SUMMARIES OF ABSTRACTS

1. M. Bachratý; *Faculty of Electrical Engineering, Technical University of Bratislava, Bratislava, Slovakia*
Sound source localization based on tdoa measurements in mobile sensor networks. This paper introduces method for sound source localization in sensor networks based on TDOA (time difference of arrival) measurements. Position of an unknown sound source is computed from relative distance of sensor nodes and TDOA measurements. The model network consists of heterogeneous sensor nodes, each with implemented microphone. Communication between nodes is event based. Each node can sense short sound event (shock, beat, etc.). The simulation results show precision of TDOA method in mobile sensor network.

2. Z. Bakšiová, I. Delyová; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Principal stress separation with strain gages. The paper deals with principal stress separation with strain gages. PhotoStress Separator Gage can be used to provide additional information required to separate the principal strains. From the isochromatic fringe patterns of the coating, the difference of the principal strains $\varepsilon_1 - \varepsilon_2$ at the test point are known. The sum of the principal strains $\varepsilon_1 + \varepsilon_2$ at the same point is measured by PhotoStress Separator Gage. The separate principal strains are obtainable by simply adding and subtracting the two measurements. The measurement is performed on coated specimen.

3. R. Baláž, M. Ádiová, Ľ. Miková; *Faculty of Engineering, Technical University of Košice, Košice, Slovakia*
The motion snake robot in limited space. The most common way of motion, which is chosen for service robots, is the movement of wheels or using passports but they do not allow movement on various ground. To this kind of ground belong ruins of points i, where the space for moving is very limited. Therefore were developed snake robots, that they have the potential moving to offer good mobility on various spaces. They can climb into small cracks or a hole, move in a narrow space. It can cross many obstacles. Snake robots are one of the most suitable robots working in ruins, working in limited spaces.

4. R. Balogh; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Model of the ball-tracing robot. Model of the simple ball-following robot is presented. The robot with a camera follows a white ping-pong ball, trying to hold its position in the centre of the camera image. Using the classical control theory we try to explain and predict the behaviour of the mobile robot controlled by an agent-space architecture controller. Some problems with different control algorithms are described, design of the simple feedback proportional controller is compared with the agent-space architecture. With such simple model of the robot we can successfully describe its behaviour and moreover we can predict its changes depending on parameter modification.

5. P. Bigoš, M. Puškár; *Faculty of Mechanical Engineering, Technical University in Košice, Košice, Slovakia*
Application of mechatronic principles in monitoring of output and working combustion engine parameters. The main purpose of presented article is an on-line monitoring of output and working parameters for combustion engines. The developed Engine Watch and Control System – EW&C scans and stores information during an engine operation (in real conditions, in real loading). This device makes possible to diagnose combustion engine parameters: an output and a torque with their behaviours, a temperature of exhaust system with its behaviour, detonating strokes and their number per time unit and other characteristics. A number and a kind of scanned parameters are related to the types and a number of sensors, which are installed on engine.

6. J. Bocko, P. Frankovský, A. Kostelníková, E. Ostertagová*, O. Ostertag; *Faculty of Mechanical Engineering, Faculty of Electrical Engineering and Informatics Technical University of Košice, Košice, Slovakia, * Faculty of Electrical Engineering and Informatics, Technical University of Košice, Košice, Slovakia*
Structural design and photoelasticimetric verification of landing gear of ultralight aircraft. Precondition for the realization of aircraft's landing gear is its structural design, computation of strength as well as its verification by experimental methods. Strength computations were realized by the finite element method and the experiment was performed by means of transmission photoelasticimetry.

7. A. Bokota, T. Domański, L. Sowa; *Institute of Computer and Information Sciences, Institute of Mechanics and Machine Design, Czestochowa University of Technology, Częstochowa, Poland*
Numerical analysis of mechanical phenomena in the hardening process of a steel element. In this paper the field stresses and strains are obtained from solutions by FEM equilibrium equations in rate form. The stresses generated during hardening were assumed to result from thermal load, structural deformation, and plastic deformation and transformation plasticity. Thermophysical values in the constitutive relations are depended upon both the temperature and the phase composition. Condition Huber-Misses with the isotropic strengthening for the creation of plastic strains is used. However model Leblond to determined transformations plasticity applied. The analysis of phase fractions, stresses and strain associated deep hardening of elements made of tool steel were done.

