, causing a reconsideration of the importance of civil status activity and the beginning of a deep reform in this field.
In this context, the purpose of this paper is to identify and analyse the main structural models of organizing the civil status activity in Romanian administrative units. The analyse method chosed is the functional benchmarking which analyse the similar functions of different organisations with the same field of activity.

Keywords: analyse, civil status activity, civil status documents, functional benchmarking, organizational structure

THE ROLE OF SCHOOL MANAGERS IN IMPLEMENTING THE QUALITY OF EDUCATION

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Abstract:

Quality assurance of education can be achieved with the help of teachers and managers who are involved in research and learning, who value teamwork and have a common purpose. The competences of school leaders and managers significantly influence the quality of the teaching and learning processes in each educational system. Mintzberg identified ten manager roles in which his activities can be classified.
The ten roles are grouped into three broad categories, in the idea that regardless of the concrete content of a manager's work, his actions can be placed in one of the following categories: decision making, information processing and engagement in interpersonal relationships.
The results of a study conducted by Bitterová (2014) showed that the school leaders considered that the most significant competences regarding the profile of a school manager are the following: creation of motivational strategies based on the common values of the school; developing an effective learning environment for students; clearly defining, distributing and delegating responsibilities and tasks; management and control of colleagues.
Pagon (2008) developed a model of managerial competences based on the existence of preconditions. At the center of the model are three main categories of competences (cognitive, functional, personal / social). Applying these skills ensures efficient change management.
The model of managerial competences developed by Pagon (2008) offers a systematic view on the categories of competences that the management of quality assurance of education implies by school managers. To ensure the quality of education, it is necessary to make changes in the content, the teaching-learning-evaluation process. Molan (2006) proposes to achieve a correlation between goals (why?), targeted components (what?) and development strategies (how?) to create a logical approach to quality in contemporary education.
Unlike traditional organizations that are distinguished by controlling the behavior of people at the level of managerial systems, learning-based organizations emphasize "the capacity for reflection, teamwork, the ability to develop common visions and common understandings of complex educational problems" (Molan, 2006).

Keywords: educational efficiency, quality, quality assurance, quality management, quality of education

APPLICATION OF TOTAL QUALITY MANAGEMENT (TQM) IN EDUCATION

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Abstract:

TQM is a management philosophy and practice that aims to capitalize on human and material resources, basic resources of any organization, which used in the most efficient way lead to the achievement of organizational objectives. This philosophy also provides a framework that integrates many positive developments in education, such as teamwork, management involvement, cooperation between learning and results-based education. TQM is a constantly evolving concept that changes with new concepts and new methods that develop. The TQM approach in education involves not only obtaining high quality results but also influences all segments of the educational process, such as organization, management, interpersonal relationships, material and human resources, etc. The aim has been to improve the quality of education in various ways, and one of the strategies to improve it is known as Total Quality Management (TQM). The philosophy of continuous quality improvement in education is used as a practical tool by educational institutions in meeting the needs, desires and expectations of current and future customers, the main goal being customer satisfaction. The TQM concept is related to the implementation of a quality culture in order for management to be able to satisfy all educational clients, teachers / employees, and the staff involved to be able to satisfy both internal and external clients. The educational institutions that implement TQM bring continuous improvements respecting the following principles: focusing on the client, permanent improvement of quality and involvement of all elements in the educational sphere. There are several models with which to implement TQM. In the USA the American Model of Excellence is used, known as the Baldrige Model, in Europe it is the European Model of Excellence administered by EFQM - European Foundation for Quality Management. The TQM conceptual model is a way of life of the organization, which introduces the continuous improvement of education at all levels and activities, creating an environment based on teamwork, trust and respect. The processes are approached in a systematic, consistent and organized way, applying the techniques of Total Quality Management.

Keywords: education, EFQM Model, Malcom Baldrige Model, processes, resources, Total Quality Management

SWOT ANALYSIS BEFORE AND AFTER A TAKEOVER – CASE STUDY UNICREDIT BANK ROMANIA

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Abstract:

Analysing the situation from the point of view of the growth offered by retail customers, we found that the scenario of a customer portfolio takeover is much more feasible than the organic growth scenario (step by step).
Starting from the main reason for the existence of a company – profit making, we made in this paper the analysis of a strategic decision of UniCredit Bank Romania to acquire the client portfolio of RBS Bank Romania. The main variable resultant of the research action is the profit and the ways of its growth and consolidation.
By closely correlating the internal and external business environments, the clients, the possibilities of organic growth and the acquisition / merger method, the internal and external financing costs and the local competition, we came to the conclusion that the acquisition at a certain moment of a certain client's portfolio of a particular bank is the best option for profit growth. Interference between external environments, cost of financing and local competition, customer acquisition is a scenario that brings added and rapid value.
This successful M&A operation had followed 5 key steps: validation of the deal model to set realistic targets, the involvement of the senior leaders, making the sales-force retention a priority of the top- management, putting your best staff forward, actively manage cultural differences.

Keywords: acquisitions,internal reorganisations, mergers, merger project, restructuring

THE IMPORTANCE OF MAINTENANCE IN THE CIRCULAR ECONOMY

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Abstract:

The concept of maintenance is defined as a totality of the technical, management and administrative activities that have as objective maintenance or restoration of an equipment / system throughout the life cycle, in order to be able to fulfill the tasks for which it was created. Circular economy represents an economic, production and consumption system based on the reuse, repair, renovation, restoration and recycling of materials and products for development of closed systems. The objective of the research in this article is to study the opportunities and threats arising from the implementation of the circular economy. Large-scale application generates effects in the management of resources in the manufacturing industry, which are accompanied by challenge and opportunities throughout the application in the management and maintenance of the machines and equipment. We will analyze the basic model in the circular economy from a point of view of life cycle management, which is represented by the business management model, regardless of the form of organization, in order to improve their sustainability. Application of the life cycle management method can be done for small and large companies, with the desire to have a more sustainable management of the equipment / system by organizing, analyzing and managing their activities and information about them. Their realization is done by comparing the basic model in the circular economy with the fundamental notions of asset management. Their effects resulting from the opportunities and threats by the circular economy for asset management and maintenance are compared with real cases. Life cycle management refers to the operational development of life cycle design and the sustainability of systems / products for companies that aim to continuously improve and minimize environmental and socio-economic tasks, while maximizing economic and social values. The role of asset management and maintenance influences strategic objectives to be implemented. The methods proposed by the circular economy come with the need to know the usage history, to combat or estimate the negative effects on the machines using heterogeneous materials and the development of new maintenance models. This aspect requires updating the data and interpreting it to allow more efficient decisions to be made in maintenance activities.

