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Abstracts

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GRAPHICAL SIMULATION SYSTEM FOR FUNCTIONAL ANALYSIS OF A PARALLEL ROBOT FOR TRANSPERINEAL PROSTATE BIOPSY

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Keywords: Parallel robot, Robotic assisted transperineal prostate biopsy, Kinematics, Workspace, Singularities

Abstract: The paper presents the functional analysis of a parallel robotic system used for transperineal prostate biopsy. A simulation system to study the robot functional analysis was developed using the integrated MATLAB software. Given the fact that the robotic system is used in a medical environment, it has to meet certain safety requirements indicated by the medical doctors. In order to fulfill these needs an appeal to complex simulation software has to be made to help choosing the best kinematic solution for the robotic system. The designed simulation software offers a correlation between the structure of the robot and the surrounding medical environment, pointing out its workspace and possible configurations that might harm the human patient during the biopsy.

MECHATRONIC SYSTEM FOR SPECTRAL MONITORING OF THE CROPS VEGETATION STATUS

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Keywords: data acquisition, monitoring, precision agriculture, vegetation status, georeference.

Abstract. This paper presents a mechatronic solution for monitoring the crops vegetation status. A data acquisition system containing different types of sensors (multispectral, temperature, plant height, GPS) is placed on a terrestrial mechatronic platform that is carried by a tractor or on an UAV (Unmanned Aerial Vehicle).The multispectral sensor offers information about the reflectance, for discrete wavelengths, necessary to compute the so called *vegetation indices*. They are correlated with the degree of development and plant health, thermal

and water stress, pests, fertilizer need and so on. Knowing this information, a timely intervention is possible, allowing supplying water, pesticide and fertilizer in the proper quantity, at the proper time and in the precise place, leading to major economic impact and significant environmental protection. Geographical information are used for geo-referencing the acquired data, so that the thematic maps to be generated.

ADAPTABLE MINIROBOTS FOR PIPE INSPECTION TASK

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Keywords: in-pipe robots, mechanisms, adaptable structure, minirobots

Abstract. In the first part, the paper presents a classification of the in-pipe inspection robots and the features of the mechanisms used in the design of the pipe inspection robots with adaptable structure. The authors' contribution to the development of three wheeled minirobots with two four bar mechanisms placed on two parallel planes, is presented is the second part of the paper.

DESIGN AND MODELLING 4 DOFS UPPER LIMB EXOSKELETON

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Keywords: upper limb, exoskeleton, kinematics, modeling

Abstract. Based on upper limb's biomechanisms, in this paper, a robotic rehabilitation system is presented. It is designed as a 4 DOFs wearable exoskeleton applicable for repetitive practice of passive or active movements of the arm in shoulder joint and forearm in elbow joint. The kinematic analysis of the proposed system is followed by the 3D model and a description of the developed prototype.

DESIGN AND ANALYSIS OF A WHEELCHAIR FOR DISABLED PEOPLE

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Keywords: Wheelchair, design, kinematics, dynamics, differential transmission.

Abstract. This paper presents researches developed by authors to design a motorized robotic wheelchair for disabled people. These devices enable disabled people perform many activities of daily living thus improving their quality of life. Proposed solution uses for traction one DC motor with steps adjustable angular speed, and for steering one smaller motor. It is presented the kinematical scheme of the proposed transmission. It is developed a CAD model of the transmission, mounted on a wheelchair. They are made simulation in Adams, in order to verify the functionality of the proposed transmission. The obtained results validate proposed transmission model and enable implementation of this transmission to a wheelchair experimental model.

EXPERIMENTAL ANALYSIS OF A NEW EXOVSKELETON FOR PEOPLE WITH DISABILITIES

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Keywords: Leg mechanism, rehabilitation, kinematic analysis, design and simulation.

Abstract. In this paper, a new mechanism for human leg motion assistance has been proposed for rehabilitation purposes. The structure of human leg and its motions have been used as inspiration for design purposes. A 3D model of the proposed system has been elaborated in Solid Works®, both for design and simulation purposes. It is developed a kinematic model of the mechanisms, useful for further design optimization. There has been build an experimental model of the mechanism and they are conducted experimental researches, the results show that the proposed mechanism performs movements similar to those of a human leg.

BALANCING OF A SLIDER-CRANK MECHANISM BY USING A COUNTER MASS AND A PROGRESSIVE SPRING WITH TWO RATES

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Keywords: Slider-crank balancing, spring-balanced, progressive spring.

Abstract. This paper investigates the possibility to individually balance the dynamic forces and moment that are characteristic to the slider-crank mechanism. The unbalanced forces that act on the frame which holds the slider-crank mechanism are known as shaking forces. Likewise, the unbalanced moment that acts on the frame is known as shaking moment. Because both force and moment are unbalanced, they cause vibrations on the entire machine that holds the mechanism. The most common mean of balancing the slider crank mechanism by using a counter mass. This is applied for most of the commercial mechanical devices that use the mechanism. However the nature of the mechanism does not allow perfect balancing in such a way. The different nature of motions that govern the slider and the crank imply that a counter mass can only statically balance the mechanism. Perfect dynamic balancing cannot be achieved this way. In this paper the excitations that act on the mechanism are split by the nature of motion that generates them and balanced accordingly. Therefore two motions are defined. The piston motion and the crank motion. The dynamic force associated to the crank motion is balanced with a dynamically equivalent system. The dynamic force associated with the piston motion is balanced by a progressive spring with two rates.

NEW FORMULATIONS ON ACCELERATION ENERGIES IN ANALYTICAL DYNAMICS

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Keywords: modeling, robotics, dynamics, energies of higher order, multibody systems.

Abstract. This paper presents new formulations on the higher order motion energies that are applied in the dynamic study of multibody mechanical systems in keeping with the researches of the main author. The analysis performed in this

paper highlights the importance of motion energies of higher order in the study of dynamic behavior of fast moving mechanical systems, as well as in transient phase of motion. In these situations, are developed higher order time variations of the linear and angular accelerations. As a result, in the final part of this paper is presented an application that emphasizes this essential dynamic aspect regarding the higher order acceleration energies.

NEW FORMULATIONS ON MOTION EQUATIONS IN ANALYTICAL DYNAMICS

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Keywords: modeling, robotics, dynamics, energies of higher order, multibody

Abstract. Using the main author's researches on the energies of acceleration and higher order equations of motion, this paper is devoted to new formulations in analytical dynamics of mechanical multibody systems (MBS). Components of multibody mechanical systems, or the serial robots parts are presenting rapid movements or transitory motion, which developing higher order variations in respect to time of linear and angular accelerations. According to research of the main author, they are integrated into higher order energies and these in differential equations of motion in higher order, which will lead to variations in time of generalized forces which dominate these types of mechanical systems. The establishing of these differential equations of motion, it is based on a generalization of a principle of analytical differential mechanics, known as the D`Alembert – Lagrange Principle.

STUDY REGARDING THE SPECIFIC COMPONENTS PERFORMANCE OF ASSISTANT ROBOTS

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Keywords: assistant robot, components, performance, testing.

Abstract: This paper presents a comparative study regarding the specific components from thermoplastic polymers and ceramic powders for a assistant

robot. Experimental research targets the testing of these materials in order to optimize the vertebrae of the robot. The vertebrae are part of a miniature robot (size, weight) for exploration and interventions in a limited space. The simplicity and small size are advantageous for reliability, safety, fast installation and ease of use. Knowing the friction coefficient shows a great importance, particularly in the friction coupling in which movement occurs with low speeds.

EXPERIMENTAL MEASUREMENTS OF THE HUMAN KNEE FLEXION ANGLE DURING SQUAT EXERCISES

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Keywords: squat, numerical simulation, phase plane portraits

Abstract: In this paper the knee joint biomechanics during squat exercises is studied. Using an acquisition system based on electro-goniometers, measurements of flexion-extension knee angle during squat movement on a sample group of healthy subjects are performed. For each subject the curves of knee squat angle are normalized and the mean squat cycle of each subject and the final medium cycle are determined. The phase plane portraits are used to characterize the kinematics of the biomechanical system. Using ADAMS software, the forces components and the resultant connection force during squat cycle in the human knee joint are determined.

EXPERIMENTAL APPROACH REGARDING THE ANALYSIS OF HUMAN COMPLEX MOTIONS

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Keywords: experimental analysis, complex motions, biomechanics, kinematics, trajectories.