8. A. Bokota, W. Piekarska*; *Institute of Computer and Information Sciences, Czestochowa University of Technology, Czestochowa, Poland, * Institute of Mechanics and Machine Design, Czestochowa University of Technology, Czestochowa, Poland*
Numerical modeling of residual stresses in a dual laser beam welding. In the paper a numerical model of the stresses and strain in the dual laser beam welding of steel sheets are presented. The phase transformation model is based on the continuous cooling transformation diagram plotted for steel welded, as well as on the Avrami, Koistinen and Marburger equations. The stresses are determined with the use of the plastic flow law with the linear-isotropic material and Huber-Mises plasticity condition. In the model the phenomenon of the transformation plasticity and the thermomechanical parameter changes of material as a function of phase contents and temperature are considered.

9. I. Delyová, O. Ostertag, P. Sivák, *Faculty of Mechanical Engineering, Košice, Slovakia*
Distortion isochromatic stripes at the surrounding of stress concentrators. This paper deals with a problems of study a little details in photoelasticity, with a rise a shade effect by using a classical refDDlect photoelasticity and with problem of illumination a little details by using of this method. Paper shows ways of solving this problems using a plane photoelasticity or using of reflex photoelasticity with a mirror-type beamsplitters.

10. I. Delyová, O. Ostertag, P. Sivák; *Faculty of Mechanical Engineering, Technical University of Košice, Slovakia*
Principal stress separation with strain gages. The article deals with fatigue life evaluation. Life span estimation was always the object of an intensive research and is as that today as well. The article introduces a method of evaluation life span using STN 73 1401 standard, which states when it is required to evaluate on fatigue.

11. M. Denk, J. Korf, M. Šír; *Faculty of Mechatronics, Informatics and Interdisciplinary Studies, Technical University of Liberec, Liberec, Czech Republic*
Robotized chassis. The presented work has been realized as a contribution to the research concept *"Optimalization of machine properties in interaction with working processes and human aspects"* and deals with a robotized chassis for social/medical applications with an ambition to assist to develop a mechanism providing a free motion to disabled person in a heavy terrain. The problem solution was divided in two parts, one dealing with a mathematical model (author M. Denk) and second one which deals with a design of a combined chassis leg (author J. Korf). The paper also contains complete model in CAD system and preliminary simulation in MSC ADAMS. Specification of servo drives including control units and scheme of connection are mentioned too.

12. T. Domañski, A. Bokota*; *Institute of Mechanics and Machine Design, Czestochowa University of Technology, Częstochowa, Poland, * Institute of Computer and Information Sciences, Czestochowa University of Technology, Częstochowa, Poland*
Numerical model of thermal phenomena and phases transformation of the tools steel hardening process. The model hardening of tool steel takes into considerations of thermal phenomena and phase transformations in the solid state is presented. In the modelling of thermal phenomena the heat equations transfer has been solved by Finite Elements Method. The chance of analyse thermal phenomena of hardening has been obtained in this way. The graph of continuous heating (CHT) and continuous cooling (CCT) considered steel are used in the model of phase transformations. Phase altered fractions during the continuous heating (austenite) and fractions ferrite, pearlite or bainite are marked in the model by formula Johnson-Mehl and Avrami. Equation and modified equation Koistinen and Marburger identify the forming fraction of martensite. In this way the derived model for evaluating phase fraction and kinetics of transformation in heating and cooling processes were verified.

13. P. Drahoš, V. Kutiš; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology Bratislava, Bratislava, Slovakia*
Transient electro-thermal analysis of sma actuator. The subject of research is the Shape Memory Alloy (SMA) actuator from Nickel–Titanium (NiTi) wire. SMA converts thermal energy to mechanical work by the change of lattice structure so-called thermoelastic martensitic phase transformation. The thermal actuator from NiTi wire is heated by electric resistance heating and cooled by natural air-cooling. The NiTi wire near the crimp is more cooled like the rest of the wire, because of thermal conduction to the crimp. The SMA actuator can lose power in this part. The goal was to perform transient FEM electro-thermal analysis in program ANSYS as coupled analysis, where the main focus is put on the influence of crimps which could cause malfunction.