Keywords: circular economy, consumption, maintenance, management, system

AN APPROACH OF RECYCLING RUBBER WASTE WITH APPLICATIONS IN INDUSTRY

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Abstract:

The study is based on the fact that waste tires are a steady problem for the future of humanity. The quantity of non-recycled waste rubber is increasing every year despite the recycling tendencies all over the world.
Economical and political strategies for conversion of the End of Life Tires in primary products as resources (fuels, carbon black, steel) and secondary products as finite or semi finite items (as rubbery asphalts) over the globe are evaluated.
Industrial methodsof rubber waste conversion in useful products, like: pyrolysis, microwaves methods for cooking tires, coprocessing, microbial way to extract Zn in waste rubber with agricultural application, devulcanization are studied. Some attempts in South America (Brazil) and European Community show that the long time economical approach is very important, in order to keep the quality of our environment and reduce the waste at world scale, creating the bases for a Circular economy, where the industrial products are designed for a long time of use and transformed in something useful at End of Life time.

Keywords: circular economy, devulcanization, rubber, textile, waste tires

INDUSTRIAL EVOLUTIONS WAVES FROM 1.0 TO 4.0- SIMMILARITIES, DIFFERENCIES AND IMPACT ON SOCIETY AND HUMAN LABOR FORCE

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Abstract:

A primary analysis upon the actual society and related socio–economic classes could reveal a profound evolution along the recent history starting with 1-st and 2-nd waves of industrial revolutions .Therefore the classic model of upper and working classes defined at the beginning of XX-th century, was transcending to a fine layering having the middle class in between , or so called „white collars” which seemed to be expanded along and dominate more and more the economic spectrum by the working means and the new definition of actual industrial revolution 4.0 as core activity linked to digital technology .
The summary of several elements showed onto table hereunder is proposing to find out the roots of main reasons of society change and also to see the reasons of actual conflict which is not related only to generations but also at the level of working categories and their value and contribution to the mankind.
The new technology with declared purpose to replace as much as possible the human work by robots and cyber-entities , besides the positive effect , shall be recognized by the convulsion determined to the working class or the „blue collars” which has the direct contact of real products of all industrial sectors .Meanwhile a slight separation is created between the category of activities with intellectual content based on creativity, initiative and decisions makers on one side and to the opposite, we have the ciber-entities” human assistants”, which is a personal definition because there is no clear definition of this new human occupational factor (just found as an agent , human entity , general employee , etc). The conflict become to be more profound as the first category sound to be more valuable and better paid at the end, by contrasting with those which are just assisting the robots.
But what about the fields where the human work content is still prevailing ? by their own skills inter-acting with raw materials (i.e. civil building, foodstuff or garmenting industries)...As long as here the digitalizing was not covering the core of „making products” , it look like the trend is to either ignore or to push them to the end of economy spectrum .The pressure imposed to lower the cost of consuming goods is driving to a compromise solution which is not ethical but is functioning, meaning exploiting the cheap labor force from emerging economy zones.The phenomen is notorius, recognized, but not yet solved.
We could notice from the historical data, each industrial wave is a landmark solution at the end of an economy crisis, 2 of them being marked as well by two devastating World Wars.
At the end of this short analysis, a clear conclusion could occur : an urgent need for economical strategies defined for our countries in order to motivate , apreciate and put the right value on human work, creating the balance and stablity of the existing categories , before they are doomed to disappear and most of all to find a solution for this perpetuum convulsion of the production categories of mankind.

Keywords: blue collars, digital technology, economic crisis, ehite collars, industry 4.0, smart factory

BIBLIOGRAPHIC STUDY ON THE USE OF COMMUNICATION IN RELATION TO THE SCHOOL RELATIONSHIP - COORDINATING INSTITUTIONS

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Abstract:

Schools have a certain status at the community level. They must ensure their existence as an organization, and this depends on how well they adapt to the external environment. They must communicate effectively with these environments.
Oliver (2008) defines external communication as appearing between managers and people outside the organization. It is the exchange of information and messages between an organization and other organizations, groups or individuals outside its formal structure which, in turn, may be at local, national and international level. Kiriago (2013) shows that, used professionally, external communication projects a distinctive image of the school in the community and increases its prestige.
The paper presents a bibliographic study on the external communication carried out at the level of educational institutions and aims to identify how this is reflected at the level of each stage of education in Romania. The stages of the study were structured on the research direction "Research of the communication process within the school relationship - coordinating institutions", which is part of the research project of the doctoral thesis with the theme "Research on the management of the communication process in pre-university education institutions".
The realization of this study determined the conceptual analysis of the communication process within the school relationship - coordinating institutions and the formulation of the following conclusions that may constitute the theoretical foundation of the researches within the doctoral thesis.
In most institutions the communication process is not transparent. The deficiencies of communication are reflected in the image of the school, which is often at the disadvantage of the unit. At the internal level, in the school institutions there is a document that regulates some aspects regarding the internal and external communication, the operational procedure. This is not a substitute for a strategic plan.
There is a lack of agreement in the communication between the levels of education: from the mayor to the secondary school, high school and university.
These observations support the choice of the research topic, as one of the impact on the pre-university education institutions, on the community and the family of the beneficiaries.

Keywords: communication, conceptual analysis, education institutions, external communication, management, pre-university

ANALYSIS OF A RISK MANAGEMENT MODEL IN THE TERRITORIAL ADMINISTRATIVE UNITS

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Abstract:

The risk management system is a systematic process that is based on operational policies and procedures, aiming to increase the level of performance of an entity. In the public sector, the organizations have a responsibility to provide efficient services in a dynamic and ever-changing environment. This has led to the identification of models and management tools that are as economical, efficient and effective, but not performing well enough. The risk management system is used to improve the efficiency of entities, and previous studies show its relevance in the private and non-profit sectors.
A management model involves a whole systematic and logical process that leads both to the fulfillment of the general principles of risk management and the specific objectives of an organization. It includes reforms aimed at improving the quality of public services, reducing spending, increasing the efficiency of government operations, and streamlining policy implementation. However, its application is not only a matter of representation (through programs), but also a matter of intervention. The objective of the paper involves the analysis of the risk management model applied in 3 Territorial Administrative Units.
The research methodology consists of identifying variables such as: the number of inhabitants, the objectives of the entity, the distance from the county town and their analysis at the level of an organization. To quantify the efficiency of the risk management system, the application of operational policies and procedures is also analyzed, the criterion used is the degree of revenue collection at the level of a commune.
Based on theoretical arguments provided by the literature and after a brief review of possible alternative ways of conceptualizing the process of adopting new management practices, the paper helps to establish the role of management control methods in public organizations. The results help to identify the institutional, political and contextual factors that affect the development of management control systems such as: underdevelopment of the collection system (ghiseul.ro, bank transfer) or failure to inform citizens about payment obligations.
Also, the research contributes to the observation of the management model used by the territorial administrative units and to the establishment of its degree of performance.

