BOOK OF ABSTRACTS

BOOK OF ABSTRACTS – MY FIRST CONFERENCE 2018

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ORGANIZED BY:

Faculty of Maritime Studies, University of Rijeka

Faculty of Civil Engineering, University of Rijeka

Faculty of Engineering, University of Rijeka

ISBN: 978-953-165-128-8

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Preface

My First Conference is a conference organized primarily for the doctoral students of Faculty of Civil Engineering, Faculty of Engineering and Faculty of Maritime Studies of the University of Rijeka but participants from other institutions are more than welcome to take part.

My First Conference is organized to achieve several goals:

- To provide the feedback to students for their ongoing research. Thus, the presentation should aim at presenting research that is still not finished.
- The doctoral students will have a possibility to improve presentation skills at a scientific conference at no cost.
- To connect young doctoral students from different institutions, and that should result in more interdisciplinary research projects.
- The international conference environment will be simulated by using the English as the conference language.
- Most doctoral students must publicly present research results. This presentation can serve for this purpose if the person in charge of your graduate study approves it.

Second edition of My First Conference was held on Faculty of Maritime Studies in Rijeka, on September 27, 2018. During the conference, 34 papers were presented along with 2 plenary lectures. All papers fit within topics of engineering and technology.

Third edition of My First Conference should take place at Faculty of Civil Engineering in Rijeka, in September 2019. The organizers would like to thank everyone involved for their effort in ensuring the success of this event.

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HPC and Cloud Computing

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Abstract

High Performance Computing (HPC) is used for modelling, simulations, analysis and visualization of data by aggregating large amounts of compute, memory, storage and networking resources in order to solve complex problems in a spectrum of scientific disciplines. HPC is use of supercomputers and clusters with advanced hardware architecture, system software and parallel processing applications to achieve faster results. As of June 2018, the fastest supercomputer on the TOP500 list [1], which ranks the 500 most powerful computer systems in the world, is the Summit, with a LINPACK benchmark score of 122.3 PFLOPS (quadrillions of floating point operations per second).
Most research institutes and universities grant free time, on their on-premise HPC resources, to scientists based on their research proposal. After the proposal is reviewed and approved by a panel of experts, scientists have to submit their jobs into a batch queue and wait for compute resources to become available. Writing a good proposal and waiting for compute resources takes time. Another solution is to use cloud computing [2] platforms because scientists can rapidly provision and access compute resources, configure them, instantly add and release resources, and therefore can get results much faster. Although most commercial clouds have been designed for web and business applications they can host loosely coupled scientific and workflow applications which frequently require large amounts of computation with modest data requirements and infrequent communication among tasks. In recent years, specialized HPC cloud providers and even the major public cloud providers [3] offer low latency and high bandwidth interconnections which are essential for communication intensive tightly coupled scientific applications to achieve best performance.

Keywords

HPC, *supercomputers, HPC clusters, Cloud Computing*, *HPC Cloud*

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The OFDM Modulation and the VHF Maritime Mobile Band

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Maritime terrestrial communication systems have not been practically changed over the last two decades since the establishment of the Global Maritime Distress and Safety System (GMDSS). Amongst these systems, the analogue Very High Frequency (VHF) radiotelephony is the most common form of communication between ships at short distances, as well as between ships and land objects in coastal and port areas. Since there are only two digital systems in the VHF maritime mobile band, VHF Digital Selective Calling (DSC) and the Automatic Identification System (AIS), various researches and the development of new solutions for data transmission have been initialized. One of the digital communication technologies already used in land communications is the OFDM modulation. This modulation technique uses multiple parallel and separately modulated carrier waves, the subcarriers, within a specific communication channel as opposed to conventional communication systems which use a single modulated carrier wave. Therefore, a systematic analysis of the maritime OFDM based VHF communication system for data transmission, through the development of analytical and simulation models of its physical layer, is presented. Additionally, the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) has developed a technological concept, the VHF Data Exchange System (VDES), to solve congestion of AIS channels, supporting the International Maritime Organization's (IMO) strategy implementation plan for e-navigation and the modernization of the GMDSS with essential digital communications. The VDES will have a very important role in improving communications to enhance maritime capabilities and supporting the strategy implementation plan for e-navigation.

Design of a 3D printed rehabilitation device and testing of its material properties

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Abstract

With the aim of developing an innovative full-arm rehabilitation mechatronics device, an inverse kinematics approach is followed in this work. By using the CATIA V5 software environment, the challenge of reproducing the motion of actual human joints is thus tackled by employing seven actuated mechanical joints [1]. The conceived device is based on 3D printing components so that virtually all the passive components will be produced in the ABS thermoplastic polymer. In fact, not only does this choice allow to attain the needed low-weight and versatility of the developed device, but also our team has at its disposal, at the premises of the Centre for Micro- and Nanosciences and Technologies of the University of Rijeka, Croatia, a suitable Stratasys Fortus 250 mc 3D printer based on Fused Deposition Modelling (FDM) technology [2]. Material properties of the ABS material are hence thoroughly studied according to proper international standards [3] so as to optimize the 3D printing process. Based on functional considerations, as well as on considerations related to needed forces, torques, velocities and motion ranges, the actuating and sensing components of the device are, in turn, chosen among commercially available ones. In parallel, the development of a real-time control system, based on the National Instruments MyRIO 1900 hardware and the LabVIEW software, including the robotics module based on Denavit-Hartenberg algorithms, is also carried on. In further work, electromyography sensors will also be integrated into system's architecture to allow an active control of the torque for each joint. All of this should results in an advanced technological solution for the rehabilitation of patients for the Croatian hospitals.

Keywords

Full-arm rehabilitation, motion kinematics, DOFs

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Ice Contact Simulation on Marine Structures

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Abstract

When designing marine structures, it is very important to determine the maximal load that could affect the structure. For polar regions navigation, ice loading should be taken as the worst case of possible loads. Safety of the vessel and economic viability are one of the biggest concerns. First of all, it is important to design and build a technically optimal structure. Since ice is an extraordinary material, inhomogeneous and anisotropic, it is very difficult to determine precisely its characteristics and influence on other structures. The ice loading phenomena has been particularly important for the offshore structures so far. This subject has become very interesting worldwide over the last few years, and investigation of ice impact on floating structures received increased attention due to the increasing demand for navigating in polar regions. In addition to the work constructions for the purpose of exploitation, luxury vessels with polar class notation are increasingly being built. In the offshore marine environment, only two fundamental different ice types exists, sea ice and land based glacier ice. This paper presents a nonlinear finite element simulation of sea ice - steel structure interaction on a simplified geometry, and a comparison of two general-purpose finite element software. First objective is to obtain the influence of sea ice on the steel structure with numerical calculation using the FEA software LS-DYNA. Additionally, a comparison is made between the obtained results and those from available literature.