Abstract. In this paper an experimental research was performed in case of a human complex motion. The research aim was to evaluate the joint trajectories and angular variations of the main human locomotion system. Thus an experimental motion analysis was performed, by using two modern equipments

in parallel, one called VICON Equipment and the other called CONTEMPLAS. The experimental activity was developed on a human subject when perform a complex motion for hitting a ball. The obtained results will be useful for the improvement of the athletes' complex motions on sports such as football in the way of conserving the energy or to reshape the foot behavior when strikes the ball.

EXPERIMENTAL APPROACH REGARDING THE BEHAVIOR OF A HUMAN REHABILITATION EXOSKELETON

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Keywords: experimental analysis, biped locomotion, rehabilitation exoskeleton, kinematics, trajectories.

Abstract. In this paper an experimental research was performed in case of a human rehabilitation exoskeleton. The research aim was to evaluate the joint trajectories and the influence of the ground-foot contact by using two distinctive shapes of the exoskeleton foot. Thus an experimental motion analysis was used, called CONTEMPLAS and an exoskeleton prototype with 1DOF placed on a treadmill. The experimental activity was developed when the exoskeleton was used on walking activity. There were studied two types of foot shapes and also the generated impact of their form on the hip, knee and ankle joints trajectories during walking. The obtained results will be useful for the improvement of the exoskeleton orientation in space.

STRUCTURAL AND STATIC ANALYSIS OF THE MECHANISMS USED IN CAR MECHANICAL JACKS

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Keywords: lifting mechanism, screw-jack, mechanical jack, topological structure, mobility

Abstract: The paper presents a structural analysis of the complex mechanisms type screw-jack. The mechanism mobility analysis using various generally applicable formulas has been performed. A new kinematic scheme of the jack linkage has been proposed. Besides the actuator screw, it has a planar kinematic chain with articulated bars. With regard to this new mechanism, an

algorithm for static calculus has been developed, in which the automobile gravity force is the main exterior force.

NEW MECHANISMS USED FOR GENERATING CIRCULAR TRANSLATION MOTION

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Keywords: planar mechanism, circular translation motion, cylindrical gear, kinematic scheme

Abstract: The curve line translation motion can be generated in the particular form of the circular translation, through mono-mobile mechanisms with articulated links of simple parallelogram type (with a fixed side) or through transmission with toothed belt with a fixed wheel. Also, the circular translation can be generated through planar mechanisms with two cylindrical gears with a fixed central wheel. It is mentioned that the two cylindrical gearings of the Fergusson mechanisms are both exterior and interior.

THEORETICAL AND EXPERIMENTAL STUDIES ON THE MOTION OF A PNEUMATICALLY ACTUATED MANIPULATOR

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Keywords: manipulator, linkage, law of movement

Abstract. The current study reveals a method of cinematic calculus of a manipulator, whose geometry has been created according to the model of a plant. The calculus method has been experimentally checked on a scale model.

MOVEMENTS OF PLANTS – A SOURCE OF INFORMATION FOR THE MECHANISMS OF ROBOTS

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Keywords: the movements of the plants, the projection of the trajectory, flows of compressed air

Abstract. The current paper presents an experimental study of the movements of plants, as well as various conclusions of the research. The main idea is that

the general movement of a plant under the action of the wind is a very complex one, and it can be studied within the research for creating mechanical systems based on the same principles.

MODEL FOR THE MOTION OF MISALIGNED SHAFTS WITH ELASTIC PLATE COUPLING

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Keywords: plate coupling, structure, misaligned shafts, FEM.

Abstract. Using the MathCAD software, this publication aims to develop a novel model to interpret the analytical results for an elastic structure as a substitute to flexible coupling between two misaligned axes. This model is used for the analysis of the motion of two deformed components comprising of the cardan joint, as well as the coupling with elastic plates.

A DYNAMIC ANALYSIS BASED ON MBD ADAMS PROGRAM FOR A VARIANT OF QUADRUPED ROBOT

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Keywords: walking robot, leg mechanism, dynamics, Lagrange equation, simulation.

Abstract. For stability and impact reaction forces assessment of a quadruped robot during walking, a dynamic analysis is considered. For this purpose, a variant of a quadruped robot based on Jansen mechanism is presented. For interpreting the influence of the reaction forces from the ground during walking, the analysis was conducted with help of ADAMS software using a 3D model of the robot. Material specifications, forces and moments acting in the robot structure were considered. Graphical results obtained regarding the ground reaction forces are displayed. Also a reduced mass moment of inertia at the crankshaft is taken into consideration based on Lagrange motion equation and generalized coordinates.

DIFFERENTIAL MODEL FOR A SIX-WEELED ROBOT (ACM1PT)

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Keywords: control, diferential robot, kinematics, mobile robotic.

Abstract. The article aims to make the description of the process for obtaining a mathematical, kinematic and dynamic model of a six-wheeled robot, in order to obtain a representation that allows simulations of drivers in the following items addressed in different ways the development of differential kinematics robots mostly with castor wheel as a fulcrum.

ACKERMAN MODEL FOR A SIX-WHEELED ROBOT (ACM1PT)

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Keywords: control, Ackerman model, kinematics model, Matlab, mobile robot, robotics

Abstract. The article is aimed at presenting the development of a kinematic model for the control of a mobile robot 6 wheel, all with both traction and rotation, the Ackerman model was chosen because the robot will move through paths designed for cars, and as it avoids slipping. Two models of simulation in MATLAB, one in continuous and one discrete space are also presented.

CRASH TESTS AND THE LOADS OVER DRIVER HEAD IN DIFFERENT SIDE IMPACT CASES

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Keywords: Crash Test, Driver Head Loads, Passive and active Safety, Traffic Accidents.

Abstract. Car occupant protection in traffic accidents is a key target of today cars manufacturers. Known as active or passive safety, many technological solutions were developing over the time for an actual better car's occupant safety. In the real world, in traffic accidents are often involved cars from different generations with various safety historical solutions. The aims of these papers are to quantify the influences over the car driver head loads in cases of different generation of cars involved in side crashes. For each case the experimental load results can be future used to calculate Head Injury Criterion (HIC)

VEHICLES' PASSIVE SAFETY SYSTEMS INFLUENCE ON DRIVER'S THORAX INJURIES

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Keywords: frontal impact, thorax injuries, CSI, passive safety system, LS-Dyna.

Abstract. The present underpins a computer-assisted investigation regarding the driver's behavior and the injuries suffered in frontal vehicle collision, more precisely the injuries suffered in the thorax area. Hence, by means of the LS-Dyna software package we have carried out two series of virtual simulations with a dummy positioned on the driver's place, i.e. belted and unbelted. For the simulation we have selected a Hybrid III 5th percentile female dummy. Aiming at achieving a simulation that would display a high accuracy degree with respect to the driver's kinematic behaviour at the impact moment, our complete model also included, besides the dummy, the elements in the habitable: the seat, the seat belt, the steering wheel, the airbag and the dash board. Thus, the focus of the undertaken study was to establish the accelerations in the driver's thorax area as well as the injury degree, expressed by the CSI (Chest Severity Index). The results obtained validated our hypothesis in that passive safety systems, i.e. the

seat belt, diminish considerably the driver's injuries degree in case of a road traffic accident.

ASPECTS REGARDING THE INFLUENCE OF LAMBDA CONTROL SYSTEM FAULTS ON POLLUTANT EMISSIONS OF SPARK IGNITION ENGINES

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Keyords: air-fuel mixture, pollutant emissions, oxygen sensor, output voltage, simulated fault, indicial response

Abstract. Flow corrections established based on Lambda control system of spark ignition engines, determines in a decisively way the quality of air-fuel mixture. Faults in the operation of the control system generates deviations of the mixture composition from stoichiometric report, in this way affecting the entire combustion process in engine cylinders. This phenomenon leads, among others, to changes regarding the density of pollutant emissions from exhaust gases. In this context, this paper presents experimental researches made using the simulation of faults that may occur in the control system to highlight their influence on the concentration of engine emissions.

STUDY OF EMISSION OF A MONO CYLINDRICAL DIESEL ENGINE FUELED WITH BIODIESEL OF PALM OIL

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Keywords: biodiesel, palm oil, gas emissions, mono cylindrical engine.

Abstract. The demand of petroleum fuels which affect the air quality requires the use of alternative fuels to decrease the harmful emissions. In all the countries of European Union the biofuel production is stimulated and is a prime political and economic goal. The aim of this research is to evaluate the possibility to use biodiesel of palm oil in diesel engines with special emphasis on CO, CO_2, HC and O_2 emissions. Various blends of diesel and biodiesel of palm oil were mixed and evaluated on an experimental engine stand developed in the laboratory.