Keywords: risk management, management system, policy and procedure, territorial administrative unit

ADVANTAGES AND DISADVANTAGES OF THE MEASURING METHODS OF THE ORGANIZATIONAL PERFORMANCE. A REVIEW

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Abstract:

Due to the fast changes in economy and society, measuring the organizational performance has become an increasingly complex necessity. In response to, in the literature regarding performance management, different methods have been formulated; through their implementation the companies can better develop and adapt to the business environment. Over time, significant progress have been made which marked the transition from traditional to modern methods, from static to dynamic, from process-centred methods to those based on system balancing, from unicriteria to multicriteria methods. In this context, the area of performance measures has expanded from financial to non-financial aspects, from quantitative to qualitative assessments, from tangible to intangible elements, from present to prospective situations. However, the performance measuring of an organization has remained a subject far from completion. A complete model, that will be easy to implement and that will allow the control of all the determinants of organizational performance has not been identified yet.
The purpose of the study is to review the most popular performance measurement methods and to point out the advantages and disadvantages of their implementation. For the achievement of the assumed purpose, the most representative studies that highlight the progress in the line of performance measurement systems have been identified. On the basis of the theoretical (regarding the functionality of the model) and empirical landmarks (regarding the degree of practical implementation), six methods of performance measurement were selected: the method of the European Foundation for Quality Management - EFQM; Economic Value Added - EVA; Strategic Measurement and Reporting Technique (SMART) Performance Pyramid; Balanced Scorecard - BSC; Performance Prism - PP; Holistic Performance Management Framework - HPFM; Multi-Criteria Decision Making - MCDM). Performing a post facto exploratory research we have built a database structured as follows: the name of the model, its purpose and particularities, the elements of novelty which have been brought (compared to the previous models), the system of indicators that were used, the advantages and disadvantages of practical implementation. The results of the study are useful from a methodological and practical point of view and provide support to researchers (who are interested in identifying new research directions) and managers (who are interested in implementing the most appropriate performance measurement system).

Keywords: advantages and disadvantages, determinants on performance, methods of measuring of performance, organizational performance, performance management

CHALLENGES OF THE VIRTUAL BUSINESS ENVIRONMENT AS A RESULT OF CYBER-ATTACKS. THE ROLE OF SCIENTIFIC RESEARCH IN COMBATING THEM

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Abstract:

The cyber-space can be defined as a result of the digitalization process, but also one of the most complex environments that the humankind has ever built. This complexity generates different software and hardware vulnerabilities, which are then exploited by hackers for malicious purposes. In this regard, cyber-security is a very important factor throughout the world, in the last few years becoming bigger and bigger. Considering the cyber-crime in the digital society, scientific research plays a very important role, because the evolution of technologies has focused on cyber-security which has been slower than the evolution of threats. The main approach of this research will be to highlight the importance of the scientific research in the security industry area, by underlying that a strong communication between the security scientific researchers and security professionals will always gain for an efficient knowledge sharing considering the security countermeasures that have to be implemented, along with the penetration testing techniques which will be used

Keywords: cyber-space, digitalization, scientific research, technology

THE STRESS ANALYSIS OF THE MILLING MACHINE STRUCTURE

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Abstract:

The article presents a ways of checking the stress of milling machine construction made of steel profiles. The aim of the article was designation of strength parameters. In order to designate basic parameters like deformation or stress, one of most popular mesh methods was used – finite elements method. In the work, load of the milling machine on the upper and the lower frame was analyzed.

Keywords: Ansys, CAE systems, CAD systems, stress analysis

MODAL ANALYSIS - DESIGN OPTIMIZATION BY SELECTING MATERIAL PARAMETERS

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Abstract:

Article presents basic issues from the field of numerical analysis in reference to modal analysis. The aim of the article was to examine influence of basic detail properties like density or mass on the result of modal analysis. The obtained results will allow to more intuitive design of objects so that they meet the assumptions of modal analysis.

Keywords: Ansys, CAE systems, CAD systems, modal

STUDY SIMULATION OF UMBILICAL CABLE FOR UNDERWATER VEHICLE

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Abstract:

This paper presents a series of analyses regarding the tethered umbilical cable in uniform current cable from the composition of the underwater remotely operated vehicle (ROV). The remotely operated vehicle is used in different undersea operation when it is important to control and determine precisely the disturbance forces generated by drag due to currents that act either on the vehicle directly or indirectly on the tether umbilical cable. The dynamics of umbilical cable represent an important part in ocean environment being used for signal and power transmission application. To perform the simulation in Ansys Aqwa, two axis systems are considered. A coordinate system related to the earth, represented by the key in front of which the measurements are made and a second coordinate system related to the vehicle at a set depth relative to the surface of the key. The results obtained from the simulation show us the drag forces that are exerted on the chosen cable for a given length, drag that appear both the seaborne platforms and underwater remotely vehicle contact.

Keywords: drag forces, tethered umbilical cable, underwater remotely vehicle

THE OPPORTUNITY OF HIGH STRENGTH STEELS UTILIZATION FOR A VLCC FORE PEAK STRUCTURE

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Abstract:

The fore area of the ships in extreme conditions is commonly subjected to external impact pressures such as bottom slamming and bow impact. The phenomenon combined with a poor design can lead to local structural damage (cracks, dents, buckling of plate panels) and malfunction to the installations on-board of the ship. At global level the slamming loads impulse induces a transient hull girder vibration as whipping, leading to fatigue structural damage and crew discomfort. Sloshing pressures due to longitudinal and transverse liquid motion in tanks are also of interest due to location at the extremity of the ship.