Keywords

Marine structures, Ice loads, Nonlinear FEA, LS-DYNA

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Flying Start Routine for Induction Motor in Scalar Control Mode

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Abstract

This study presents control routine for starting a deenergized rotating induction machine (IM), commonly known as flying start function. This routine is needed in industry applications where inverter controls the IM with large inertia load, after power interruption. The idea is to determine the speed of the IM so that correct value of voltage and frequency can be applied to the machine to magnetiz it. After period of magnetization, motor can be accelerated to predetermind setpoint. The proposed routine was simulated, and later on tested on 11 kW IM.

Proposed method is implemented in dq reference frame. Idea is to determine the rotor speed by frequency search run [1]. After power interruption is over and IM is still rotating because of high intertia load, inverter starts to conduct speed search. Speed search is conducted by rapidly changing the inverter output frequency from rated value to zero. During speed search voltage is kept constant. During initial period IM starts to draw the active component of the current from the inverter. As frequency is ramped down, at some point frequency crosses the frequency of the rotor. This crossover is detected as change in direction of active current component. At that point when crossover is detected, the frequency of the rotor is found. After that the voltage is ramp up to magnetiz the IM. Proposed method ensures that during flying start routine large overcurrents don't occur.

Keywords

Induction machine, Inverter, Flying start, Power interruption

References

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Methanol and Ethanol as ship fuel

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Abstract

The purpose of this research is to draw conclusions on the cost-effectiveness of using Methanol and Ethanol as a fuel on board with dual fuel diesel-powered propulsion, both from the aspect of the fuel cheaper than the classic fuel, as well as from the ecological aspect.

Shipbuilding has always been a business where profit is in the first place. In the last few years there have been several rebounds of energy prices that have had a significant effect on both the freight rates and the volume of freight transported. To reduce the dependence on fuel price jumps, ship owners should look into installation of dual fuel engines that could be powered by classic heavy fuel oil as well as some other fuel (natural gas, methanol, ethanol). In this way, these shipping companies have alternative fuel whose price does not necessarily increase with the price of liquid fuel, and whose price in the past has not changed as much as the price of liquid fuel. This gives them the opportunity to be more competitive in certain situations, and they can plan better the company's future in aspect of the multiple choice of fuel options.

The second aspect is the ecological one, which is also of utmost importance. With the enforcement of Annex VI to the Marpol Convention permitted quantities of harmful gases in the exhaust are drastically reduced.

Keywords

Ship fuel, Methanol, Ethanol, alternative fuel

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Advanced combined inverse techniques for the identification of material parameters

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Abstract

The recent advancement of science and engineering has pushed the integration of multidisciplinary discoveries into research of innovative composite and hybrid materials, which brought to attention the necessity for investigation of their performance combining both experimental and numerical studies. The key issue in experimental solid mechanics is the identification of the parameters governing the constitutive equations. In cases where constitutive equations depend on a large number of unknowns, scarce linking assumptions between the unknown parameters and those determinable from mechanical tests result in the necessity to perform a larger number of experiments for accurate parameter identification.

Few techniques to overcome these limitations have already been proposed. The virtual fields method [1] was developed on the basis of full-field non-contact measurements, while iFEM [2] combines experimental and numerical analysis using an inverse finite element method. Moreover, constitutive parameters can be extracted by combining finite element method with advanced optimization tools such as genetic algorithms (GA) and artificial neural networks (ANN) [3].

Combining these advanced methods for the material model calibration of materials such as printed composites provides a base for accurate material behaviour modelling of innovative materials.

Keywords

constitutive model, material parameter identification, finite element model updating

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Experimental characterisation of thermoelectric generators for wearable technology applications

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Abstract

The rapid development is shrinking the size of electronic devices to the level that they can be worn on the body. Such devices, also known as wearables, usually comprise sensors, communication devices and e.g. medical diagnostic devices. Wearable devices require a wearable power source as well. Apart from the conventional battery, the power needed for such devices can be generated on the body itself, i.e., it can reply on energy harvesting principles. A commonly used environmental energy source that can be efficiently harvested and used to power wearable technology devices is waste heat [1, 2]. In fact, thermal energy is emanated by multiple sources such as machines (combustion, friction), pipes (hot medium), radioactive materials, but also from human and animal bodies due to metabolism. The latter heat sources are particularly interesting for wearable technologies' applications. To convert waste heat into electrical energy, thermoelectric generators (TEGs) are hence commonly used. These devices use the Seebeck effect to generate electrical current from the available heat flow [1, 2].

An experimental set-up is developed in this work to characterise three types of TEG devices. In the devised set-up, heat is applied on the hot side of the TEGs and dissipated from their cold side via a heatsink. The used range of temperatures is thereby selected to cover the conditions found in actual energy harvesting applications. The temperatures on both sides of the TEGs are measured with thermocouples and via thermal imaging. The experiments are thus conducted for various load resistances. The measurement of the attained voltages is enabled by employing a LabView® virtual instrument (VI) that allows also calculating the respective electrical currents, the resulting powers and the energy conversion efficiencies. The obtained results will be used to establish the optimal working conditions of the analysed TEGs in the foreseen wearable applications.

Keywords

Energy harvesting, thermoelectric generator, Seebeck effect, wearable technology

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Finite element analysis of micropolar boundary value problems

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Abstract

Most of the materials are heterogeneous in general, composed of a specific microstructure which can be determined at a scale particular for the material itself. However, when that scale is significant compared to the overall scale, representation based on the classical (Cauchy) theory fails. In such problems a size effect is experimentally observed, showing an increased stiffness of smaller specimens. In order to capture this phenomenon, a number of alternative continuum theories have been developed, including the micropolar (Cosserats') theory analysed here. In this theory, in addition to the displacement field, there also exists an independent microrotation field, representing the local rotation of a material point. Such a theoretical setting allows us to take into account the intrinsic material length-scale but, in order to completely describe such a material, six material parameters are needed, in contrast to only two in the classical theory. Since an unified experimental procedure for their determination is still not developed, a comprehensive numerical analysis of significant boundary value problems could lead to better understanding and developing of more precise experimental procedures. Due to that, we present a detailed numerical analysis of three-dimensional micropolar problems using the finite-element method in the geometrically linear and non-linear regime. Some of the problems analysed are shown to be of great importance for the modest, but existing experimental verification of micropolar parameters.