14. M. Fabian, E. Spišák, J. Šeminský, M. Dovica, P. Ižol; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovak Republic*
Cam parameters setup and milled concave and covex surface quality. Application of CAx technology in the process of R&D and production of products brought expansion possibilities of machining strategies. Cutting conditions made by speed rate spindle speed are still key parameters, which affect the quality of machining surface. CAD / CAM systems and CNC manufacturing centers too offer new possibilities by means of we are able to affect the quality of the manufactured surface too. These options include the choice of tool path strategy, option one or two-way machining and new parameters, which have directly effect to manufactured surface quality. Especially setting the value of the parameter MSH (Maximum Scallop Height) in the CAM system is significant, which is in practice measurable as Rz, which is the Average Maximum Height of the Profile.

15. P. Ferfecki, P. Židlík, B. Strnadel, R. Bonček, J. Brumek; *Structural Integrity & Materials Design, VSB – Technical University of Ostrava, Ostrava, Czech Republic*
Numerical evaluation approaches for fracture surface of drop weight tear test specimens. Drop-weight tear test (DWTT) is the one of the principal test method used to assess the level of toughness of the thick steel sheets intended for manufacturing of pipeline steels. After a break in the specimen by hammer strike, the percentage of ductile fracture (PDF) is determined from fracture surface. The PDF is subjectively assessed and measurement carries substantial error. New methods were developed for objective assessments of the PDF that are tested on several specimens of X70 steel. The usage of newly designed methods shows as much as 20 % higher accuracy compared to results of subjective assessments.

16. P. Ferfecki, Z. Poruba*; *Structural Integrity & Materials Design, VSB – Technical University of Ostrava, Ostrava, Czech Republic; *Department of Mechanics, VSB – Technical University of Ostrava, Ostrava, Czech Republic*
Numerical investigation of impacts between the rotor and auxiliary bearing of a cracked rotor system supported by radial active magnetic bearings. The article deals with the mathematical modelling of cracked rotor systems impacts supported by radial active magnetic bearings (AMBs). In the computational model the radial AMBs and impacts are incorporated by means of a nonlinear force coupling. The presence of a fatigue crack in a shaft is introduced in the motion equation by a nonlinear local flexibility matrix. Breathing of the transverse crack is considered by the status of a stress intensity factor computed along the crack edge. The influence of crack depth in the impact response of a rotor system is carried out by means of numerical simulations.

17. J. Filas, A. Ambrúzs; *Faculty of Mechnical Engeneering, Technical University of Košice, Košice, Slovakia*
Elevator machinery dynamic analysis. The article features design of dynamic calculation model for mechanic system of elevator machinery drive. For task solution method of mass and force reduction is used. For illustration and to verify the method and solution outcomes dynamic calculation model is applied on real mechanical system. In conclusion suitability of method used for elevator machinery analysis is discussed.

18. V. Fliegel, R. Martonka; *Faculty of Mechanical Engineering, Technical University of Liberec, Liberec, Czech republic*
Automobile seats – energy method measurement. Topical automobile seats goes through development innovation, her main aim is raise theirs safeness and comfort. Safeness automobile seats is subjective to punctually rules-norm, which are all the time stricter. Their performance is monitored special laboratories (e.g. Thatcham). Comfort seats is partly limited norms, e.g. acceleration or transmission, contact pressures. But very nameless feeling – subjective comfort of each of person. Nevertheless this subjective for everyone individual feeling has correlation with objective measurable parameters. Feeling tiredness rises on base incidence quite real mechanical vibration, only is need find correct correlative terms and coefficients. Once from methods comfort assessment automobile seats is energy method, gives possibility peep on this problems from look power structures and flows.

19. F. Fojtík, J. Fuxa; *Faculty of Mechanical Engineering, VSB - Technical University of Ostrava, Ostrava, Czech Republic*
Application conjugated strength criterion fit for the fatigue combined loading of material. The paper descreibes the experimental results for the combined loading of the specimen manufactured from the construction steel 11523. The first set of the specimen was loaded by the alternating torque amplitude. The second set was loaded by the alternating amplitude of the bending moment and the third set of specimen was loaded by the combination of the bending moment and of the torque for two slants of 30 and 60 degrees in the conditions of the alternating cycle. The conjugated strength criterion was applied on the experimental results. The required input parameters for the conjugated strength criterion were obtained from the stress-strain analysis of the specimen by the finite element method in the software ANSYS. The tests were performed on the adjusted testing device equipped by the special fixative jaws.