In the present article, a comparison study between different steel material grades is performed for a VLCC fore peak structure subjected to external and internal dynamic pressures under the Harmonized Common Structural Rules for Bulk Carriers and Oil Tankers (H-CSR). The hull structure is built based on the benchmark crude oil carrier KVLCC2 surface developed by KRISO (Korea Research Institute for Ships and Ocean Engineering). and modelled with plate finite elements in FEMAP software. A fine mesh size was adopted for the entire model in order to capture most of the abrupt and pronounced structural geometrical gradients. Three steel grades generally used in the shipbuilding industry, one normal strength and two higher strength, are subjected for the assessment.

The study targets an optimisation process to minimize the steel weight of the structural members by plate elements thickness reduction for relevant limit states under both Working Stress Design (WSD) and Load and Resistance Factor Design (LRFD) methods. The allowable stress criterion is set to be the main target while maintaining the minimum thickness requirements fulfilled.

With similar mechanical properties, except the yield stress and tensile strength, the mild steel utilisation leads to thicker plates, therefore a heavier structure, due to the lower allowable stress. The usage of the higher strength steels results to thinner plates and a lighter structure, but special attention needs to be paid for slenderness and buckling requirements.

Keywords: dynamic pressure, finite element analysis, H-CSR, KVLCC2, steel grades, structural analysis

GREEN-LINDSAY THERMOELASTICITY FOR DOUBLE POROUS MATERIALS

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Abstract:

The applications of double porosity materials spread accross a wide range of domains e.g. civil engineering, geotechnics, biomechanics. First mathematical model of a thermoelastic material with double porosity structure was studied by Barenblatt. Straughan expressed the connection between the two porosities of a material referring to the pores of the body and the cracks of the skeleton.
As it is known, some generalized thermoelastic models have been proposed for transient responses in many applications, like ultra-fast lasers heating, or low temperatures; that is, in situations where classical thermoelasticity fails. Furthermore, in books we find some models for generalized thermoelastic media. The thermoelastic model proposed by Green and Lindsay is one of such theory, and it takes the second sound effect of heat conduction into account. It should be emphasized that Green and Lindsay’s theory has been addressed for many types of media: classical thermoelastic environments, dynamic thermoelasticity, mixture of Green-Lindsay thermoelastic solids, thermoviscoelastic environments and so on.
The main purpose of this paper is to obtain some new results in the thermoelasticity for double porous materials, starting from the classical theory of elasticity of Green-Lindsay. For the problem with mixt data for bodies with double porosity we proved a reciprocal theorem, then we obtained the energy equation in the context of Green Lindsay thermoelasticity for double porosity bodies, and we established a result regarding the uniqueness of the solution of the problem with mixed data for bodies with double porosity.

Keywords: double porous materials, Green-Lindsay, thermoelasticity

DRIVING THE ROD PUMPING SYSTEM

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Abstract:

The asynchronous electric motor is used in the industry for the operate pumps, compressors, cranes, traveling cranes. Powered by an inverter, it can be used for traction of tramways and trolleys. The static frequency converter is used to adjust the asynchronous motor with a rotor in short circuit, from the 0 value up tothe nominal speed.
A oil pumping installation include the bottom machine and the surface machine. The bottom equipment is composed of the depth pump, the bottom separator for gases and sand, the extraction pipes, the pumping rods, the anchor for the extraction pipes, the paraffin cleaners. The surface equipment includes the pumping unit, the pumping head and the mixing pipe. In turn, the pumping unit consists of the rocker, mechanical gearbox, connecting rods, cranks and electric motor.
In the process of extraction by pumping there is no need for speed and/or maximum engine power. Significant reductions in energy consumption can be obtained by adjusting the engine speed by means of a frequency converter. This solution can reduce production costs and increase productivity by up to 50-60%.
The paper is dedicated to the study of the asynchronous electric motor adjusting using a frequency converter controlled by a Siemens PLC. The equipment used is didactic, being produced by the company ASTI Romania. The following elements have been studied so far: the programming way ot the programmer; the acquisition of data from the PLC; the creation and updating of the experimental database; configuration of the programming environment in order to visualize the dynamic evolution of the acquired parameters; the regulation of the engine speed in the absence of change.
Following the experimental tests performed, a family of characteristics is highlighted: the yellow color represents the supply voltage, the orange one represents the frequency, and the green one represents the current absorbed by the engine, for the speed of 100 rotations / min. The type of converter used is Sinamics G120. The access to the converter parameters is done with the STARTER software. It reduces the engine voltage by controlling thevariable phase, and increases it in ramp mode with a variable voltage from the 0 start-up value up to the network voltage, during the start the torque and current are limited, helping to a soft start by reducing the shocks in the motor.

Keywords: asynchronous motor, dynamic characteristics, frequency converter, oil extraction, software

PROBLEMS IN INSURING MAINTENANCE OF TRANSPORT SYSTEMS OF FLUID HYDROCARBONS THROUGH METAL PIPES

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Abstract:

The structural continuity of the and the integrity of the metallic materials specific of pipelines guarantees their exploitation under proper technical conditions and with the minimum reduction of environmental risks, representing a permanent preoccupation and essential condition in the maintenance of the transport systems of fluid hydrocarbons through metallic pipes. Metallic and non-metallic materials coming in contact with a certain environment suffer gradual degradation due to reciprocal interaction. The nature of this interaction can be chemical or electrochemical and this, in time, makes the material unusable due to the structural, dimensional or continuity changes. The resistance to corrosion of a metallic material is closely related to the composition and its structure, to its degree of purity, to the nature and characteristic of the corrosive environment, to the conditions in which the corrosion takes place. When there is uniform corrosion, the behavior of the material is evaluated by the gravimetric index, the penetration index and the volumetric index.
The protection against corrosion represents the total measures taken to diminish the destructive action of the environment on materials in working concrete conditions, at the lowest possible cost and by meeting safety conditions. The main means of protection or reduction of the corrosion intensity are the following: treatment of the environment (with the purpose of reducing its aggressivity), coating of the surfaces exposed to the corrosion, application of surface treatments, moving the electrochemical potential of the metal in the field of immunity or passaging and draining of dispersion currents. The displacement of the potential of the metallic material protected in the field of immunity can be ensured by the realization of a galvanic pile with an active anode or by current injection, which opens, as an engineering practice, the way to ensuring the cathodic protection applied to the equipments in contact with an electrolyte (water, oil etc.), as the most modern method of preventing the loss of metallic material and of structural damage of the pipes destined for the transport of fluid hydrocarbons.