Keywords

Micropolar theory, finite element method, incompatible modes, geometrical nonlinearity

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Warka water – a new concept for collecting of a drinkable water

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Abstract

The aim and objective of this paper is to appraise the ability of the Warka water concept to collect a drinkable water from horizontal and vertical types of the precipitation. Warka water is a concept that was designed by Italian designer Arturio Vittori and Swiss architect Andreas Vogler in order to provide a drinkable water for people in Africa [1]. According to their design idea, in Laboratory for hydraulic engineering at the Faculty of Civil Engineering, the scale model of the one type of the design called Warka tower is built [2]. The model is installed outside in the vicinity of the automatic meteorological station (Vantage Pro2 manufactured by Davis instruments, USA) at Kampus Trsat in Rijeka, Croatia. In order to analyse the Warka water concept ability, meteorological variables and the amount of collected water by Warka tower are measured. Meteorological variables are collected in a time step of the $\Delta t=5$ *minutes* for a period of two months. Analyses have shown a very good ability of the Warka tower to collect every type of usable precipitation in order to maximise the amount of the collected water.

Keywords

Warka water, precipitation, drinkable water

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Automatic Radius Bones Fracture Detection using Machine Learning

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Abstract

Radius bone fracture is one of the most common occurring injury in humans . The usual procedure of detecting radius bone fracture is by examination of its X-ray image by radiologist. Besides denoising and brightness and contrast adjustments, the examination process of an X-ray image is not automated or enhanced by any software assistance. The aim of this work is to create a fully automated fracture detection software for calculating probability of existence of radial bone fracture on X-ray images. The preprocessing of an X-ray image is done by edge detection of the radius bone with contour generation. Method used for edge detection and contour generation is adaptive thresholding [1]. Proposed approach for detecting fracture uses the difference between the estimated unbroken radius bone line and the real contour of a bone. The estimation of the unbroken bone is calculated using a combined bootstrap method with polynomial regression of contour points [2]. After calculating the differences, the error threshold is set dividing fractured bone images from non-fractured ones. Also, this approach enables detecting the exact area of the fracture. Afterwards, this method is evaluated based on precision its achieves on detecting fractures on previously unseen X-ray images.

Keywords

Radius bone fracture, X-ray, Polynomial r*egression, Machine learning*

References

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EDIFACT as a basis for data exchange in maritime transport

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Abstract

Data exchange, or its unhindered flow, is a key to success of any company, including companies that operate within the maritime transport sector. Even though some companies and organizations still use obsolete methods of paper documents, an increasing number of them are turning to electronic data exchange, mainly EDIFACT and ebXML. EDIFACT consists of internationally agreed standards, and its intensive introduction into maritime transport sector, mainly seaports has begun to speed up the process of electronic data exchange and reduce errors. Unfortunately, paper document exchange is still maintained at less developed sea ports. Without automation or electronic exchange, such processes can be time consuming, which ultimately affects the performance of commercial and administrative operations. After the upgrade in 2017, EDIFACT has the potential to become the leading standard of electronic data exchange, since it can significantly boost communication and efficiency within the maritime transport sector.

Keywords

EDIFACT, electronic data exchange, EDI

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Selective Harmonic Elimination in Closed Loop – Implementation on Medium-Voltage 3-level NPC Active Front End Converter

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Abstract

Today many industry and renewable source applications require use of AC/DC PWM converters for connecting DC voltage sources with supply network. As demands for the quality of electrical energy exchanged between converter and grid increase, AC/DC converters are required to work with high power factor and with low harmonic distortion. Furthermore, increasing power demands require connection at medium-voltage (MV) level which implies usage of multilevel AC/DC converters. Multilevel converters are required to operate with lower switching frequency due to the high switching loses of the semiconductor devices, so well-known methods for harmonic elimination are used in that case [1]. Limited switching frequency causes higher current distortion compared to cases where high-frequency modulation techniques are used, so closed loop control with current controllers can become unstable.

In this study implementation of a control structure which combines selective harmonic elimination with closed loop control in synchronous dq reference frame is discussed. Control structure is implemented in industry application where 3-level NPC converter is used as Active Front End (AFE) for a MV motor drive system. In such configuration role of AFE is to control DC link voltage during various dynamic and static states. Control of active and reactive power is achieved through the control of d (Active component) and q-axis (Reactive component) current. Therefore, implemented control structure is composed of inner current control loops, so method for harmonic compensation in current feedback signal is used, as proposed in [2].

Keywords

Selective harmonic elimination, PWM, NPC converter, Active front end

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Numerical analysis of heat and mass transfer in an indirect evaporative heat exchanger

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Abstract

Evaporation is a phenomenon occurring at the surface of a liquid as it turns into gaseous state in the presence of another substance (air). When a molecule on the surface of liquid absorbs enough energy to surpass vapor pressure of the surrounding air, it will leave the liquid and be absorbed into the gas in the form of vapor. In the absence of external heat flux, the energy required to turn liquid into vapor is taken from the surrounding air, causing a decrease in its temperature. This form of cooling is called evaporative cooling and has been the subject of investigation [1,2] due to its simplicity and affordability compared to conventional air-conditioning. Evaporative coolers can be direct (DEC); using the wet channel air, i.e. air in direct contact with evaporating water as the product air, or indirect (IEC); in which the dry channel (primary) air, cooled by wet channel (secondary) air, is used for cooling. Even though DECs provide better evaporative cooling, it also increases humidity of the product air, which can cause thermal discomfort, so IECs are more commonly used. This paper presents a two-dimensional steady state numerical analysis of heat and mass transfer inside a flat plate indirect evaporative heat exchanger. Wet and dry air are separated by a solid wall, with thin water film covering secondary side of the wall. Using the finite volume method, several cases with different air saturation levels are investigated, and model is validated against empirical correlations for moisture content at air-water interface, and good agreement is observed.

Keywords

Evaporative cooling, heat and mass transfer, numerical analysis, finite volume method

Acknowledgement: This work has been fully supported by Croatian Science Foundation under the project HEXENER (IP-2016-06-4095).