20. P. Frankovský, A. Kostelníková, P. Šarga; *Faculty of Engineering, Technical University of Košice, Košice, Slovakia*
The use of strain-gage method and photostress® method in determining residual stresses of steel console. The article deals with the issue of determining the residual stresses while buckling the steel console whereby hole-drilling methods are used. The goal of these methods is to determine the changes of stresses, or strains which result during drilling a small hole into some object with residual stress in it. The change of stress or strain on the steel console was determined by use of strain-gage method and PhotoStress® method. In case of strain-gage method a strain gage 1-RY21-3/120 was used when drilling the hole of appropriate depth into the console. When using the PhotoStress® method a photoelastic coating PS-1 was applied. Then, a hole was drilled through the coating until material of console was reached. Following step was to determine released residual stress by use of polariscope LF/Z-2. The values of residual stresses that have been determined by strain-gage method and PhotoStress® method are to be found at the end of this article.

21. K. Frydrýšek, H. Gondek, P. Marek*; *Faculty of Mechanical Engineering, VŠB-Technical University of Ostrava, Ostrava, Czech Republic, * Institute of Theoretical and Applied Mechanics Academy of Sciences of the Czech Republic, Czech Republic*
Hard rock disintegration process (deterministic and probabilistic approach). This paper focuses on a numerical analysis of the hard rock (ore) disintegration process. The bit moves into the ore and subsequently disintegrates it. The disintegration (i.e. fracture of the ore) is solved via deterministic approach (FEM) and probabilistic approach (FEM in combination with the Simulation-Based Reliability Assessment method, i.e. Monte Carlo simulations,

stochastic inputs). The ore is disintegrated by deactivating the FE which satisfy the fracture condition. The results are compared with experiments. Application of the SBRA method in this area is a new and innovative trend. Finally, the probabilistic reliability assessment is proposed.

22. V. Fuis, T. Profant; *Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic*
Calculation of the bioceramic material parameters from the destructions of the hip joint endoprostheses heads. The paper deals with calculation of the parameters of bio-ceramic material from a set of destruction tests of ceramic heads of total hip joint endoprostheses. The standard way of calculation of the material parameters consists in carrying out a set of 4-point bending tests of specimens cut out from parts of the ceramic material to be analysed. In case of ceramic heads, it is not possible to cut out specimens of required dimensions because the heads are too small. Therefore a special testing jig was made, in which 40 heads were destructed. From the measured destruction values of circumferential strains of the head's external spherical surface, the state of stress in the head under destruction was established using the final elements method. From the values obtained, the sought for parameters of the ceramic material were calculated using Weibull's weakest-link theory.

23. V. Fuis, T. Profant, L. Houfek, P. Janíček; *Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic*
Influence of the shape deviations of the head and stem cones of hip joint endoprosthesis on the tensile stress in the head. The failure of the hip joint endoprosthesis ceramic head has always traumatic consequences for the patient, since a part of or even the whole endoprosthesis has to be re-operated. Hence, it is desired to reduce the number of implant re-operations to the minimum. Therefore the computational modelling of the stress of the head was realised under ISO 7206-5 loading. The shape deviations of the ideal contact cone areas of the head and stem are parameters that significantly influence the tensile stress in the head and its reliability. The assumed shape deviations of the head's and stem's cones are macro shape deviations (different cone taper) and micro shape deviations (unevennes) measured using the IMS-UMPIRE equipment. The stress state in the ceramic heads was solved using the FEM and head's failure probability is based on the Weibull weakest link theory.

24. V. Fuis, T. Profant, P. Ždímal, J. Venclík; *Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic*
Stress and deformation analyses of the photovoltaic power plant construction. Photovoltaic power plants represent an alternative and environment friendly source of electric power. Their contribution to the protection of climate and environment is not insignificant. Conversion of solar energy to electricity is environmentally pure, as it does not product any toxic waste, gas, fly ash or noise. The paper presents the results of the analysis of the optimization of the photovoltaic power plant construction with regard to its weight (maximum weight of the plant construction – without photovoltaic panels – must not exceed 50 tonnes) while ensuring that the construction is safe against the plasticity of the construction and the loss of buckling stability of steel rods.