Keywords: cathodic protection, corrosion, electrochemical potential, gravimetric index, penetration index, volumetric index,

METHODS OF CARRYING OUT THE ANTICIPATIVE MAINTENANCE OF FLUID HYDROCARBONS TRANSPORT SYSTEMS

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Abstract:

The scientific knowledge, transposed into the engineering practice, requires the collection, by using the most state-of-the-art and complete means of the information necessary for the decision to initiate the most appropriate measures of predictive maintenance. In this context, the information provided as a result of the investigation of the pipelines intended for the transport of fluid hydrocarbons with smart pigging devices (cleaning, calibration, geometric, magnetic flux leakage) refers to those pre-existing in the questionnaire of the pipeline of the inspection operation. The values in the questionnaire are used to evaluate the anomalies in the inspection reports (preliminary and final). A quantitative assessment of anomalies is based on, and limited exclusively to the results of the inspection, and does not include any numerical parameters (corrosion growth rates, anodic potential etc.), other than those from In-Line Inspection such as values Estimated Repair Factor (ERF) of anomalies. The questionnaire (initial data provided) of the pipeline to be investigated with smart pigging devices includes at least: pipe diameter, wall thickness, pipe material, design pressure, Maximum Allowable Operating Pressure (MAOP), transported product, curve type, investigation history. The detection thresholds are applied in accordance with the manufacturing standards of the pipes.
Generally, the calculation results, namely ERF and safe pressure, based on ASME B31G (Manual for Determining the Remaining Strength of Corroded Pipelines) are used to present the pipeline condition.
There are several approaches that can be used to characterize the behavior of corrosion anomalies, both pierced and partial. ASME B31G is a very conservative criterion that helps operators avoid unnecessary cuts. It is based on an empirical adequacy to an extensive series of tests on a full scale on vessels with narrow ridges. Depth-based histograms show the distribution of all metal loss characteristics detected along the entire length of the pipe relative to their location and surface. The approach to the referred issue allows the collection of essential information about the pipeline, and presents summaries of any anomalies of the pipeline, having a comprehensive character.

Keywords: histograms, In-Line Inspection, metal loss, predictive maintenance, smart pigging

HYBRID PROPULSION SYSTEM FOR A MEDIUM SIZE OIL TANKER

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Abstract:

The global warming as an effect of air pollution has forced the commercial shipping industry to comply with much tougher rules for emissions, rules and standards required by IMO Tier III, energy efficiency design index for ships, classification societies (as DNV, GL) and special emission control areas transiting.
A well optimised hybrid propulsion system designed for reducing the fuel consumption and gas emissions is becoming a real challenge for the vessels owners worldwide.
Present paper brings into attention a study of implementing a hybrid propulsion system onboard an existing vessel, oil tanker, in order to explore its efficiency and reliability over a period of 2-3 decades.
The hybrid propulsion system developed by present study contains the following components : main propulsion engine (ICE), diesel generators (ICE), shaft generator (PTO), energy storage system (batteries packs, chargers, converters, switchboards) and a Power Management Controller.
There are already designed vessels having the hybrid propulsion onboard, but smaller size and mainly designated for harbour operating routes, such as tugs, ferries, navy high-speed boats, pleasure crafts.
The goal of saving more than 10% of fuel consumption makes the Power Management Controller to be the key for optimizing the whole hybrid system.
The type of vessel taken as studying subject is an oil tanker sailing in northern emisphere, between latitudes of 38^{o} and 25^{o} on a standard route from Mexican Gulf and eastern Mediteranean Sea. Vessel’s length is 180 meters, available area on deck for solar grid is 1600 m^2, energy demands for different operations can vary from 300 kWh to 1000 kWh.
As the solar panels grid cost has fallen over 20% within the last 5 years, as solar grid’s performance span-life has extended over 25 years at minimum 90% compared to the initial nominal performance, combined with advantages of lithium iron phosphate batteries, all indicate a sustainable choice for a hybrid propulsion system onboard a larger size vessel.
The SWOT method analysis to be used for evaluating the most efficient and economical system which can achieve both fuel consumption and emissions reduction.

Keywords: Green propulsion at sea, Hybrid propulsion, Hybrid system, Pollution from ships, Ship fuel economy, Solar grid onboard ships

LEAN CONCEPT DISAMBIGUATION USING TAXONOMY APPROACH

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Abstract:

The scope of the paper is to eliminate some mistakes that are commonly believed about what truly means lean manufacturing. Althought the definition of lean can be summed up as minimization of waste, lean implementation turned out many times more than challenging. Rushing to implement lean resulted in many misapplications of specific tools due to poor understanding of tools application field and their scope. Lean manufacturing is based on a number of specific principles, such as Kaizen, or continuous improvement. A clear understanding of all principles within lean concept can drive a firm to eliminate unnecessary transportation, excess inventory, over-production, defects and all the other kind of wastes. Providing an organization knows what are its manufacturing wastes and with a proper understanding of lean manufacturing tools, a link can be established, therefore non-value-adding (*muda*) tools won’t be implemented. By developing a literature-based taxonomy of lean concept, this paper will highlight the differences of specific tools, giving a clear roadmap towards successful lean implementation within an organization.

Keywords: automotive manufacturing, Kaizen, lean manufacturing, lean taxonomy

ASPECTS CONCERNING THE USE OF MAGNETOREOLOGICAL FLUIDS IN CONSTRUCTION OF SHOCK ABSORBERS

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Abstract:

This paper presents the magnetorheological fluids that are non-Newtonian fluids of the Bingham type and can be classified as intelligent fluids. They are characterized by the fact that their energization is achieved by means of an external magnetic field which has the effect of modifying the viscous friction effort. The application of an adjustable external magnetic field determines the control of the flow velocity of the magnetorheological fluid through a hydraulic resistance and implicitly of the flow velocity between the two working chambers of the control element of the damper. The shock absorber with elastic element and magnetorheological fluid performs the stroke control and the response speed of the piston-cylinder system. An invention with relatively recent applications, the magnetorheological damper promotes the reaction speed and the accuracy of the damping. On the outside the magnetorheological shock absorber looks like an ordinary monotube, but two unusual things are noted: the lack of valves that control fluid flow and the absence of moving components. This is possible precisely because of the properties of the magnetorheological liquid, which, in essence, is a synthetic solution based on hydrocarbons, populated with particles of soft magnetic material (easily magnetized and demagnetized). The technical problem solved by the research consists in the production of a piston-cylinder shock absorber, characterized by a control circuit with no relative moving parts, in watertight construction, without internal sealing elements for the magnetorheological fluid, which allows the control of stroke and speed. response of the piston-cylinder system. The shock absorber with elastic element and magnetorheological fluid presents the following advantages: the possibility of electric control of the stroke and the speed of response of the piston-cylinder system, by a contactless method; it has a simple and reliable construction; the proposed shock absorber is a watertight construction; no internal sealing elements compatible with the magnetorheological fluid are required; the shock absorber does not have components with relative movement at the level of the control element, reducing frictional forces.