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Analysis of influence of geometrical and working parameters on temperature stratification in heat storage tanks

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Abstract

For the purpose of storing and using expensive heat energy, temperature stratification has been applied in many applications. The reason for the wide application lies in minimizing the effect of mixing between the warmer and colder fluid layers. The heat stratification of water in the heat tank is caused by the difference in the density between the hot and cold water. Because of this difference in density, the colder water stays at the bottom of the tank while the hot water stays at the top of the tank. The area where the hot water separates from the cold water is called a thermocline. Wahiba Yaïci et al. [1] investigated the influence of shape and working parameters on the temperature stratification quality in the tank. The results show that increasing the tanks height/diameter aspect ratio, decreasing inlet/outlet flow rates and moving the inlet/outlet to the outer extremities of the tank all result in increasing levels of thermal stratification. In this paper series of numerical analysis of the two-dimensional field temperature and velocity in vertical cylindrical tanks were performed to analyze the influence of fundamental parameters, shape (height and width ratio), diffuser distance from the top of the tank, temperature difference between hot and cold water on temperature separation. By developing a two-dimensional non-stationary numerical model, equations of mass conservation, movement and energy quantification are resolved by the final volume method. Fluid flow inside the tank is observed as non-stationary and laminar with variable properties. In order to verify the accuracy of the numerical model, the simulation of tank charging was carried out and the results obtained were very much in line with the measurements obtained at the plant which are given in the literature [2]. The results of the analysis have shown that the effect of the difference in temperature between the warmer and colder water is negligible. The impact of the diffuser distance from the top of the tank is significant. With increasing the distance, a degree of temperature stratification decreases. The influence of the shape of the tank also has a significant role in the temperature stratification. The results have shown that the temperature stratification increases as the tank height increases and the diameter decreases.

Keywords

temperature stratification, heat storage tank, thermocline, final volume method

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Transport Problems of Goods Flow – Construction and Integration of Distribution Center in the City of Rijeka

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1 Abstract

A continuous growth and development of cities are increasingly burdening the cities road network. Nowadays when the mentioned topic has developed and has become a serious problem, the intensity of orienting knowledge into the methods and processes of optimization has become essential for the normal functioning of city centers. The traffic in city centers takes place in such a way that each carrier individually determines the time and routes on which he will perform his primary activity. Therefore, it is necessary to organize the delivery of goods to urban centers based on the implementation of the rules in order to increase the productivity and efficiency of the logistic service providers, improve service to end users, reduce the number of deliveries per store and improve the entire city center traffic system. One of the ways of optimizing delivery to city centers is the integration and construction of a distribution center. Distribution centers represent the central point in the transport chain, which would increase the utilization of cargo space for delivery vehicles and result in a significant reduction of the number of delivery vehicles in city centers. Based on the data collected by the survey questionnaires, the location of the distribution center was defined with several scenarios, among which by using the transport solution handling methods, was chosen the one that mostly adapts to the presented criteria.

2 Keywords

Distribution center, *city centers*, delivery,

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Time-frequency representations of induction machine stator current

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Abstract

Induction machines have a dominant role in industrial applications nowadays, due to their robustness, reliability, low cost and efficiency [1]. Therefore, the monitoring of their conditions is required. The most cost effective approach might be the monitoring of the stator current, whose measurements are usually already incorporated into the control systems. During the transient states of the machine, stator current may be considered as a nonstationary signal, because its frequency content varies with time. Time-frequency distributions (TFDs) [2] represent valuable tools for the analysis and processing of nonstationary signals. They provide a simultaneous representation in the both time and frequency domain [2]. Therefore, TFDs are convenient to keep track of signal frequency variation with time [2]. The function that provides signal frequency at each time instance is called the instantaneous frequency (IF) [2]. This study provides an analysis of TFDs, focusing on their possible application in the monitoring of the induction machine stator current frequency during the transient and steady state, in the case of the measured signal being heavily corrupted by noise. The nonstationary current signal was obtained by experimental measurements conducted during the acceleration of induction machine, with low signal-to-noise ratio. After signal preprocessing, six different TFDs were applied and examined. Finally, IF was estimated by the algorithm exploiting peak values of the computed TFDs. The spectrogram offered a good attenuation of interferences, but a poor resolution. The Wigner-Ville distribution was discarded as unsuitable for this application due to significant interferences. The smoothed-pseudo Wigner-Ville, the Choi-Williams and the Born-Jordan distributions gave satisfactory results, with the Zhao-Atlas-Marks distribution suggested as the most suitable choice for this application as it provided the best balance between time and frequency resolution and noise and interferences reduction. Considered distributions, except the Wigner-Ville's, offered practically identical IF estimations, in accordance to the expected ones.

Keywords

Time-frequency distributions, Instantaneous frequency, Nonstationary signals, Induction machine, Analytic signal

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Numerical analysis of trashrack bar cross section influence on head losses

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Abstract

Main purpose of trashracks installed at the intake of hydroelectric power plants is to prevent debris and fish from entering turbine space. Growing ecological concern and legislations prescribe that fish mortality and injuries caused by entrapment in hydroelectric power plants should be reduced. Since trashracks cause inevitable head loss, optimal configuration should be chosen to provide maximum blockage for fish species with minimum head losses. Many experiments were conducted where bar spacing, trash rack and bar inclination were investigated. In these experiments only two types of profiles were investigated - rectangular and aerodynamic profiles.

In this work numerical analysis of fluid flow around bars was compared to the existing experimental results provided in literature to validate numerical simulation. After validation, cross-section of bars was changed to examine influence of bar cross section on head losses.

Keywords

Trashrack, head-loss, fish mortality, numerical analysis

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In-memory Distributed service for searching metadata of radiology images

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Abstract

Radiology images contain a lot of useful information that can be used for training medical students. In addition, this data can be very useful for building predictive models which can be used for automated or computer-assisted diagnosis. The main standard for storing radiology images is Digital Imaging and Communications in Medicine (DICOM). This standard connects image metadata to its pixel data, enabling integration of multiple various medical imaging devices such as Picture Archiving and Communication Systems (PACS) from multiple manufacturers. Since the data acquisition process is prone to noise, due to either technical circumstances or human factor, this data can contain false information which can make radiology images more difficult to search and analyse. Furthermore, there exists a need for quick querying of DICOM metadata because the underlying relational database, containing basic information about images, does not contain all available information. Finally, it is important to note that searching DICOM files on permanent storage is slow due to hardware limitations of this technology. In this work, an in-memory scalable distributed service for fast searching of DICOM metadata is proposed. Solution is based on Apache Spark and Apache Ignite technologies with REST interface for making queries. Proposed solution was tested on a large set of radiology images from Clincal Hospital Centre Rijeka PACS. Multiple queries were tested varying from searching one to multiple fields in DICOM metadata. Based on testing results, our system exhibited a significant increase in performance when compared to classical disk search of raw DICOM files.