STUDIES REGARDING THE EVOLUTION OF POLLUTANT EMISSIONS RELATED TO CERTAIN TRANSITORY CONDITION OF AN INTERNAL COMBUSTION ENGINE USING MOBILE MEASURING SYSTEMS

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Keywords: pollutant emissions, OBD, measure, acquisition system, engine parameters.

Abstract. The internal combustion engine that equips a vehicle is a complex assembly of mechanical parts and electronics that controls almost every system. The electronic part of the vehicle gives the opportunity to observe and control what happens with the engine during function. The present paper follows the evolution of the pollutant emissions in relation with some transitory regimes of the car.

LEVEL OF SERVICE CALCULATION FOR FOUR-LEG INTERSECTION WITH DIFFERENT TYPES OF PRIORITIES

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Keywords: Level of Service; LOS; Delay; Unsignaled intersection, Movement capacity, Queue length, Four-leg intersection, Traffic priority.

Abstract. Calculation of an intersection Level of Service (delay values in the intersection) is the basis for subsequent development of the area as well as testing factor for the optimum conditions of road traffic. However just as important in evaluating an intersection is the road priority direction. Bringing together the two necessities, in the current context of development, evaluation junctions also needs to be done based on delays caused by road direction priority and the possible problems it causes. A good road traffic requires a low delay value based on road direction priority.

SIMULATION AND MODELING OF COMPRESSION STROKE IN DIESEL ENGINES

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Keywords: CFD, polynomial functions, compression stroke, Diesel engines.

Abstract. The objective of this study is to simulate the compression stroke in diesel engines by using computational fluid dynamics (CFD), and to model the compression stroke by using thermodynamic equations for Ideal gases and polynomial function that fits thermodynamic data of JANAF tables. The most important parameters to be simulated and modeled during the compression stroke are temperature and pressure of cylinder gases because of their important effects on mixture formation inside the engine combustion chamber. The simulation part will be performed using ANSYS ICE software. The modeling part will be performed using a MATLAB program composed by the corresponding author. Simulation and modeling process will be carried out between the intake valve close (IVC) and top dead center (TDC), the results of simulation and modeling will be compared and discussed.

SIMULATION OF COMBUSTION PROCESS IN DIESEL ENGINES BASED ON EDDY DISSIPATION MODEL

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Keywords: CFD, eddy dissipation model, combustion, diesel engines.

Abstract. The aim of this study is to simulate the combustion process in the combustion chamber of diesel engines by using eddy dissipation model (EDM) and computational fluid dynamics method (CFD). Computational fluid dynamics has been used wieldy in the recent years for simulating the strokes of diesel engines including the combustion process. Eddy dissipation model can be used for simulating non-premixed combustion cases such as the combustion in diesel engines. The simulation steps and the simulation results will be discussed and illustrated. ANSYS program is the software which used for performing this simulation.

EXPERIMENTAL INVESTIGATION ON THE EFFECT OF BIOETHANOL ON EMISSION PERFORMANCE OF DIESEL ENGINE FOR RAPESEED BIODIESEL-DIESEL BLENDS

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Keywords: bioethanol, bioediesel, blends, emissions.

Abstract. Global warming and climate change are the motives to find a solution for emission reduction of diesel engines. Bioethanol is renewable fuel which can be used in diesel engine as a part of biodiesel-diesel blends. The effect of bioethanol on the emission performance of diesel engine for rapeseed biodiesel-diesel blends as a function of engine load is evaluated in this paper. KDE 6500E diesel generator is used for this purpose. Carbon monoxide (CO), unburned hydrocarbons (HC), oxygen (O_2) and carbon dioxide (CO_2) emissions are recorded with the help of VLT-4588 exhaust gas analyzer. Blends with higher concentrations of bioethanol have shown lower CO emissions while HC emissions increase with the increase in bioethanol concentration in the blends. CO_2 emissions are recorded more at higher loads for all types of biodiesel and bioethanol concentrations than that of diesel fuel.

PROCESS DESIGN FOR AUTONOMOUS CAR MINING 1ST PROTOTYPE "ACM1PT" TO HELP ON EXPLORATION TASK ON OUTDOOR ENVIRONMENTS

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Keywords: QFD, Mechanical design, Simulation and engineering validation, mobile robot.

Abstract. The follow paper explains the process design of the development of a mobile robotic vehicle which main purpose is to aid on task of exploration on the mining sector. The paper shows the whole process from the customer needs through the conceptual sketch to the definitive design. It also describes

mathematical considerations for the selection of the motors for locomotion and steering. Followed by mechanical strength simulations in order to choose the right material and finally simulations of the behavior of the robotic vehicle suspension.

ON THE PROGRESSIVE VZN SHOCK ABSORBER PERFORMANCES AND DISSIPATED ENERGY

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Keywords: shock absorber, damper, progressive, damping, stability, comfort, displacement, acceleration, energy, fuel, pollution

Abstract. The *VZN* shock absorber concept granted with European Patents EP 1190184 [2], EP 2078168/2011 is characterized by damping coefficients self according with road and load conditions. The simulations made on vehicles equipped with new *VZN* shock absorbers concept relative to standard one, indicates better behavior concerning stability, comfort and reduced dissipated energy, with fuel consumption and pollution reducing effect.
Starting on these remarks the paper evaluates the influence of the damping characteristic in suspension performances and dissipated energy, based a simulation on a Californian road realized with Matlab Simulink software.

¼ CAR MODEL FOR SUSPENSION TRIM CORRECTOR PERFORMANCES EVALUATION

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Keywords: shock absorber, damper, suspension, damping, stability, comfort, displacement, acceleration, trim corrector, clearance, buffer, simulation, quarter

Abstract. The paper presents a complex quarter car model obtained with ADAMS software, View module, useful in the first stage of suspension dimensioning and optimization. Even at this stage can not overlook the fact that suspension stroke has lower values than the free oscillation amplitude, especially in the natural frequency of the body and axles/semi-axles, so the models must to have stroke limiters. Because the stroke limitation, must be softly, to not harm passenger safety and comfort and reliability of vehicle body and axles, the model is achieved by elastic stopper bumpers on both rebound and compression strokes. The same, the model is equipped with trim corrector

acting like a supplementary suspension spring, adding on the main suspension spring.

ON-BOARD MALFUNCTION SIMULATIONS ON VEHICLES THAT ARE EQUIPPED WITH ELECTRONIC CONTROL SYSTEMS

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Keyords: engine, malfunction simulation, signal generator, sensor, output voltage, absolute pressure

Abstract. On-board malfunction simulation consists of generating controlled malfunctions by transmitting, through sensor connector, a signal of a certain variation/ wave to the electronic control unit. Thus, the control unit will interpret that the monitored system has a malfunction. The main advantage of this method is that it allows the simulation for a wide range of malfunctions without requiring complex operations when changing from one type of malfunction to another. Also, this method (nondestructive type) exploits the technical potential of on-board diagnosis systems which fit modern vehicles and it allows to use the same devices for all types of simulated malfunctions.

SAFETY CLUTCH WITH ADJUSTABLE CENTRIFUGAL DRIVING. AN INTRODUCTION INTO A NEW CLASS OF COUPLINGS.

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Keywords: Adjustable centrifugal driving, function, class, driving mechanism.

Abstract. The paper deals with constructive and functional elements of an adjustable coupling with friction disks and adjustable driving planar mechanisms. The paper shows few conceptual and functional principles, introduces a new function for couplings and a new class of centrifugal couplings. It also presents structural elements of an innovative constructive solution of a centrifugal clutch with friction disks and adjustable centrifugal driving.

INVESTIGATION ON THE INTAKE PROCESS FOR A THEORETICAL TWIN OPPOSITE PISTON COMPRESSOR USING R744 REFRIGERANT

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Keywords: CFD, opposite piston compressor, R744

Abstract. This study aims to validate the use of R744 for a resonant twin piston compressor for domestic applications. The vapor-compression refrigeration is the most commonly approached method for cooling household appliances such as refrigerators and air conditioning systems. The R134a refrigerant is one of the most suitable refrigerants from an energetic point of view. R744 (CO_2) compressors are less efficient, but the fact that the R134a raises serious environmental issues pushes commercial trend towards the usage of R744 [1]-[3]. Use of R744 in household appliances is currently an open topic and no company has switched yet to the environmental-friendly alternative. In this paper the fill efficiency will be simulated in order to validate if a conventional compressor such as the opposite twin piston compressor is capable of filling with refrigerant when operating at a 50Hz frequency. Such a validation can enable further investigations regarding the replacement of R134a with R744.