Keywords: elastic element shock absorbers, intelligent fluids, magnetorheological fluids, magnetorheological shock absorbers, piston-cylinder shock absorbers

EFFECT OF ANTI-CORROSION TREATMENT APPLIED TO DIESEL INJECTOR NOZZLES

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Abstract:

Current developments in fuels and emissions regulations are resulting in increasingly severe operating conditions of the injection system of auto-vehicles. Diesel engines are used especially and heavy transportation, since they have very good reliability and generate high torque output. The key diesel technology focuses on how to obtain a very good spray quality. Intensive research work was performed to find the appropriate geometry for injector nozzles, to identify the optimum size of injection holes and to identify the appropriate hydraulic parameters for efficient fuel spray evolution and dispersion.

Although, research results in the domain are encouraging, in practice new and used injectors are often subject to some operating problems, mainly because inside the diesel fuel injector nozzle, accumulation of unwanted materials might occur. External factors, such as climate factors might be responsible for deposition, but also normal aging process can lead to similar consequences.

The main effect of formation of deposits in the injector nozzle holes of diesel cars is the reduction of the fluid flow rates of the fuel injected into the combustion chamber. In this case, the combustion becomes less efficient which leads to the increase of fuel consumption and diminishes the power of the engine.

To control the phenomenon, the scientific literature proposes to use cleaning by special detergents or adding of organic substances to the fuel.

The present paper studies the effect of cleaning a new diesel injector by a fuel detergent. The method consists in using a Scanning Electron Microscope to study the obstruction of the holes by EDX Spectrometry. The results indicate that the best method to apply an anti-corrosion treatment, is to immerse the new diesel injector nozzles in an organic fuel detergent. Other interesting conclusion is that the concentration of the substance and the time must be strictly controlled, because an inappropriate technology might generate new kind of deposits that reverse the efficiency of the method.

Keywords: anti-corrosion treatment, deposit formation, fuel injection, fuel spray

EXPERIMENTAL INVESTIGATION ON ASSEMBLY PROCESS FOR HIGH PRESSURE INJECTION PUMP COMPONENTS

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Abstract:

The sealing gaskets are mechanical systems that seal and fill the gap between two or more jointed surfaces. The gasket have been created and designed to prevent leaks that can occur between surfaces subjected to compression and also, to prevent contamination with dust, mud or other impurities from outside of the system.
The applicability area of these gaskets has increased visibly and they are currently used in a full range of equipment, such as mechanical transmissions, machines for terrain works, equipment production, etc.
The way that seals help to fix and connect the mechanical assemblies, their stress resistance and their durability over the time have been intensively studied by literature (J. A. Speck, M. Paunescu).
The geometry of the seal, the properties and materials from which they are made are adapted according to the conditions at which they must withstand. The temperature, relative movements, vibrations and pressure differences are environmental factors that can influence sealing.
According to the classification of the European Sealing Association, the gaskets are metallic and non-mettalic (also called soft seals) manufactured by the compaction process in which the mixture, a wide variety of fibers (carbon, cellulose, glass and lyts) are compressed between two cylindrical drums. The sealing between the front plate and the housing in an injection high pressure pump is carried out using a gasket, but also by means of screws. The composition of this sealing gasket is a Cr-Si and elastomers mixture. Also, it’s very important that all components that built the high pressure pumps to respect the cleanliness class requirements and to be within the permissible limits because any deviation from the drawing can have negative effects in the assembly and functionality of high pressure pumps.
This paper presents an experimental investigation of the jointing process for high pressure injection pump and the impact of the gasket and screws on the sealing of the pump. The measurements were performed using the Taylor Hobson measurement system to determine the ideal condition of the components, cleanliness tests for particle collection and SEM for particle composition.

Keywords: assembly, gasket, high pressure injection pump, sealing, Taylor Hobson system

FROM STATIC TO KINEMATIC FRICTION COEFFICIENT IN SLIDING PROCESSES

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Abstract:

In the sliding tribological systems operating at low speed and dry conditions, the nonlinear variation of the friction force can be observed with alternative stick and slip processes. Two parameters are important in this stick-slip process: differences between static and kinematic friction coefficient and rigidity of the system. Generally, the static friction coefficient has a higher value than kinematic friction coefficient. Both static and kinematic friction coefficients are not constant values for a pair of materials. So, static friction coefficient is depending on nature of contact materials, roughness and the the sticking time. The kinematic friction coefficient is also depending of materials, roughness and of the sliding speed.
The selection of the real values for static and kinematic friction coefficient is dificult to do, esspecialy for very low contact pressure and low rigidity.
The authors determined experimentally the friction in the sliding tribosystems realized from the cloth for wiping glasses and the glass, using a sliding speed range between 0.02 mm/s and 8mm/s. The tests were realized with a single degree-of-freedom mass-spring system adapted to the UMT-2 Tribometer from the Tribology Laboratory. A mass having 242 grams was sliding on his plane surfaces covered by a cloth for wiping glasses on a glass surface with a linear speed. The contact pressure is of 0.02MPa. The mass is attached by a spring to a support fixed on a Tribometer force sensor. The rigidity of the spring varies between 0.04 and 0.16N/mm. The tangential force developed between contact surfaces is transmited by the spring to the force sensor as Fx. This force is both adherence and friction force and his value raported to the weight of the mass given the static or kinematic friction coefficient. The variation of the force Fx as function of the sliding distance and time is registered on the computer by the special soft of the Tribometer.
The experiments evidenced that dry friction between a cloth for wiping glasses and glass is a complex process depending on the sliding speed and the system rigidity. Important variations for static and kinematic friction coefficient has been obtained.