Keywords

DICOM, distributed systems, in-memory, medical imaging

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Removal of eye blink artifacts from EEG signal

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Abstract

Electroencephalography or EEG is well known noninvasive method to record electrical brain activity with electrodes placed along the scalp. By processing and analyzing the measurements made by EEG acquisition, we can tell a lot about human brain activities and even built a brain computer interface(BCI). One of the challenging tasks by study of EEG signals, is the removal of electrical signals that are not related to any brain electrical activity. This electrical signals commonly known as artifacts, are mainly a product of a muscle activity like eye or neck moving, and are characteristic for large signal amplitudes that are up to 10 times higher than amplitudes of EEG signal. Such high amplitudes are covering the real electrical activity of brain and in terms of signal processing can be represented as noise.

In this paper an artifact removing algorithm for the rejection of EEG signals corresponding to eye blink artifacts is presented. Algorithm is based on ADJUST[1] artifact removing tool, which uses ICA (independent component analysis) for calculation of independent components. For every independent component returned by ICA, temporal-spatial features are calculated. Based on the feature values every independent component is classified as artifact or non-artifact, where in next step the components associated with artifact are removed from EEG signal.

Keywords

EEG, eye blink *artifacts*, signal processing, ICA, *ADJUST*

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Sea Environment Effect on High Tensile Steel AH36

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Abstract

Marine environment behaves as electrolyte, thus having impact on shipbuilding metals causing corrosion and fouling which increases the ships resistance in navigation. Effects of corrosion cause damage of a steel which can reduce its ability of safety working load, leading to breakdown whereby endangering ships safety at sea. Corrosion is a chemical process of material wear and tear; chemical reaction takes place between metal and environment where the product of the reaction is rust. In this research effort was made to determine the effects of marine environment on the shipbuilding steel AH36 characteristics. Specimens of the steel were welded with MIG (Metal Inert Gas) and MMA (Manual Metal Arc) welding techniques and were exposed to marine environment for a period of three months. In addition, different tests are done to determine changes that have occurred in weld and material due to exposure to marine environment. One mode of determining changes is done by measuring the weight residuals of specimens, other tests used in research are: radiographic and penetrant testing to determine weld quality and micro analysis of material structure. Results from the tests are compared to the results of identical specimens exposed to fresh water and air. Results of each specimen are compared before and after being exposed to different environment, besides that into account was taken quality of weld made by amateur and professional welders. Research shows quality deterioration of shipbuilding steels in case when the material is not covered with protection layer of paint or any other protection against corrosion and at the end it gives a comparison between different environment factors which have influence on corrosion of metal.

Keywords

Shipbuilding steel, AH36, corrosion, welding, sea environment

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FATIGUE ANALYSIS OF A COIL SPRING UNDER STOCHASTICALLY MODELLED DYNAMIC LOADING

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Abstract

This paper presents results of a numerical research that employed stochastic variable dynamic loading ona coil spring of specific type of motor vehicle. According to ISO 8608 standard, different road roughness profiles are classified in groups from A to H (minor to high roughness) which is described stochastically by power spectral density (PSD). Finite element (FE) model of the spring coil was subjected to road class D roughness. Quarter car model (QCM) was used for assessment of vehicle behavior under dynamic loading. Shear stresses were determined using structural transient FE analysis. A Matlab numerical routine was used to perform rainflow counting and Miner's cumulative damage assessment in accordance to Goodman failure criterion. Obtained results give prediction of failure due to coil spring material fatigue after finite number of cycles i.e. time period. Results can be used in further design optimization of motor vehicle coil springs.

Keywords

coil spring, stochastic variable loading, fatigue, failure

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Inverse Modelling for Material Parameters Identification of Soft Tissues

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Abstract

Soft tissue behaviour modelling has become a significant area of interest of numerous researchers in technical materials. Since soft tissues are nonlinear elastic materials that can undergo large deformations when subjected to loading, it is suitable to consider application of hyperelastic material models, like Yeoh, Mooney-Rivlin, Odgen, neo-Hookean, Weronda-Vestmann, Humphrey, Arruda-Boyce, Gent and polynomial models. Models differ by the number of constants which have to be identified as meaningful material parameters. Some material models have few variants in order to capture more or less phenomena in material, which correspond to the number of parameters. Also, there are complex material models which are comprised from several components which originate from simpler models. It is not only crucial to select appropriate model, but also the calibration of the chosen model must be performed. Excluding very simple models, like those with one, like neo-Hookean model, or two, like Mooney and the second order Yeoh model, parameters, calibration of the models is not a trivial task and adequate optimization procedures need to be applied, especially when working with complex material models. The solution for the mentioned calibration is in the application of genetic algorithm with specially developed operators. The algorithm has proved itself to be a suitable tool for automatization of the calibration process and is applicable within the scope of the widely available numerical computing environments. Effective genetic algorithm enables the achievement of appropriate values of parameters for the chosen models and, consequently, the more accurate modelling of the soft tissue behaviour.

Keywords

Soft tissuees, biomaterials, inverse modelling, parameter identification, genetic algorithm

Leadership styles determines proactivity of employees – instance on board

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Abstract

A crisis event could be uncommon, sudden or rare incidence which is very disturbing and stressful to many people. Stressor as an objective event causes stress in an individual, but the level of stress depends indeed of evaluation and interpretation of situation by the individual himself. There is presence of threat, feeling of loss of persons, belongings, things, vessel in overall or potential hazard for the environment. The affected individuals feel that they cannot fight down a crisis event with common mechanisms of dealing. Leadership styles of managers to a large degree determines proactivity of employees in the crisis events, and we differentiate transactional, transformational and transcendental leadership. Historically, on board, transactional leadership had been dominated over the years. Nowadays, there is more accent on transformation, or even transcendental leadership. Even though, on board, crisis events, situations and emergencies has been foreseen with the different types of check-lists in order to increase situational awareness among employees. There is also different and various trainings and drills scenario which covers diverse crisis events wherefore affected employee react trained and routinely. Familiarisation with foreseen situation, and "know what to do" in the real one, decreases level of stress among individuals, and helps to react much more calmer and focused.