25. P. Girovský, J. Timko, J. žilková; *Faculty of Electrical Engineering and Informatics, Technical University of Košice, Košice, Slovakia*
Modelling of neural network speed estimator for field oriented control of induction motor. This paper considers the problem of speed estimation, based on neural modelling approach, in the shaft sensorless field oriented control structure with the induction motor. Will be presented some types and configuration of neural network for estimation of angular speed of induction motor. Properties of proposed neural estimators have been together comparing. Consequently we are chosen most suitable type and configuration of neural network for testing neural estimator in field oriented control. Structures of the ANN estimators are based on measurable motor variables: components of stator current and voltage in rotating system x, y. For suggestion and testing of speed neural estimators was used MATLAB/Simulink.

26. A. Gmiterko, D. Hroncová; *Faculty of Mechanical Engineering, Technical University Košice, Košice, Slovakia*
Generation of state equations from a bond graph diagram of the system. In this paper the method of generation of system equations is discussed. From a bond graph diagram of the system, using a step-by-step procedure, system equations may be generated. As a starting point a model of a simple single degree of freedom mass-spring-damper system is taken. The differential equations describing the dynamics of the system are obtained in terms of the states of the system.

27. A. Gmiterko, D. Hroncová; *Faculty of Mechanical Engineering, Technical University Košice, Košice, Slovakia*
Introduction to modeling mechanical systems using bond graphs. The work shows the use of Bond Graph formalism for modeling dynamic systems. As an example a mechanical model of 1 DOF is solved by this approach at the level of its physical behavior. In contrast with the classical method, where the equations for individual components are created first and then the simulation scheme is derived on their basis, the described method uses the reverse procedure.

28. M. Gorzás, M. Dovica, S. Slosarčík; *Faculty of Mechanical Engineering, Technical University Košice, Košice, Slovakia*
Concept of in-pipe inspection minimachine. This paper presents a concept of in-pipe minimachine designed to move in the pipes with the inner diameter less than 25 mm. The minimachine consists of three modules, each driven by linear screw actuator. The principle of the movement is based on the change in the distance between the minimachine modules in the front and at the back. The direction of its movement in the pipe is determined by the pressing of bristles of the module in the front or at the back. The paper describes mechanical and electrical concept, and software solution of the control of the minimachine.

29. R. Grepl; *Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic*
Multi-model based online parameter estimation applied to system with significant dry friction. The small electromechanical actuators (usually with DC motors) play an important role in automotive industry. Due to low cost mass production the mechanical properties of designed drive systems are relatively poor and thus e.g. dry friction nonlinearity is significant. The linear control algorithm such as PID or LQR cannot be successfully used and the nonlinear compensators are of interest. Usually, such compensators require the knowledge of system parameters which can be time variant. This paper deals with model-based algorithm for online parameter estimation. The bank of models with perturbed parameters is computed in real-time. Using the input-output comparison of MSE the best model candidate is selected and its parameters are used in nonlinear friction compensation algorithm. Simulation results are presented in this paper.

30. R. Halama, Z. Poruba*; *Department of Mechanics of Materials, VŠB - Technical University of Ostrava, Ostrava, Czech Republic, * Department o Mechanics, VŠB - Technical University of Ostrava, Ostrava, Czech Republic*
A cyclic plasticity model for nonproportional loading effects description. Plasticity models included in commercial FEM software are not able to describe well such cyclic plasticity effects as multiaxial ratcheting or cyclic hardening caused by nonproportional loading. This problem is presented in the contribution on an example of experimental data of 316L steel which embodies the mentioned behavior of some steels. For this numerical study the experimental data published by Portier et al. [Int. J. Plasticity 16 (2000) 303] were adopted. There are tested the kinematic hardening rules proposed by Besseling, Chaboche and AbdelKarim-Ohno in the contribution. For the proposed modification of AbdelKarim-Ohno model the markedly better agreement with experiments is achieved. The way of implementation into a FE code of the proposed material model is described at the end of the contribution.