Keywords: Cloth, kinematic friction coefficient, sliding speed, static friction coefficient, stick-slip, tribometer

MAIN CAUSES OF THE WEAR IN HIGH-PRESSURE PUMPS

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Abstract:

The wear is a very common physical phenomenon in the mechanical area. It can be observed in different mechanisms in different forms. Depending of the role of the mechanism in the assembly or subassembly of which it is part of, wear can happen. Thus, after a short analysis in the automotive area, can be observed that in the fuel high pressure pumps, several forms of wear are encountered. Various levels of the wear can be studied.
In order to have an extensive view on the wear types wich may occur in high pressure pumps, we must first know it’s interface with diesel engine, role in the engine operations, operating mode of the pump, area where it has a functional impact or the influence of the external factors.
In order to analyze the working conditions of the high pressure pump, firstly is necessary to know the operating mode of the diesel engine. Part of diesel engine consists in fuel injection system and pump is part of this system that is the main focus of the study.
The high pressure pump is a mechanical system, with subassemblies and electronically controlled with an electric valve. The role of this valve is to receive the information from the Eloctronic Control Unit in order to be able to deliver the necessary quantity of fuel that reaches in the common rail. The high pressure pump can have multiple iterations based on the engine manufacturer requirements. Nowdays the latests used types of pumps are the ones with roller-shoe transmission mechanism. Another type is the cam-tappet transmission mechanism. The mechanical subassemblies are most likely to encounter wear. Depending of the using period and the operating conditions of the pump, various types of wear can occur, such as adhesion, corrosion, abrasion, fatigue or erosion.
The purpose of this article is to study the existing types of wear wich can occur in high pressure pumps and to perform a comparative analysis regarding driving conditions and main causes of the arising wear.

Keywords: analysis, diesel engine, high pressure pump, main causes, wear

METHODS AND TECHNIQUES FOR VIBROACOUSTIC DIAGNOSTIC OF VEHICLES

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Abstract:

Consistent with industrial development, the human brain, by learning, comes to use the information taken through the auditory system, as well as the receptors of the tactile system, to differentiate sounds and vibrations of the normal state of operation (for instance a complex mechanical system with hydraulic, pneumatic and electrical interactions) from those that predict or attest malfunction state or even failure. Thus, the human brain, as a complex analysis system, by filtering the frequency spectrum of sounds and vibrations, can isolate and identify the area / nature of the defect (a mechanical one, such as shock of worn suspension, partially blocked power steering hose, ventilation of pneumatic braking system blocked or a starter with an altered electrical characteristic due to aging during use). By analogy with this human capability of diagnosing the state of existence / malfunction, we aim to develop a model that leads to the creation of an independent electronic system of vibroacoustic diagnostics used in vehicles. In the automotive industry today, vehicles are not equipped with computers capable of recognizing the source of noise or vibration and providing the most accurate information about an element, subassembly or source assembly. The only electronic unit that has implemented similar function is the engine computer, called PCM (Powertrain Control Module) or ECM (Engine Control Module) and is limited to fault detection (missfire). Our paper intend to streghten this kind of approach, reviewing the methods and techniques of vibroacoustic diagnosis currently used. The paper presents the limitations of these methods, highlighting the experimental vibroacoustic studies from literature, performed on separate elements, without globally analyzing the whole vehicle as a unitary entity. It results the need to implement an independent electronic system useful in prediction and detection of operating status of whole vehicle. In the same time, predicting the failure of a subassembly is strongly linked to the increase of traffic safety.

Keywords: automotive, failure detection, limitative methods, vibroacustic diagnosis

HOVERCRAFTS – AN OVERVIEW
PART III: MAIN COMPONENTS OF AIR CUSHION VEHICLE

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Abstract:

The main purpose of this article is to present the construction features of an air cushion vehicle. It presents aspects about the main components such as hull in which are presented the main exterior constructive forms, types of internal configurations, the shapes of the transfer holes, the influence of the geometric shape of the hull base, the materials most used in its construction and the main characteristics that must fulfil them, flexible skirt in which most of the types encountered over time are presented, the most frequently used materials and the main advantages offered by this component and the other components that are part of both lift system and thrust system. Regarding the presentation of the information, it was attempted to synthesize them through a schematic realization avoiding giving concrete examples of various companies producing such components.

Keywords: air cushion vehicle, flexible skirt, hull, lift system, thrust system

SURVEY ON REGENERATIVE BRAKING IN ELECTRICAL AND HYBRID VEHICLES

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Abstract:

Pollution norms applied to automobiles became more strictly in the last decade, this make car’s manufacturers to find solutions to reduce emissions of their product. The most popular solutions promote electrical and hybrid vehicles (EVs and HEVs). Two aspects of the electrical and hybrid cars are most valuable: efficiency and autonomy. These aspects are related and interdependent. Electrical motor and transmission efficiency, hybrid powertrain configuration, motor control and energy recuperation systems have impact on overall powertrain efficiency. Autonomy is dependent of storage device (battery, supercapacitor, flywheel, compressed fluid, etc.) and energy conversion efficiency.
Recuperation system that can capture about 10-20 % of the energy is represented by the regenerative brakes, it converts loses of kinetic energy of the car during braking in form of heat to electrical or chemical energy. The amount of recovered energy depends on driving styles and driving cycle. Also, there are technical limitation: the battery charge current limit (correlated to the battery charge status having a radical impact on efficiency at high speeds), the impossibility to bring the car in standstill state using only regenerative brakes and the need of precisely wheel torque control to compensate car stability loss.
Regenerative brakes can provide a good increase in car’s autonomy, especially in city driving cycles with high frequency of braking. Besides autonomy increase, the regenerative brakes come with other advantages such as: they reduce friction brakes wear and offer more precisely control of wheel braking torque. A survey in this paper presents basics, uses, types and braking strategies for existing regenerative braking systems with the purpose to identify and detail their limitations. Identifying key factors that have influence on system efficiency allows to elaborate optimizing technics, strategies and algorithms, applied to existing systems in order to develop future concepts that will overcome current limitations.