Keywords

crisis event, stressor, leadership styles, check-lists

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Marine Energy Potential in Northern Adriatic with Special Consideration of Waters around Istrian Peninsula

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Abstract

The increasing world's population and demand for energy in the developing countries pose a significant challenge in enabling the economic and population growth while preserving the nature and limiting human impact on the climate change. Developed countries have recognized this problem by signing the United Nations Framework Convention on Climate Change agreement which obliges them to reduce their greenhouse gases emissions and undertake appropriate measures to limit the global temperature rise. Being a European Union (EU) member state, Croatia has to reach 20% share of renewables in the total energy consumption by 2020. The potential of marine energy as a vast source of renewable energy has been officially recognized by the EU, and Croatia, having a relatively large coastline and territorial waters, should investigate this potential. Therefore, the purpose of this paper is to review the literature containing the relevant oceanographic data and to investigate and estimate the marine energy potential mainly in the Croatian part of Northern Adriatic, with an emphasis on the waters surrounding Istrian peninsula. The marine energy potential is estimated on the basis of a simplified mathematical approach by considering the current BE technology possibilities. The results are compared with the current minimum requirements for commercial application of BE technology and potential suitable locations and possible restrictions are discussed.

Keywords

Renewable energy, marine energy, blue energy, blue energy potential, Istrian peninsula

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Analysis of the Grid Structures Isotropy

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Abstract

Throughout the past century, different approaches have been used in order to create widely applicable lightweight structures. Aluminium isogrid is the oldest and most well-known example of a grid stiffened plate, but due to high production costs, it was used primarily in aerospace industry. Thanks to engineering advancements, cheap and effective alternatives in the form of sandwich panels and composite grid stiffened structures have started emerging. Consequently, lightweight construction elements have become a common occurrence in a variety of industries, including civil engineering. Despite the increasing interest in grid stiffeners, grid design has remained relatively stagnant; stiffeners are formed through repetition of a basic cell, which tends to have a triangular or rectangular shape. This article therefore proposes an alternative approach to stiffener grid design. Heat Equation Driven Area Coverage (HEDAC) is employed to achieve set coverage density, with respects to gradient of potential field. Trajectories generated by HEDAC model in conjunction with multi-agent coverage algorithm can be interpreted as two-dimensional nonuniform grids with fixed cross-section, and depending on the resulting properties, used as a valid alternative in grid stiffened structures or as a standalone structural element for specific load cases. Validity of this assumption is evaluated by comparing the stiffness of multiple types of grid structures in various orientations and subjected to different loads. The comparison is based on nonlinear finite element analysis using linear beam elements as underlying model for grid segments.

Keywords

Nonuniform grid, grid structures, isotropy, area coverage algorithm

High Impedance Fault

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Abstract

Today one of the major concerns of power distribution networks are High Impedance Faults (HIF). HIF mainly occur if high tree branches touch the conductors or if the conductors break and touch the ground. During these types of fault the generated currents magnitude is not high enough to trip overcurrent relays. In fact, the fault current magnitude is close to the normal load current due to the high grounding impedance of the surroundings. It is estimated that between 5% and 10% of the distribution faults are HIFs [1], however there is no statistic about these faults since only the faults that result in relay alarm or trip are reported. Most faults on high voltage endanger electrical equipment, while HIF highly endanger human safety. High flammability of the surroundings and the evolution of the arc pose a dangerous fire hazard. In non-flammable surroundings, HIF endanger crewmen or members of the public who can easily establish contact with the exposed conductor [2].

There are different HIF detection techniques, which were reviewed by Ghaderi in 2017 [3], since the HIF does not induce voltage or current variations usually used for fault detection. However, if proper signal processing is performed, including voltage, current and magnetic field intensity, notable variations can be identified.

This research will be focused on HIF detection using Phasor Measurement Units (PMU). The reason for focusing on this detection technique is the use of PMUs in the Croatian Power System, like in most European power systems. Using provided data part of the Croatian Power System will be modeled in NEPLAN and a HIF and HIF detection will be simulated.

Keywords

High Impedance Fault, Fault Detection, Phasor Measurement Units, HIF Model, NEPLAN

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Kriging and 3D geological modelling based on boreholes data

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Abstract

To obtain a digital model of a certain geological formation, which can be used for the simulation of e.g. transport within groundwater basins or for the modelling irrigation systems, a program code is developed using FORTRAN 90 to reconstruct the geological structures from the given boreholes data. The interpolation procedure is initialized by Delaunay triangulation which is used to construct a series of triangles with boreholes at the triangle vertices. After that, a series of criteria is developed for horizontal interpolation of geological layers between the selected three boreholes [1]. For this purpose, an analytical geometry is used to retrieve the geometry of each layer present in the selected boreholes. By unifying the geometrical description over all formed triangles, a geological model is approximated. After that, a Kriging procedure [2] is used to include the statistical nature of relevant hydraulic parameters such as spatial distribution of hydraulic conductivities or specific storage coefficient. Moreover, the Kriging procedure is performed individually for each geological layer. As a result, a real approximation of the geological structure is obtained. The formed geological model will be used for a program code which is now under development and specialized for the analysis of surface water and ground water interaction.

Keywords

geological model, boreholes data, Kriging, Delaunay triangulation, FORTRAN

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AIS data usage for vessel movement analysis

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Abstract

Automatic Identification System (AIS) is an automatic data exchange system, mandatory under requirements of International Convention for the Safety of Life at Sea (SOLAS). Since implementation in early 2000s it has significantly improved safe and efficient navigation of ships, environmental protection, traffic and coastal monitoring.
It is also used by non-mandatory vessels, coastal stations or as an element of other systems or devices.
AIS data, which includes vessel's static, dynamic and voyage information, has been used in various areas of economic, environmental and transportation research such as vessel exhaust emission estimations, maritime traffic density and trade pattern analysis, vessel route extraction and movement anomalies detection.
The ever-increasing availability of data has improved possibilities for extensive research, analysis and prediction, but not without challenges regarding management and interpretation of such big data volumes.
Methods of data collection, processing and analysis are presented for vessel movement and route extraction.

Keywords

Automatic Identification System, AIS, vessel movement, route extraction,

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EEG data processing in neurofeedback

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Abstract

EEG signals are the signatures of neural activities [1]. They are captured by multiple-electrode EEG machines either from inside the brain, over the cortex under the skull, or certain locations over the scalp, and can be recorded in different formats. The signals are normally presented in the time domain, but many new EEG machines are capable of applying simple signal processing tools such as the Fourier transform to perform frequency analysis and equipped with some imaging tools to visualize EEG topographies (maps of the brain activities in the spatial domain) [1]. Neurofeedback (NFB), also called neurotherapy or neurobiofeedback, is a type of biofeedback that uses real-time displays of brain activity—most commonly electroencephalography (EEG), to teach self-regulation of brain function. Typically, sensors are placed on the scalp to measure activity, with measurements displayed using video displays or sound. Neurofeedback can be used to cure the disorder but also to improve athletes' performance. In this paper, I have extracted the statistical features from observed EEG signal such as mean, standard deviation and gradients. Also I calculated the relative power of the signal and based on all of this features I will make neurofeedback protocol.