Multi-domain and durability analysis of a Hybrid Hydraulic Vehicle

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Keywords: - Vehicle, Propulsion Systems, Fluid power, Fatigue Life, Multi-domain Simulation

Abstract- The intent of this paper is to present a multi-domain and structural study of a hydraulic hybrid machine. The evaluation of different solutions is based on simulation approach, using LMS Imagine.Lab (Amesim) and Ansys Workbench software packages. Amesim provides a 1D simulation suite to model and analyze multi-domain intelligent systems, to predict their multi-disciplinary performance and Ansys Workbench Durability tool performs the high cycle fatigue life calculation. The multi-domain analyses are made for different constructive solutions at different drive ratio. The comprehensive fatigue calculations and results enable engineers to evaluate the main shaft design of

the hydraulic motor in order to avoid failures under real world conditions. Some recommendations are made regarding possible solutions.

TIME DEPENDING FRICTION IN BEARING MOUNTINGS

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Keywords: bearing mounting, friction coefficient, experimental tests, time.

Abstract. The subjects of this paper are the existing bearing mountings of a testing rig for chain or belt drives. Friction in transmission without bearings is calculated by subtracting the bearing friction from the global friction. This is why it is of maximal importance in the correct evaluation of experimental measurements on the rig to have accurate data on the friction on bearings. After the period of running in, friction on the bearings is measured at certain intervals in time, but also depending on rotational speed, load and lubricating oil temperature.

SYNTHESIS OF THE MECHANISMS USED FOR REVERSE DRIVING ON CONTINUOUSLY VARIABLE TRANSMISSIONS (CVT)

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Keywords: Continuously Variable Transmission (CVT), metal pushing V-belt, planetary cylindrical gear mechanism, reverse driving, front-wheel drive, rear-wheel drive.

Abstract. The paper presents two kinematic schemes of the reverse driving mechanism on CVT's, the first one for rear-wheel drive, and the second one for front-wheel drive. For the first kinematic scheme, the reverse driving mechanism consists of a planetary cylindrical gear set and a multi-disk brake. In order to achieve a better efficiency for reverse driving, the authors propose a new kinematic structure of a planetary cylindrical gear mechanism, simpler than the existing designs. While describing a synthesis of the new kinematic solution, special attention was granted to maintaining the advantages of each of the two existing mechanisms, and highlighting the advantage of using less cylindrical gears.

METAL PUSHING V-BELT CONTINUOUSLY VARIABLE TRANSMISSIONS (CVT) USED IN MOTOR VEHICLES

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Keywords: Continuously Variable Transmission, metal pushing V-belt, friction pulley, metal V-element, stress, simulation.

Abstract. The paper presents 3D modeling of a trapezoidal element (V-element) of a metal pushing V-belt. This type of belt is used on the Continuously Variable Transmissions (CVT) with friction pulleys that equip low and medium capacity motor vehicles. Also, the structural analysis of the V-belt element with regards to the material strength is presented. Modeling and simulation have been accomplished by an advanced CAD – CAM – CAE software which permits three-dimensional virtual design of the V-element or the entire belt.

STUDY OF HANDLING MECHANISM ATTACHED TO A MULTISTOREY CAR PARKS

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Keywords: parking the vehicle, bunk mechanisms, strength calculations, optimizations.

Abstract. The study of bunk storage systems for motor vehicles has developed much lately due to high demand for parking in congested city centers. In this paper we propose to study the mechanism of drive bunk platforms for dynamic request. This paper aims to improve the response mechanism on a platform behaviour self during operation of the system and identify the points with maximum stress values.

VEHICLE STEERING MECHANISM ELASTODYNAMIC ANALYSIS

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Keywords: steering mechanism, tie rod, modal-dynamic, deformable body.

Abstract. In this paper is performed an elasto-dynamic study of a steering mechanism from a road vehicle. Kinematical studies of the steering mechanism have been made especially on robots, their results being presented in scientific literature. The main purpose of this study is to reduce tires wear by optimizing the components of the steering mechanism.

DYNAMICS OF A PUMPING SYSTEM

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Keywords: pumping system, flexible link, Poincaré map, Lyapunov exponents

Abstract. In this paper a pumping systems for deep extraction is simulated using SolidWorks and
ADAMS. The elastic displacement of a point on the flexible moving cable is analyzed. The dynamics of the system is characterized with phase plane, Poincaré maps, and Lyapunov exponents. The Lyapunovexponents represent the dynamic stability of the system.

MODEL BASED ALGORITHM FOR THE STUDY OF THE VEHICLE SUSPENSION

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Keywords: vehicle suspension, suspension design, quarter-car 2 DoF model, simulation, comfort.

Abstract. The design of a vehicle suspension system starts with very few input data. Simple models are used during initial simulations in order to ensure the

wanted compromise between the comfort and dynamic performance qualities, at different vehicle speeds and loads. That stage leads to the setup on model of the needed suspension parameters, principally the stiffness of suspension spring and tire and the damping coefficient.

In an algorithmic way, this paper summarizes actual design recommendations existing in the field of vehicle suspensions. Based on the procedure in this article, a computer program was implemented in the MDesign software.

MODELING THE WORK OF A TORQUE CONVERTER DURING THE GETAWAY PROCESS OF A VEHICLE

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Keywords: simulation, torque converter, torque, angular speed.

Abstract: The paper aims at issuing of a virtual simulation model that would be able to assess the actual working modes of a torque converter, both hydraulically and mechanically. To estimating the dynamic behavior we used the assessing equations of the converter's performance coefficients. The rotational inertial phenomena due to the transient regimes during the getaway phase are also considered. The modeling process assumed the use of the pre-defined structures of the *Simulink-Matlab* and *Simscape-Matlab* modules. The virtual model of the torque converter was fed with the experimentally determined, performance parameters as input. The input also consisted of the inertia moments of the converter's components. Eventually, by interrogating the simulation model, we've got and plotted the time histories of the converter's impeller and turbine angular velocities during the vehicle's getaway process

RECURRENCE PLOT ANALYSIS TO STUDY PARAMETERS OF A GASOLINE ENGINE

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Keywords: Recurrence Plot Analysis (RPA), phase-space, gasoline engine, ignition angle, engine angular speed.

Abstract. Modern data analysis techniques has been successfully applied in many technical disciplines to understand the complexity of the system. The growing volume of theoretical knowledge about systems dynamic's offered researchers the opportunity to look for non-linear dynamics in data whose evolution linear models are unable to explain in a satisfactory manner. One of the most recent approach in this respect is Recurrence Analysis - RA. It is a graphical method designed to locate hidden recurring patterns, nonstationarity and structural changes. As is presented in this paper, the recurrence plot investigation for the analyzing of the gasoline engine shows some of the its capabilities in this domain. We chose two specific engine parameters measured in two different tests to perform the RPA. These parameters are ignition angle and engine angular speed. There were computed graphs for each of them. Graphs were analyzed and compared to obtain a conclusion. This work is an incipient research, being one of the first attempt of using recurrence plot for analyzing automotive dynamics. It opens a wide field of action for future research programs.

DUAL SUPERCHARGING WITH TURBOCHARGER AND PRESSURE WAVE SUPERCHARGER

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Keywords: engine, dual supercharging, turbocharger, pressure wave supercharger - PWS

Abstract. The efficiency of the turbochargers is not satisfactory while the supercharged engine is working at low speeds. The dual supercharging can represent a solution to improve the supercharging process efficiency of the

turbochargers. Due to the different functioning principles of the turbochargers and the pressure wave superchargers, this compressors are not having the same efficiency when the engines is running at a certain speed. The pressure wave superchargers can operate with a satisfactory efficiency at low-medium engine speeds. For this reason the dual supercharging with turbocharger-pressure wave supercharger is making the supercharging processes applied on engines more efficient. The two supercharging compressors are compressing the intake air by using a part of the exhaust gases energy. Due to the pressure wave supercharger rotor is having only gas distribution role, the power needed to drive it is reduced. The driving of the rotor can be realized by the crankshaft or by an electric motor.

DYNAMIC PRESSURE ANALYSIS OF HIGH PRESSURE FUEL SYSTEMS

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Keywords: High pressure fuel systems, pressure wave, 1d simulation, internal combustion engine, two strokes.

Abstract. In this paper is presented the dynamic study on the fuel feeding line of a compression ignition two stroke engine with two cylinders. The common rail type feeding line is working on a pressure of 1600 bar. To provide a uniformity of the fuel dosage introduced in the cylinder and a suitable control of fuel mixture realization a study was made of dynamic phenomenons that occur during the openings and closings of the injectors. The mathematic model was calibrated based on the experiments done on the engine.