31. R. Halama, F. Fojtík, J. Brumek, M. Fusek; *VŠB - Technical University of Ostrava, Ostrava, Czech Republic*
Cyclic plasticity behavior of st52 steel and its fe prediction. The contribution deals with the simulation of stress-strain response of the steel Fe52C in the cyclic plasticity domain. The deformations in realized tests were measured using axial extensometer and by the digital image correlation method. The phenomenon of ratcheting (or cyclic creep) was experimentally studied under proportional and nonproportional loading. The results obtained by simulations performed with the Chaboche model show very good ability to predict the accumulated plastic strain.

32. M. Handrik, L. Jakubovičová, P. Kopas, M. Sága; *Faculty of Mechanical Engineering, University of Žilina, Žilina, Slovakia*
Analysis of microplastic areas near graphite particles of nodular cast iron loading bellow yield stress. The amount and morphology of the graphite phase largely controls the resulting properties of cast iron. Goal of this paper is a quantification of microplastic areas near graphite particles by FE analysis. Computational analysis was performed bellow yield stress for ferritic matrix with casual shape of graphite particles.

33. L. Hargaš, M. Hrianka, J. Lakatoš, D. Koniar; *Faculty of Electrical Engineering, University of Žilina, Žilina, Slovakia*
Heat fields modelling and verification of electronic parts of mechatronics systems. Paper deals with simulation and verification of heat relations in DC/DC converter as a part of various mechatronics systems. Results of simulation were compared with values obtained by measurement with virtual instruments. Measurements were made at various operating conditions of DC/DC converter.

34. L. Horný, H. Chlup, R. Žitný, T. Adámek*;** *Faculty of Mechanical Engineering Czech Technical University in Prague, Prague, Czech Republic, * Third Faculty of Medicine, Charles University in Prague, Prague, Czech Republic, ** Institute of Thermomechanics, Czech Academy of đScience, Prague, Czech Republic*
Constitutive modeling of coronary artery bypass graft with incorporated torsion. The aim of this study is to describe mechanical response of coronary artery bypass graft (CABG). Attention was paid to sensitivity of a model to small torsions superimposed to an inflation and extension of an artery. The inflation-extension test was performed. A presence of torsions was proved via displacements analysis based on digital image correlation. CABG was modeled as nonlinearly hyperelastic, anisotropic and incompressible material with thin-walled cylindrical geometry. A strain energy function based on limiting fiber extensibility was used. Estimation of material parameters led to good agreement between the model and observations. It was concluded that the model is insensitive to small torsions superimposed to inflation-extension of the artery.

35. J. Hrabec, P. Jura, F. Šolc, P. Honzík; *Faculty of Electrincal Engineering and Communication, Brno University of Technology, Brno, Czech Republic*
Modelling and control of bi-steerable wheeled mobile robot. The paper presents a kinematic model of bi-steered wheeled mobile robot (also referred to as pseudobicycle) and briefly describes a design of control algorithm suitable for set-point stabilization and trajectory tracking. Performance of the algorithm is presented on simulations.

36. M. Hrianka, J. Lakatoš, L. Hargaš, D. Koniar; *Faculty of Electrical Engineering, University of Zilina, Zilina, Slovakia*
Modeling, simulation and verification of heat transfer in power transistor cooler. The contribution includes modeling, simulation, and practical verification of the spread of heat in the cooler with the power electronic devices of DC / DC converter. Modeling and simulation of the spread of heat was carried out in COMSOL Multiphysics. When dealing with differential equations is the finite element method. Results of simulation were compared with values obtained thermovision measurement. Measurements were made at various operating conditions of DC / DC converter.

37. P. Hubinský, L. Palkovič; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Stop point prediction in portal crane control design. This article is concerned with using input signal shapers to dump residual oscillation and prediction and indication of the delayed positioning caused by these shapers.

38. V. Ivančo, A. Ďuricová; *Faculty of Mechanical Engineering, Technical University Košice, Slovakia*
Influence of geometric imperfections on resistance of long cylindrical shell. The paper deals with resistance assessment of vertical thin-walled cylindrical shell loaded by external pressure and axial compression due to self-weight. Dimensions of the shell (height of 120 m, internal diameter of 1600 mm and wall thickness of 3 mm) correspond to the real flue lining made of weathering steel. The influence of different shapes of initial geometric imperfections on collapse state is studied. The results of geometric and materially non-linear finite element method (FEM) analyses show large differences in stress and deformation state while collapse loads differ neglectable for all imperfections studied. Conservative results were obtained for imperfection shapes defined as normalized first linear buckling mode.