Keywords

EEG, neurofeedback, data processing

References

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Water level oscillation model in accumulation

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Abstract

In this paper, the mathematical water level oscillation model is going to be described. The aim and objective of the research are to compare computational and measured oscillations of the water level in accumulation according to inflow and outflow of the accumulation [1]. In order to accomplish that, a physical model of the accumulation in the rain chamber (HM 145 Advanced hydrological investigations) is prepared. The experiment is conducted in Laboratory for hydraulic engineering at the Faculty of Civil Engineering. The experiment is performed under the different initial conditions of the accumulation water levels and different cases of water inflow and outflow. The volume of the accumulation is precisely determined by use of the Structure-from-Motion (SfM) photogrammetry [2] and the inflow and outflow from the accumulation is measured in a time step of the $\Delta t=1s$.

Keywords

Water oscillation, accumulation, physical model, SfM

References

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Numerical Modelling of the Air-Side Flow and Heat Transfer Characteristics of Slotted Fin and Tube Heat Exchanger

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Abstract

Compact air-cooled fin and tube heat exchangers find applications in many areas such as automotive industry, computer industry, heating, air-conditioning and refrigeration applications, process industry etc. Because of the physical properties of air, dominant thermal resistance is found on the air side of a heat exchanger. This is why the researches of fin and tube heat exchangers are mostly focused on improving the air- side performances of heat exchangers. Many works on this subject can be found in the literature where different fin and tube geometries are proposed for designing a fin and tube heat exchanger [1, 2]. In this work, numerical modelling of a 3D, laminar, steady state air-side flow and heat transfer characteristics of a slotted fin and tube heat exchanger has been done using the finite volume method. The convection-diffusion terms are discretized using Power Law scheme, and for pressure and velocity coupling the SIMPLE algorithm was used. Numerical calculations were performed in *ANSYS Fluent 18.2*. Four different inlet air velocities were considered ranging from 1 to 4 m/s which corresponds to Reynolds numbers ranging from 558 to 2233. Both inlet air temperature and temperatures of tube surfaces were constant. They were 293 K and 373 K respectively. Good agreement was observed with published results [1] in terms of Nusselt vs Reynolds numbers comparison.

Keywords

Heat exchanger, Slotted fin and tube, Numerical analysis

Acknowledgement: This work has been fully supported by Croatian Science Foundation under the project HEXENER (IP-2016-06-4095).

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Bouncing Balls in a Box

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Abstract

Bouncing balls in box is a well-known problem to showcase algorithms dealing with contacts both between a spherical (circular in 2D) object and a plane (straight line in 2D) boundary, and between the objects.

In this paper the problem is discretized in time by using the Backward Euler numerical method, and the contacts are solved using the non-smooth contact dynamics (NSCD) method [1] – an event - capturing method where the exact time instant of a contact is not a prerequisite because the main unknowns are velocities and impulses, not accelerations and forces. Interpenetration is not allowed – when a contact is detected, the colliding bodies must satisfy the Signorini condition [2].

The implemented numerical model takes into account both the friction between bodies (via Coulomb's law of friction) and the inelasticity of the contact (via coefcient of restitution).

The results of multiple examples (with one and several balls) will be shown.

Keywords

non-smooth contact dynamics, *inelastic contact, Coulomb's law*, *Signorini condition*

References

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Nonlinear Control of a Bearingless Flux-Switching Slice Motor with Combined Winding System

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Abstract

Bearingless motor is a special type of electrical motor in which rotor has no physical contact with the stator. Therefore, in bearingless motors 6 degrees of freedom of rotor motion are generally required to be actively controlled. However, introducing bearingless slice motor [1], three degrees of freedom of rotor motion can be passively stabilized, thus simplifying motor control to the control only in radial directions and rotor angle. In order to achieve bearingless motor control, the knowledge of the dependence of radial forces and torque on phase currents and rotor angle is essential. This dependence was shown to be nonlinear. Nonlinear radial forces relationship with currents and rotor angle demands nonlinear control structure of bearingless motors. Most state-of-the-art control algorithms[2] of bearingless motors assume only the relationship between the currents and the rotor angle to be nonlinear, while the relationship between the currents and the force/torque is assumed to be linear. However, in some types of bearingless motors, especially in motors with reluctance-type rotor, such as flux-switching slice motor, suspension forces are quadratic functions of the phase currents, which means that, in addition to linear terms, quadratic terms also contribute significantly to force generation. This study proposes a novel control structure of a bearingless motor, which allows to control a bearingless motor in cases where nonlinear current to force/torque relationship cannot be ignored. The solution that can be implemented in a digital signal processor (DSP) was found by numeric solution followed by the 2nd order Taylor approximation. The functionality of the suggested control structure algorithm was verified by implementation on bearingless flux-switching 12/10 motor prototype.

Keywords

Bearingless Motor, nonlinear control, flux-switching, taylor series, force

References

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Scalability design impact in multi-product RMS

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Abstract

Today's production meets the challenges of an extremely changeable market demands which are characterised by large fluctuations in the variety and quantity of products. It is not enough to produce high quality products at an affordable price but should be adaptable to the volatile changes dictated by the market in an economical way [1].

The purpose of the proposed scientific research to broaden the knowledge in the field of research precisely these production systems with emphasis on scalability and dynamic implications that affect the rapid changes in production capacity. Scalability is one of the basic characteristics of reconfigurable manufacturing systems (RMS).

The main objective of the proposed research is the formation of stochastic dynamic model for designing and calculating the capacity of the optimal scalability production system with minimal capital costs, based on the model of multi-products production for processing a number of different products.

Keywords

Reconfigurable manufacturing systems, scalability, multi-products production

References

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Analysis of a Hydraulic Torque Wrench Adapter Failure

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Abstract

All parts of a mechanical system are designed in such a manner to assure functionality and structural integrity during the desired lifetime of the system itself. Nevertheless, mechanical parts do fail due to various reasons (manufacturing defects, material inconsistencies, crack occurrence, design oversights, overloads, fatigue etc.) . When a part experiences failure it can be subjected to analysis in order to ascertain the failure cause and mechanism [1]. The results of failure analysis can be used to improve the failed mechanical parts. In this case, an analysis of a hydraulic torque wrench square drive adapter is presented. The adapter is a 1.5" size adapter with the nominal torque range from 1550 Nm to 15500 Nm. A significant number of the same adapter type has exhibited same failure mode during exploitation so a failure analysis was conducted in order to determine the causes. Experimental and numerical methods have been applied. Visual examination revealed the location and path of the fracture, while optical microscopy was used to inspect microstructure of the fractured surface and reveal possible inclusions. Scanning electron microscopy (SEM) examination at various magnifications was performed to obtain the fracture surface microstructural characteristics as well as insight to possible material flaws existence. An optical emission spectrometer with glow discharge source (GDS) sample stimulation was used to determine the chemical composition of the adapter material. Maximum tensile strength of the material was derived from the performed hardness test results. Finally, finite element analysis (FEA) was used to determine the stress levels that could have caused the adapter failure. The same FEA analysis has been conducted for different sizes (1" and 2.5") of the same type square drive adapter which did not fail during exploitation. Significant stress concentration was noticed at the crack initiation point of the 1.5" adapter. It can be concluded that the dimensioning of the adapter needs revision in order to obtain a more reliable mechanical part.