Keywords: electrical vehicles, energy recuperation, generator, regenerative brakes

CONSTRUCTIVE SOLUTIONS FOR REDUCING THE ENERGY CONSUMED BY THE AUTOMOTIVE HVAC SYSTEM

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Abstract:

The first cars with air conditioning appeared in the early 1940s. Then, 1500 Packard cars received an air conditioning system developed by Nash. In the 60s about 20% of the total production of cars had air conditioning system. Nowadays car manufacturers consider air conditioning as a standard option and try various solutions to increase thermal comfort and road safety. The air conditioning system in the current configurations is a big energy consumer system. The air conditioning compressor along with the cooling system fans and the air distribution system consume quite a lot of engine power, up to 10 kW, which is a real disadvantage for cars with low capacity engines. The loss of power is due to the fact that no matter the number of occupants of the car, the ventilation and air conditioning system process the same amount of air. The work involves the delivery of air conditioning only to the occupied places. Studies show that in 80% of cases, only the driver's seat is occupied. The current trends are for zero pollutant emissions (nitrogen oxides, hydrocarbons, suspended particles), and this means reduced fuel consumption. One of the methods to reduce fuel consumption is to reduce the energy consumed by the air conditioning system. All changes made to reduce the energy consumed will take into account temperature, humidity level, vibration and noise so that human safety and comfort are not affected. Other studies show that the fuel consumption of a car increases by about 35% when using the HVAC system. The purpose of this paper is to review the ways to reduce the energy consumed by the air conditioning system of cars and their importance.

Keywords: air conditioning, comfort, car power, energy, fuel consumption, human

A SIMPLIFIED METHOD FOR DETERMINING THE CENTRIFUGAL EFFECTS IN HIGH SPEED ANGULAR CONTACT BALL BEARINGS

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Abstract:

Simulation of the kinematics and dynamics in a high-speed angular contact ball bearing is a complex problem depending on a lot of parameters as: geometry, lubrication, rotational speed, temperature, guiding cage, material of cage. First complex problem consist in simulation of the effect of centrifugal forces generated by the balls. As result the contact loads between the balls and races and the contact angles undergoes significant changes compared to low speed conditions.

This paper presents a simplified method used to determine the effect of centrifugal forces considering the mechanical interactions between the bearing components which are described as function of 5 degrees of freedom: three deformations and two tilting angles of the inner race in relation to the outer race considered fixed. Both deformations and the tiltings can be determined using mathematical formulas based on the relationship between the external forces and the tilting moments. The geometrical parameters considered for the simplified method are the pich diameter, the curvature radius, the mean radius of the inner and outer raceways, the osculation factors etc.

Considering the mass of the rolling elements and the rotational speeds, the balls exert more pressure on the outer raceway. These contact produces an elastic deflection due to the centrifugal forces. This can be viewed as a rise of the internal clearance which can determine a decrease of the ball and inner race deformations. The rise of the internal clearance generated by the centrifugal effects coupled with the radial clearance of the ball bearing, causes a modification of ball – race contact angles and normal contact loads which can be computed. The influence of the centrifugal forces was included in this model both for contact loads and contact angles. A simulation was carried out on a 7206 angular - contact ball bearing which evidenced the influence of centrifugal effects. According to this method, the centrifugal effects of the balls both on the contact loads and the contact angles were discussed. The cumputed results obtained with this method are near similar to the results obtained by complex numerical programs and can be used for the current engineering applications.

Keywords: angular contact ball bearing, centrifugal forces, high speed ball bearings, numerical simulation, rolling elements

INFLUENCE OF YARN ARCHITECTURE IN SIMULATING THE IMPACT WITH A SPHERE

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Abstract:

Tests to assess impact protection are expensive and numerous. These medels are modeled at the mezo level (multi-fiber yarns, yarns of layers). They facilitate the engineers limit the number and complexity of impact tests. The highest strength and modulus on the direction of the fibers in a composite laminate is produced by the unidirectional orientation of the yarns. Simple unidirectional fabrics are not used in the protection systems for these fabrics do not offer resistance to penetration and the design easily removes the yarns. Oriented bi-axial, tri-axial and, more recently, quadriaxial fabrics (0°, 90°, 45°, -45°) provide penetration protection. If the yarns are oriented efficiently on each layer, then the difference in strength in different directions can be reduced. What can happen with many laminates for which the yarn architecture could leads to increased resistance to impact or early breakage by delamination, in which cracks appeared at the interface between the layers due to high interlamatory stresses and shear stresses cause the layer to separate.
This paper modeled four yarn architectures, in four layers, taking into account the yarn orientation on each layer. There is simulated the impact of a sphere made of lead, the yarns are considered monoblock, even if in the reality, there are bunch of glass fibers. Both materials implied in the impact have bilinear isotropic constitutive models, taken from recent literature for lead is a bilinear. Simulations were run for an impact velocity of 100 m/s. There were analyzed the failure aspects and the residual velocity and acceleration of the projectile in order to estimate if the package has the thickness close to stop the projectile.
The geometric models in this paper are organized in four layers with different orientations, each layer being composed of 20 yarns: unidirectional, arranged (0°, 0°, 0°, 0°), bidirectional, arranged (0°, 90°, 0°, 90°) and quadriaxial, arranged (0°, 90°, 45°, -45°) having 60 mm x 60 mm. The yarn is 3 mm wide and 0.2 mm thick. The ends are rounded with a radius equal to half the height of the wire. The model contains 176203 nodes and 78769 elements (the size of the element being between 0.1 mm and 0.5 mm).

Keywords: bilinear constitutive model, impact model, unidirectional yarn arhitecture

INTELLIGENT DECISIONS FOR SMART HOMES

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Abstract:

Smart homes have been built to simplify our lives. The Internet and, implicitly, artificial intelligence have miraculously developed in recent years. Not to mention the house of the future, because we can build smart homes in the present. At the same time, as the Internet of Things has evolved, the concept of the smart home has evolved from a simple concept to a set of applications and tools that make our lives easier and safer.Currently, automatic safety, temperature, or light intensity comfort systems are implemented, as well as applications for multimedia control.In this article, we will try to define the concept of a smart home and try to go through a few steps that involve certain criteria that differentiate an ordinary house from a smart one. Certain artificial intelligence systems have been implemented in a smart home. Intelligent equipment (electronics, appliances, heating systems, media, security, etc.) can be controlled and controlled by a software program. They can be managed remotely, through the internet and local applications, through touch switches, with touch. All these systems can control certain equipment such as remote healing, coffee prepared when you woke up, lawn irrigation system with a click, door control, opening/closing ventilation system, etc. The internet of things is expected to evolve into super-smart applications that anticipate people's needs.

Keywords: smart homes; intelligent decisions; internet of things; software program; remote equipment

SOME KEY FIGURES:

- 245 papers
- participants from 11 countries (authors and co-authors)
- 40 universities, research and development institutes, companies

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