PREDESIGN OF AUTOMOTIVE INDEPENDENT SUSPENSIONS: IMPLEMENTATION AS MDESIGN CALCULATION MODULE

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Keywords: automotive suspension, design algorithm, software implementation.

Abstract: Implementation of an algorithm as a software module is not an easy task for a mechanical engineer. Usually the design engineer needs to be assisted by a programmer when a new software module is to be designed. The MDesign approach offers a way to create custom calculation modules by the

user himself, who in this case is the automotive engineer, using only basic programming knowledge. This paper is focused on the development of a computation software module when the algorithm is already established. It is presented the case of the independent suspension predesign algorithm, but the same way is used for any other mechanical system. The MDesign framework was created for mechanical design and it was extended with a custom component dedicated to automotive engineering. A calculation module consists of program code and data, and is designed to execute an implemented algorithm and to provide the user with some text and graphics information.

DESIGN OPTIMIZATION OF THE REAR WING OF A SPORTS CAR

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Keywords: design optimization, parameterization, rear wing, aerodynamics.

Abstract. In this paper it is presented the design optimization of the rear wing of a sports car having traction on rear axle. The wing profile was parameterized with three variables, the angle of attack was the fourth variable and the objective function was to minimize the lift over drag ratio. Three virtual models were considered: a model without rear wing, a model with a rear wing with initial profile and position and a model with optimized rear wing. For these three models the drag and lift coefficients were calculated for comparison along with drag and lift forces.

MANAGEMENT AND PRODUCTION SYSTEMSCOMPARATIVE ANALYSIS OF TWO WIND TURBINES WITH PLANETARY SPEED INCREASER IN STEADY-STATE

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Keywords: wind turbine, planetary gear, speed increaser, steady-state regime, mechanical characteristic, running point, analytical model, analysis.

Abstract. Planetary transmissions used as speed increasers in wind/hydro conversion systems typically rely on the conventional concept of mechanism with one input and one output. This concept is found in most of the high power wind

turbines; however, the need to implement in the built environment smaller wind turbines with speed increaser led to new turbine concepts such as counter-rotating rotors and classical generator. The paper presents a comparative analysis of two novel wind turbines with one rotor and two counter-rotating rotors, respectively, which contain identical electrical generators and the same type of speed increaser used both as a 1 DOF and 2 DOF mechanism respectively. With the assumption of maintaining the same electrical generator running point for both wind turbines, the steady-state behaviour of the considered turbines is identified and a comparative kinematic and static performance analysis is performed, aiming at highlighting the impact on efficiency and on constructive design and development of the two turbines.

FLOW MEASUREMENT TO A KAPLAN TURBINE USING A DIRECT METHOD AND AN INDIRECT ONE

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Keywords: Kaplan turbine, Winter Kennedy method, tests index, flow measurement

Abstract. The paper present two different methods for measuring flow in hydropower, one direct and one indirect method. The study consists in comparing the results obtained by measurements made by both methods in a Romanian hydropower plant. The indirect method used is the Winter-Kennedy method. The other method involves direct measurement of the flow rate of water using a specialized outfit in this.

Modified Bouc-Wen Analytical Model for Romanian SERB-C Seismic Dampers Used in Buildings Protection System

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Keywords: Seismic devices, friction devices, analytical model, hysteretic loop.

Abstract. In this paper is presented a new mathematical model which is intended to simulate the hysteresis phenomenon of SERB-C Romanian friction device for damping and dissipation of earthquake energy used for buildings. These devices have unusual shape of force-displacement loop which can be simulated with our new model which represents a specific modification of the

well known Bouc-Wen model of hysteresis. The purpose of this analytical simulation is to determine a relation for the hysteretic loop which was obtained by experimental tests performed by the authors. The mathematical model presented in this paper can be used in computational simulation of a building protected with these types of devices, in order to determine the anti-seismic performances of a Romanian friction building protection system.

STRUCTURAL AND KINEMATIC FEATURES OF A 2 DOF SPEED INCREASER FOR RENEWABLE ENERGY SYSTEMS

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Keywords: counter-rotating, planetary gearbox, speed increaser, kinematics, efficiency, wind turbine.

Abstract. The counter-rotating wind turbine is a relatively new concept of wind converter that contains two rotors placed on the same side or on both sides of the nacelle with the aim of increasing the wind energy conversion efficiency. As the rotors are rotating at a lower speed than the generator requires, the wind turbine usually contains a speed increaser to harmonize their running regimes. Similar counter-rotating systems are approached for hydro applications but they are still in the research phase. The paper proposes a novel concept of a 2 DOF (degrees of freedom) speed increaser to be used in counter-rotating systems (wind or hydro). The structural and kinematic features of the 1 DOF and 2 DOF transmission running cases are presented in the paper. The differential transmission is further analyzed and the transmission functions and efficiency are established. Finally, conclusions regarding the use of 2 DOF transmissions in the renewable energy systems are formulated.

DETERMINATION OF DISPLACEMENT OF THE PIECE CENTER IN THE PROCESS OF CENTERLESS GRINDING

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Keywords: centerless grinding, productivity, process monitoring.

Abstract. Chatter, geometric lobbing and work piece rotation problems are the main problems which affect the centerless grinding productivity. An original

method was developed and implemented to determine the displacement of the center of the piece in centerless grinding. Until now no functional tool has been developed to solve these coupled problems. In conclusion, future trends and research work in centerless grinding technology are analyzed and discussed.

F.E.M. SIMULATION OF THE BUILDING FRAME NODE BEHAVIOR DURING SEISM

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Keywords: Ansys, reinforcement bars, concrete, damping forces, stress, strain.

Abstract. This paper presents a simulation made with Ansys software on the stress and strain state of the node region of a reinforced concrete building subjected to earthquakes and equipped with devices for seism energy dissipation. This simulation includes the forces developed by the damping devices which act on these important nodes regions. The main goal of this simulation is to determine if the presence of the damping device at the supra-structure of the building is increasing the stresses and strains in the concrete and reinforcement bars of the node during earthquakes. For this study were used damping devices with damping forces depending on displacements. The results are very useful in the process of designing the damping system for the superstructure of the building and in the process of designing the reinforcements of the building nodes regions.

ABOUT INVERSE PROBLEM IN HEAT TRANSFER

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Keywords: inverse problem, heat transfer, thermal source.

Abstract. The paper presents a method for obtaining the power of thermal source, based on finite element approach, when the temperature distribution is known from an infrared image. The method is solving for the load vector, and extracts the power at element level from this vector.

ASPECTS ABOUT IMPLEMENTATION OF LEAN MANUFACTURING PRINCIPLES FOR QUALITY IMPROVEMENT IN A PRODUCTION SYSTEM FOR AUTOMOTIVE INDUSTRY

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Keywords: Lean principles, 6S, quality, automotive components, safety, indicators.

Abstract. Now, worldwide, the Lean Manufacturing system represents the most comprehensive management philosophy within a manufacturing process. One of the basic principles of Lean Manufacturing is 5S process which involves the risks and wastes eliminating and it is considered a key of worker and equipment's safety. Therefore, during the last years, 5S was expanded to 6S by the Safety adding. Thus, in this paper aspects about 6S process implementation on a manufacturing company of automotive components is presented. The monthly implementation extent of each 6S process indicators from 2013 until now is described, especially on the production lines of the factory. Finally, the major benefits of the introduction of the 6S principles in the company are highlighted.

ADAPTIVE CONTROL FOR SOLAR PHOTOVOLTAIC TRACKING SYSTEM

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Keywords: Adaptive control, Model Reference Adaptive Control, Gradient.

Abstract. This paper describes the behavior of adaptive control using the MIT rule for a polar aligned single axis tracking system, it´s for increase the efficiency of solar energy capturing compared to a polar fixed system, where the response of system is analyzed by simulation in Simulink – MATLAB® software. The data input for estimate the energy in the photovoltaic panels is the radiation data, that is obtained by weather station of the CAR (regional autonomous corporation) situated in the zone of study. The objective of the integration between the photovoltaic panel and the mechanics tracking system is to keep the

perpendicular sunlight during the day. The MIT adaptive control tries to reduce possible errors, such a sun position data deviations, friction and environmental changes in the conventional solar tracking. This control was designed according to a typical polar aligned single axis tracker.

DESIGN AND IMPLEMENTATION OF A NEURAL NETWORK APPLIED TO THE MAXIMUM POWER POINT TRACKING OF A SOLAR PANEL

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Keywords : Neural Networks, Gradient descent, Back propagation, Training coefficient, Activation function, Maximum power point tracking, Quality Function Deployment (QFD), Radial base function.