Keywords

Torque wrench adapter; failure analysis; failure; fracture; crack

References

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CBS Finite Element Model for 2D Shallow Water Equations

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Abstract

A numerical algorithm based on the characteristic based split procedure [1,2] is implemented into a computer code for the numerical integration of 2D shallow water equations. FORTRAN 90 was used to implement the numerical algorithm into a set of CPU instructions. The spatial discretization for any given domain is provided by CST finite elements, and the time discretisation is conducted in a traditional manner i.e. by finite difference methods. An adaptive time stepping procedure is implemented. Both explicit and implicit time integration schemes are implemented. The system of equations for pressure distribution is solved using conjugate gradient methods. However, the numerical computation is optimised so that the number of arithmetical operations is highly reduced. For this purpose a particular storage method for global matrices is developed and a particular encryption is used for matrix algebra. The numerical code is validated by benchmark problems. At the moment the developed program code is under parallelisation adapted for the SMP architecture which will be used for computations on the supercomputer BURA at the University of Rijeka.

Keywords

CBS, Finite Element, Shallow Water Equations, FORTRAN

References

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CONFERENCE PROGRAM

8:30 - 9:00 **REGISTRATION** **ROOM 207**

09:00 **CONFERENCE OPENING** **ROOM 207**

09:00 - 9:45 **PLENARY SESSION**

Invited speaker D. Ogrizović

HPC and Cloud Computing

9:45 - 10:15 **COFFEE BREAK**

10:15 - 12:00

SESSION A **ROOM 207**	**SESSION B** **ROOM 405**
Chair: P. Gljuščić	Chair: F. Hržić
G. Vizentin, G. Vukelić *Analysis of a Hydraulic Torque Wrench Adapter Failure*	A. Grgurić, I. Sušanj Čule, N. Ožanić *Warka water – a new concept for collecting of a drinkable water*
S. Grbčić, G. Jelenić, A. Ibrahimbegović *Finite element analysis of micropolar boundary value problems*	A. Tadić, I. Sušanj Čule, N. Ožanić *Water level oscillation model in accumulation*
P. Brezac, A. Zamarin *Ice contact Simulation on Marine Structures*	L. Zaharija, V. Travaš *CBS Finite Element Model for 2D Shallow Water Equations*
A. Sikirica, S. Ivić, M. Čanađija *Analysis of the Grid Structures Isotropy*	M. Kirinčić, K. Lenić *Numerical analysis of heat and mass transfer in an indirect evaporative heat exchanger*
I. Lučin, Z. Čarija, B. Lučin *Numerical analysis of trashrack bar cross section influence on head losses*	F. Torbarina, A. Trp *Numerical Modelling of the Air-Side Flow and Heat Transfer Characteristics of Slotted Fin and Tube Heat Exchanger*
D. Pastorčić, G. Vukelić *Fatigue Analysis of a Coil Spring Under Stochastically Modelled Dynamic Loading*	D. Glujić, R. Radonja *Methanol and Ethanol as ship fuel*
D. Stipanić, D. Holjević, V. Travaš *Kriging and 3D geological modelling based on boreholes data*	L. Kocijel *Analysis of influence of geometrical and working parameters on temperature stratification in heat storage tanks*

12:00 - 13:30 **LUNCH**

13:30 - 14:15 **PLENARY SESSION** **ROOM 207**

Invited speaker S. Valčić

The OFDM modulation and the VHF maritime mobile band

14:15 - 15:15 **SESSION C** **ROOM 207**

Chair: L. Maglić

M. Jović, D. Čišić, E. Tijan

EDIFACT as a basis for data exchange in maritime transport

D. Šakan, I. Rudan, S. Žuškin, D. Brčić

AIS data usage for vessel movement analysis

I. Polić

Leadership styles determines proactivity of employees – instance on board

T. Krljan, M. Jardas

Transport Problems of Goods Flow – Construction and Integration of Distribution Center in the City of Rijeka

SESSION D **ROOM 405**

Chair: S. Valčić

F. Hržić, I. Štajduhar

Automatic Radius Bones Fracture Detection using Machine Learning

Z. Šverko

EEG data processing in neurofeedback

I. Markovinović

Removal of eye blink artifacts from EEG signal

T. Manojlović

In-memory Distributed service for searching metadata of radiology images

15:15 - 15:45 **COFFEE BREAK**

15:45 - 17:15 **SESSION E** **ROOM 207**

Chair: S. Grbčić

T. Arrigoni, S. Zelenika, E. Kamenar

Design of a 3D printed rehabilitation device and testing of its material proporties

S. Piličić, K. Marković

Inverse Modelling for Material Parameters Identification of Soft Tissues

M. Gljuščić, M. Franulović, D. Lanc

Advanced combined inverse techniques for the identification of material parameters

V. Uran

Scalability design impact in multi-product RMS

SESSION F **ROOM 405**

Chair: I. Sušanj Čule

N. Lopac, N. Bulić

Time-frequency representations of induction machine stator current

I. Jurković, N. Bulić

Selective Harmonic Elimination in Closed Loop – Implementation on Medium-Voltage 3-level NPC Active Front End Converter

I. Sterpin, D. Franković

High Impedance Fault

N. Turk, N. Bulić

Nonlinear Control of a Bearingless Flux Switching Slice Motor with Combined Winding System

	M. Tuhtan, G. Jelenić *Bouncing Balls in a Box*		B. Schira Marine Energy Potential in Northern Adriatic with Special Consideration of Waters around Istrian Peninsula
	P. Gljuščić, S. Zelenika *Experimental characterisation of thermoelectric generators for wearable technology applications*		D. Cikač, N. Bulić *Flying Start Routine for Induction Motor in Scalar Control Mode*
17:15	**CONFERENCE CLOSING**	**ROOM 207**	