Abstract. This paper shows the design and implementation of a neural network using *back propagation* method in order to perform the tracking of the maximum power point of a solar panel; this can be achieved by the use of the predictive ability of the network which uses light sensors to perform angular movement of the panel to find the optimum position all of this with the use of C# software. Tests were performed both in artificial and real environments; the network tracking sensitivity was tested in the artificial environment and it gave a result of less than 8 degrees of error, on the other hand in terms of voltage an improvement of more than 25% was found on the tracking configuration against a static configuration. As for the real environment testing, the tracking achieved to find the value of maximum power with a difference smaller than 4% of the maximum power measurement obtained.

LINEAR CONTROL FOR FULL BRIDGE PHASE PWM RECTIFIER

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Keywords: Control strategies, Linearization system, PWM rectifier, Single Phase rectifier

Abstract. Rectifiers are widely use in areas of industry and commerce to implement equipment which require to be powered by alternating current (AC) source, so that uncontrolled rectification requires an operational requirement

study because they only properly works if the rectifier calculated boundary conditions are ideal and invariant. Therefore the implementation of control strategies should be take into account to generate the desired signal performance in the rectifier. This document shows the implementation of different control techniques on the behavior the sinusoidal current in a single-phase rectifier width modulated pulse and resistive load. Consequently, in this work the development of several control strategies are presented, for behavior analysis of signals in a rectifier with width pulse modulation and resistive load. Additionally, a comparison between the developed controllers is performed in order to get the best behavior available for this applications.

OPTIMIZATION OF CUTTING CONDITIONS IN MULTI-PASS MILLING

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Key words: Multipass Milling, Dynamic Programming, Sequential Quadratic Programming, Genetic Algorithm

Abstract. In this paper, a new, optimization strategy is used for the determination of the optimum cutting parameters for multipass milling operations. This strategy is based on the “minimum production time” criterion. The optimum number of passes is determined via dynamic programming, and the optimal values of the cutting conditions are found based on the objective function developed for the typified criterion by using a hybrid genetic algorithm with SQP. GA is the main optimizer of this algorithm, whereas SQP is used to fine-tune the results obtained from the GA. Furthermore, the convergence characteristics and robustness of the proposed method have been explored through comparisons with results reported in literature. The obtained results indicate that the proposed strategy is effective compared to other techniques carried out by different researchers

PREDICTION OF SOLAR RADIATION THROUGH THE ANFIS ALGORITHM

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Keywords: Fuzzy, ANFIS, solar radiation, membership function, fuzzification, climate change

Abstract. The constant evolution of the energy industry, has introduced the need for ongoing research studies about climate change due to its direct action on the production of alternative energies. Thus, they have focused on developing predictive algorithms in order to resolve, in an early way, the climate action on each point of energy production. In the development of this work, the ANFIS algorithm and information from the NASA Langley research center virtual database were implemented. They being oriented to the analysis and prediction of solar radiation over the geographic area of the Nueva Granada Military University campus in Cajicá, Colombia, with the purpose of making appropriate use of the power generating system located in the zone. The development of such systems, would allow the early identification of solar radiation that can be present in different geographical areas of Colombia, in order to provide the necessary power to cover the electricity demand required in each region, achieving as results an approximation error less than 1%.

MATERIALS AND FABRICATION SYSTEMS FEA OF BIOABSORBABLE MATERIAL TO REPAIR HAND FRACTURES

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Keywords: bioabsorbable, fractures, copolymers

Abstract. Polylactic acid (PLA) is a bioabsorbable polymer that is used in a variety of medical conditions. Complex forms of this material are commonly made for fixation and reconstruction of bone fractures. These bioabsorbable implants have been gaining popularity as an alternative to metal implants to stabilize small fractures due to its metal counterpart, avoiding problems such as bone resorption, additional surgery after fixation, infection and possible new fractures. In this paper are shows a number of finite element analysis that aims

to determine the functionality of the plates and screws fixation with bioabsorbable material made from PDLLA copolymers 50/50 and 85/15 PLLA - PGA respectively, for fixing and rebuilding of bone fractures in hand.

FACTORS AFFECTING ELECTROCHEMICAL HONING OF SS-316

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Keywords: electrochemical honing, processing time, electrolyte, SS-316, surface finishing, out-of-roundness

Abstract. Electrochemical Honing (ECH) is a process of precision finishing of functional surfaces with the use of the electrical and mechanical energy. It is reported that the 90 percent of the material is removed by electrochemical machining (ECM) process and remaining 10 percent by mechanical scrubbing, which shows the electrical energy is the main constituent in the ECH process. Basically, electrical energy is combined with chemical to form an electrolysis dissolution to remove material from the workpiece surface. This work presents a study for the factors affecting the electrochemical honing of SS-316 turned surfaces, especially the processing time and electrolyte composition. The percentage improvement in surface roughness (Ra, Rt) and out-of-roundness (OOR) as a monitored output of ECH were determined. The results are finally furnished with the aim to generalize a useful guideline for the user to enable proper selection of conditions for obtaining good surface quality.

THE REINFORCEMENT EFFECT OF TWO EXTRA CARBON FIBER LAYERS ON THE FLEXURAL RIGIDITY AND YOUNG MODULUS FOR SANDWICH BARS WITH HONEYCOMB CORE

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Keywords: flexural rigidity, Young modulus, carbon fiber, polypropylene honeycomb.

Abstract. In this paper we will build some new and original composite sandwich bars reinforced with two and four layers of carbon fiber (in the upper and lower

sides), with the core made of polypropylene honeycomb. For these sandwich bars, we will use the next experimental setup: we will clamp them at one end and we will leave the other free. Using an accelerometer, we will record the eigenfrequencies. Bu using the eigenfrequencies values and the Euler-Bernoulli theory, there is established a procedure to determine the bars flexural rigidity and dynamic Young modulus. We will consider the bars as having 320 and 350 mm free lengths. We will highlight how the two extra carbon fiber layers will influence the flexural rigidity values and the dynamic Young modulus.

THE INFLUENCE OF TWO EXTRA CARBON FIBER LAYERS OVER THE DAMPING PROPERTIES FOR SANDWICH BARS WITH POLYPROPYLENE HONEYCOMB CORE

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Keywords: free vibrations, damping factor, carbon fiber, polypropylene honeycomb.

Abstract. In this paper we will build some new and original composite sandwich bars reinforced with two (one in the upper and the other in the lower side) and four layers of carbon fiber (two in the upper and two in the lower side), with the core made of polypropylene honeycomb. Starting from the dynamic response of these bars that are in free vibration, we will establish a procedure to determine their damping factor per unit mass and per unit length. The bars will have the polypropylene honeycomb core with 10 and 15 mm and the width of 45 mm. The bars will be clamped at one end and free at the other. We will consider several free lengths of: 200, 230, 260, 290, 320 and 350 mm. We will highlight how the damping factor will increase if two extra carbon fiber layers are added in the upper and lower sides of the sandwich bars.

THE CRACK LENGTH GROWTH – A FRACTURE PARAMETER IN A STAINLESS STEEL INFLUENCED BY THE LOADING TEST

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Keywords: crack, cracking rate, stress intensity factor, asymmetry coefficient, solicitation cycle.

Abstract. The defects or micro-cracks that exist in a product mass from the elaboration phase, can extend controlled or not, because of a variable

solicitation applied to a product or a sample. The Fracture Mechanics parameter that highlight the crack propagation in time is its rate growth marked as da/dN and represents the crack advancement length during a solicitation cycle. This can be studied based on some mathematical models obtained from some propose models, experimentally determined. In this paper, a propagation process analysis is made of a fracture crack by an axial-eccentric fatigue loading for a X6CrNiTi18-10 (from the standard SR EN 100027/1,2:1996) stainless steel. CT type flat samples were loaded with an asymmetry coefficient R= 0.3, for the solicitation temperatures: T= 293K (20^0C), T= 253K (-20^0C), respectively T= 213 K (-60^0C). The crack growth increase was studied by three most used mathematical models: the polynomial method standardized according to ASTM E647, method proposed by P.C. Paris and method proposed by E.K. Walker.

FUZZY LOGIC TREATMENT OF THE LAMINATED COMPOSITES FRACTURE

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Keywords: interfacial fracture, symmetrical crack advance, fuzzy logic, laminated composites.

Abstract. No one wants a material to fail. If it does happen then we have to know what the causes are and then what is the intensity at which it fails. Many experimental tests were making for this. The laboratory data for the laminated composites fractures normally exhibit scatter. This implies an element of uncertainty or vagueness in the results. Fuzzy logic is a natural means of expressing vague categories of information through fuzzy sets and offers means of performing logical operations. In this paper are considered some aspects regarding laminated composites fractures using fuzzy logic methods. The fuzzy logic treatment of the case considered in this work clearly show some risk of failures at lower parameter levels than might be expected using a deterministic treatment in which the vagueness of knowledge is masked and which might not be safeguard against by using a factor of safety value.

STUDY OF THE FRICTION COEFFICIENT IN POLYAMIDE / STEEL TYPE CONTACTS IN NON-LUBRICATED CONDITIONS

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Keywords: polyamide, friction coefficient, dry friction, tribometer, tests.

Abstract. The paper presents the determination of the friction coefficient for the polyamide / steel type contacts in the case of dry friction. First, there are presented the characteristics of the testing equipments and the test procedure. According to the results, there are presented recommendations for the applicability of the tested polyamide material.

FRICTION OF THE POLYMERS. EXPERIMENTAL RESULTS AND ANALYTICAL MODEL

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Keywords: polymer friction tests, friction coefficient, friction forces, dry and lubricated conditions

Abstract. To determine the friction forces and friction coefficient in dry and lubricated conditions between steel and a triol crosslinked polyurethane, the authors developed a new experimental method consist in sliding of a steel cylinder on a plate polymer sample in the direction of the cylinder axis. By using this method the experiments were realized on a deformed path in the polymer sample by maintaining the same pressure distribution between the contact elements during the experiments. The experiments were realized with normal load between 1 N and 8 N and a cyclic linear speed having values between 1mm/s and 10 mm/s. Were determined the friction forces and friction coefficients in dry and lubricated contacts. An analytical model to evaluate the friction force in the cylinder – polymer contact surface has been developed and a good correlation with the experiments was obtained.

ASPECTS ABOUT SINTERING BEHAVIOUR OF A TITANIUM HYDRIDE POWDER BASED ALLOY USED FOR AUTOMOTIVE COMPONENTS

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Keywords: Titanium alloy, automotive, sintering, hardness, microstructure.

Abstract. For this study with high originality, some aspects about the sintering behaviour of Titanium based alloy used for automotive components are presented. This paper presents the experimental results concerning the processing of Ti based alloy by Powder Metallurgy (PM) technology. The initial powder mixture consists in TiH_2 micrometric powder particles that have been combined with some metallic powders for improving the final mechanic-chemicals and functional properties for using in the automotive industry. The classical PM route have been applied for obtaining a low-cost Ti- alloy.
As a result it was compulsory to study the parameters that influence the densification process and the sintered properties, depending on the sintering temperature. The experimental test results were processed using the STATISTICA program. Therefore the influence of these sintering temperatures on the height and diameter shrinkages, density and hardness for the alloys based on Ti micrometric powders has been studied.

EXPERIMENTAL AND NUMERICAL STUDY OF THE CUTTING TEMPERATURE DURING THE TURNING OF THE C45 STEEL

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Keywords: Cutting Temperature, Comsol Multiphysics, Finite element, Turning Process.

Abstract. In machining operation, the quality of surface finish is an important requirement for many turned work pieces. Cutting temperature is one of the most important parameters in determining the cutting performance and tool life. The objective for this work is to estimate the cutting temperature in 3D model on tool-chip interface and the interface temperature during turning process, using

the digital simulation software COMSOL Multiphysics.The tool–chip interface temperature results obtained from experimental results by using C45 medium carbon steel work piece with natural contact tools, without the application of cooling and lubricating agents and a K type thermocouple technique was used for estimating cutting temperatures in a turning operation.
This procedure facilitates the determination of the temperature at tool-chip interface in dry turning process, which is still a challenge for existing experimental and numerical methods

MODELING AND SIMULATION IN MECHANICAL ENGINEERING SIMULATION OF A MONO CYLINDRICAL ENGINE WITH LES SOFTWARE

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Keywords: 1D simulation, mono cylindrical, automotive industry, CFD tools, LES software.

Abstract. This paper analyzes the numerical research carried out on a single-cylinder research engine. 1D engine simulation tools are widely used to model the combustion and gas flow processes in a four-stroke spark ignited engine. LES software represents a powerful tool for optimization of engine dynamic processes and parameters. The simulation and design of engines can drastically reduce time and costs in automotive industry. 1D advance systems are needed for an effective boosting of the engine. A mono cylindrical spark ignition engine was analyzed to determine the performance and general parameters.

A SIMULATION OF THE STRESS INTENSITY FACTORS KI AND KII VARIATION IN THE HERTZIAN STRESSES FIELD OF GEAR TEETH

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Keywords: fatigue cracks, stress intensity factors KI ,KII, crack center depth, residual tensions

Abstract: The most outstanding parameter that governs the fatigue crack growth under tensile stresses field is the stress intensity factor, mode I, KI. This is a sufficient parameter to describe the whole stress field at the crack tip. An accurate stress intensity factor KI evolution was worked out taking into account

the position of the crack center depth, and also, the residual stresses that act on the surface of the tooth, tensions that are linearly decreasing with the depth in the contact zone. On the other hand, the parameter that governs the crack fatigue growth in the case of compression stresses field is the stress intensity factor mode II, KII. This paper also presents the KII variation along pitch line with respect to the Hertzian contact stresses, the residual stresses and the crack centre depth of an initial crack in the sub-surface of the spur gear teeth, having different inclination angle *α*. As result of this study, some particular factors favorable to the propagation of the fatigue cracks towards the surface of the gear tooth were identified. The availability of a master curve for a particular material relating fatigue crack growth rate and range of stress intensity factor enables a designer to predict growth rates for any cracked body, and it is not limited to situations similar to those pertaining to the cracked stressed specimen used to generate the original data.

SOME CONSIDERATIONS ABOUT THE INFLUENCE OF THE STRESS INTENSITY FACTORS KIMIN, KIIMAX AND KEQ IN FATIGUE CRACK PROPAGATION IN THE SUBSTRATE OF THE GEAR TEETH

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Keywords: fatigue crack growth, stress intensity factors simulation KI min, KIImax, Keq, Hertzian stresses field, gear teeth

Abstract: The values of the stress intensity factor (SIF) KI are almost always negative in the substrate of the gear teeth, due to the compressive stresses field. The more negative values are higher, respectively, the positive values are lower, the crack faces are more compressed, so the probability of crack propagation after the mode I is lower. Thus, the analysis of the factors leading to the minimum KI values may reveal the conditions that favor the fatigue crack propagation by opening mode. Instead, SIF KII is determinant in the growth rate of the fatigue crack by mode II, in terms of compressive stresses field. Thus, the more KII is higher, the propagation speed is higher, so an analysis of the factors that lead to its maximum value is very useful. The equivalent stress intensity factor Keq corresponds to a mixed-mode of loading and take into account the simultaneous influence of both stress intensity factors KI and KII. The variation of this factor can be used as a parameter of the modified Paris law, in order to study the propagation of the fatigue cracks in the case of mixed-mode loading of

contact area between teeth flanks. SIFs variations were analyzed according to the state of stresses, position on the pitch line between the gear teeth flanks, position and angle of an initial crack in the gear tooth substrate, residual tensions etc.

MONO-OBJECTIVE OPTIMIZATION OF A PHOTOVOLTAIC TRACKING SYSTEM WITH LPF CONTROLLERS

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Keywords: PV system, tracking mechanism, design for control, low-pass filter, efficiency.

Abstract. The work deals with the optimal design of a single-axis solar tracker, which is used to adjust the daily position of a photovoltaic system in order to capture as much as possible solar radiation. The two main components of the solar tracker (the mechanical device and the control system) have been coupled (integrated) in the concurrent engineering concept. For assuring high stability and robustness, the control system is a cascaded two-loop employing LPF (Low-Pass Filter) controllers. The controlled parameter in the main (external) loop is the daily angle of the photovoltaic platform, while in the secondary (internal) loop the linear velocity in the driving actuator is monitored. The mono-objective optimization problem is described in the following way: to minimize the difference between the imposed and current daily angle (thus preserving a high nergetic efficiency of the tracking system), considering the controllers' gains as independent design parameters.

Wavelet Analysis of Humans with Osteoarthritis

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Keywords: wavelet transform, energy level, osteoarthritis knee

Abstract. In this research proposal we want to develop from kinematic data, measures using the wavelets theory to characterize normal and osteoarthritis knee locomotion. The kinematic data of the radio-carpal flexion-extension angles were analyzed using the wavelet transform. The experimental data was acquired with a complex goniometer system. The detail energy for the level 5 is an important factor to characterize the osteoarthritis patients and normal subjects.

ANALYSIS AND PROCESSING OF INDEX TESTS RESULTS AT DOUBLE-ADJUST HYDRAULIC TURBINES WITH A COMPUTER-AIDED DESIGN SOFTWARE

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Keywords: index tests, hydraulic turbine, b-spline, hydraulic efficiency, combinatory cam.

Abstract. The paper presents a method developed and used by the CCHAPT researchers for the graphic plotting of the index tests results for hydraulic turbines, the comparison of the efficiency curves resulted from testing to those obtained by the model transposition i.e. the determination and comparison of the existing combinatory cam with that obtained from tests.
The method presented in the paper was born from the need for processing and presenting the results of index tests within the shortest delay and eliminating the errors that might occur in the results plotting.

VIRTUAL MODELING, DETAIL DESIGN AND FEM ANALYSIS FOR A TESTING DEVICE

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Keywords: Testing device, Detail design, Virtual modeling, Finite Element, Analysis.

Abstract. The paper presents aspects regarding the virtual modeling, detailed design and FEM analysis of a testing device, to be used to fix small pieces in tribological tests. First there are presented some aspects of the device virtual modeling and drafting, using CATIA software. Then are defined the geometrical and kinematical restrictions between the parts. Finally, there are presented some aspects about the Finite Element Analysis and the results of this, using ANSYS software. In the final part of the paper, there are presented the conclusions of the simulation.

MODELING AND SIMULATION OF THE STAND FOR TESTING OF HELICOIDALLY SPRINGS FROM AUTOMOTIVE'S SUSPENSION

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Keywords: stand, helicoidally spring, automotive suspension, modeling, simulation, stress, deformation.

Abstract. In this paper is made a tridimensional model for the stand use for the testing of helicoidally springs from automotives suspension using Solid Works soft. Then, it is realized the simulation for the testing of helicoidally springs. On this 3D-model is realized a dynamic analysis for the stand for obtaining the variation of stresses and deformation for all parts of this stand.

PARAMETRIC MODELING FOR ANALYZING DISEASES OF THE HUMAN SPINE

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Keywords: Geometrical Parameters of the Human Spine, Spine Affections, Graphical Simulation, Spine Diagnose, Parameters of Vertebra, Ideal and Real Model of the Human Spine.

Abstract: The paper presents a graphical simulation system of the human spine developed using integrated MATLAB software. The application is based on real parameters of the human spine that can be modified and personalized during the analysis and all data are reported with respect to an ideal model of the human spine that is also personalized to the patient in cause. Given the fact that the human spine is one of the most complex systems in the human body a high attention must be paid at every aspect of its geometry and motion during the daily activities of the patient, this application enabling the monitoring of the majority of these aspects by analyzing data obtained from a special designed sensor system attached to the patient body.

SIMULATION MODELS OF THE COMPREX TYPE PRESSURE WAVE SUPERCHARGER

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Keywords: pressure wave supercharger, Simulation model, Diesel engine, optimizing

Abstract. In order to efficiently supercharge Diesel engines with pressure wave superchargers it is necessary to correlate the superchargers rotation speed with certain parameters of the supercharged engine. For this purpose, to reduce the research costs and duration, simulation models can be used which help to determine the parameters which have a major impact on the supercharger's rotational speed and efficiency. In this paper there are presented two simulation models: a one-dimensional (made in AMESim software) and a three dimensional (made in Fluent Software). This simulation models offer the possibility to visualize some dynamic phenomenon within the supercharger, like the evolution of the pressure waves or the turbulent flow inside the rotor channels. These phenomena are difficult and expensive to study with conventional methods.

STUDY OF PARTICLE MOTION ON A HELICAL VIBRATING SURFACE

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Keywords: vibrations, vibrating surface, vibratory conveyors, particle motion, particle velocity

Abstract. The helical trough of a vibratory elevator induces, by its helical vibratory motion, a complex behavior to the transported parts. The paper analyses the displacement of a singular plate material particle on the cylindrical helix of a vibratory elevator, by decomposing the particle motion on slide and jump phases, dependent on the functional specific features of the vibratory equipment.

A computer model of the particle motion was developed to study the theoretical average transportation velocity on the helical vibrating surface.

THE 3D VIRTUAL MODEL OF A CLASSICAL HIP JOINT PROSTHESIS

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Keywords: virtual hip, hip prosthesis, finite elements method

Abstract. In this paper the main steps for defining a virtual prosthetic hip are presented. Based on direct measurement method used in first step, each of the hip prosthesis components were generated, one by one, in SolidWorks software. These components were included in the virtual 3D biomechanical hip system. The entire model was divided in finite elements. Starting from this 3D model, the goal of the research is to determine new geometries and optimized solutions for an innovative hip prosthesis. Also, the stress maps for the normal walking in the prosthetic hip were determined.

THE DYNAMIC SIMULATION OF A GEAR. THE CONVEYANCE ERROR ASSOCIATE WITH THE ECCENTRICITY FAULTS

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Keywords: gear, dynamic simulation, vibrations.

Abstract. As is known, the gearing seems the principal excitation source into the components of the power transmission. The momentary movements of pinion driving gear and driven gear are represented by six liberty degrees, three translations and three rotations. The fluctuations of the conveyance error and of the gearing rigidity are the principal causes of the excitations associated to this one. For the conveyance error, it is necessary to tell the consequences of the elastic deformations from the kinematic consequences associated to the gearing of the non-mating profiles. In this paper is presented the simulation of the conveyance error associated to the eccentricity faults. In order to obtain the dynamic response it is suggested the using of the integral Laplace's transform.

VIRTUAL MODEL AND SIMULATION OF THE NORMAL AND AFFECTED HUMAN HIP JOINT

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Keywords: virtual hip, bone models, finite elements method, FEM analysis, affected hip.
Abstract. To generate a virtual human hip is a main goal for our research team. Also, starting from the normal virtual hip joint and using the important orthopedics information was defined the affected hip joint. All these models were generated in a 3D virtual environment starting with Computer Tomograph (CT) scanning images. Using an original method all the scanned CT images were re-defined and re- drawn and transferred to the 3D software. The resulted curves were used to generate the bones and the virtual complex system of both hip joints. With motion and geometric constrains the bio-mechanical assemblies were defined, starting from anatomical information. The normal hip joint and the model of the affected hip were defined and exported to ANSYS, software based on Finite Element Analysis.

INFLUENCES OF VARUS TILT ON THE STRESSES IN HUMAN PROSTHETIC KNEE JOINT

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Keywords: varus tilt, prosthetic knee, virtual model, stresses, finite element method,.
Abstract. In this paper the effects of varus tilt on contact stresses in the three components of total knee prostheses using 3D finite element analysis were investigated. Using Ansys simulation environment, six complex virtual models of human knee joint–prosthesis assembly obtained for six different varus tilts which increase from 176^{o} to 191^{o}, have been subjected to finite element analysis in order to obtain the stress maps and total displacements maps.

INFLUENCES OF ANTERO-POSTERIOR TIBIAL SLOPE ON THE PROSTHETIC KNEE CONTACT STRESSES

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Keywords: virtual knee prosthesis, total knee arthroplasty, finite element method, antero -posterior tibial slope

Abstract: In this paper, using 3D finite element method and starting from the virtual model of the human knee joint-prosthesis assembly, we investigate the effects of antero-posterior tibial slope on contact stresses in the three components of total knee prosthesis. Using AnsysWorkbench15.07 software, the stress and displacements maps are obtained for knee-prosthesis assemblies and for their components, considering two loading force: 800N and 2400N and two cases of prosthetic knee varus slope: 176^{o} and b) 191^{o}. For each prosthesis-knee assembly and for each considered force, two variants of antero-posterior tibial slope were considered: 0^{0} and 5^{0}.

COMPARATIVE STUDY OF CERVICAL CLASSIC SYSTEMS AND TEST DUMMIES BIOFIDELIC OF ROAD ACCIDENTS

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Keywords: mannequins, cervical complex system, anthropometry, shape memory alloys

Abstract. Evolution of accidentology science, computer engineering and systems of data collection and processing has allowed in recent years, development of border areas that make the connection between life sciences and engineering.

This paper tries to prove that this link exists and can be emphasized by using scientific instruments. In recent years, following the development of the automotive industry has increased the need for design and development of systems for testing biofidelity impact of vehicles, since the phase of the virtual model or prototype "zero", with visible effects in improving the safety of road users. In general, it is considered that the development of automotive mannequins to test different types of impact, will lead to continuous improvement of safety of the driver and passengers.

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