39. J. Ivanka; *Faculty of Applied Informatics, UTB in Zlin, Zlin, Czech republic*
Sensors in commercial safety industry and in mechatronics systems. It is evident that commercial safety industry cannot do without automation. Typical of the current status of automation in commercial safety industry is the introduction and use of computer technologies controlling the individual safety systems. Up-to-date safeguarding technology would be impossible without computerized control systems. A fact which is often overlooked and ignored in this context is that computer techniques would be useless without sensors, which provide the computer with information regarding the state of the environment. This paper is an outline of the area of ultrasonic sensors, their basic properties with emission characteristics and narrow-band sensors, ultrasonic detection and its uses in the commercial safety industry and automation.

40. J. Jezný; *VVU ZTS, a.s., Košice, Slovakia*
Pyrotechnical robots. The paper deals with pyrotechnical robots, which are dedicated for bomb removing, inspection for dangerous objects and for offensive against terrorists. The robots are remote-controled via teleoperator. Robots are also useable as combat robot. These robots are used with police and combat forces.

41. L. Jurišica, F. Duchoò; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Landmarks detection with laser scanner. In mobile robotics are laser scanners typically used for creating environment representation, thus environment map. For inteligent navigation of mobile robot is useful to detect some significant properties of the environment. These significant properties can be detected landmarks in environment such as corners or doors. This paper deals with landmarks detection (especially corners) with laser scanner.

42. J. Kardoš; *Faculty of mechanical engineering, Technical University of Ostrava, Ostrava, Czech republic*
A simple remedy for the oscillating torque feedback in force control. The contribution deals with the problem of an undesirable (oscillating) influence of the inherent torque feedback in the fixed target force control. A precise analysis and complete synthesis method of an effective control algorithm in frequency domain is presented. Using the inner state variable control loop, an easily implementable control structure has been achieved. The efficiency of the proposed control approach is verified by numerical simulation.

43. L. Kárník; *Faculty of mechanical engineering, Technical University of Ostrava, Czech republic*
The prototype of modular robots for manipulation task, monitoring and 3d metrical data capturing. The article presents model of the detection modular robot on belt chassis and service robot prototype, intended for gathering and processing the 3D metric data in real time, including monitoring tasks. Shape, function and basic characteristics of the robots rise from the demands for service robots, customized for applications in urban areas. Robots can fulfill a batch of service task with specialization on manipulation with objects, transportation, 3D metric data capturing and monitoring in the outdoor environment. MSC/ADAMS simulations and analysis was performed on the robots model and these will be compared with real prototype performance. Prototype's operational and control systems will be tested as well as riding parameters and video transmission, etc. Testing will be done on specially crafted polygons during performance of the selected concrete service tasks in real environment.

44. M. Kelemen, T. Kelemenová; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Displacement amplifying systems in mechatronics. Many actuators used in mechatronics application have very small displacement. There are a lot of application where is necessary large displacement. Consequently, there is a place for amplifier for displacement of actuator. The paper deals with displacement amplifying systems. Presented taxonomy of the displacement amplifier shows the possible solution of mentioned problems.

45. M. Kelemen; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
In-pipe micromachine based on inertial stepping principle. This paper describes the in-pipe micromachine which locomotes via innertial stepping principle. Inertial stepping principle is generated with crash of two masses. The micromachine is composed of a electromagnet, a permanent magnet, a adjusting unit, a guide rod, a damping spring and bristles. The steady velocity is 15 mm/s (in vertical pipe) and 20 mm/s (in horizontal pipe). These velocities have been measured in the glass pipe with inner diameter 12 mm. The micromachine diameter is 10 mm, length is 45 mm and weight is 10 g.

46. T. Kelemenová; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Geometric deviations of inner pipe surface. This paper describes methods of measurement of the inner diameter of pipe and measurement of geometric deviations of inner pipe wall. Geometric deviations consist of deviation of the dimension, deviation of the shape, deviation of the position and roughness. Measurement of these geometric characteristic of inner pipe wall are very complicated mainly in small dimensions (under the 50 mm of inner diameter). The paper describes measurements in new unused pipes and used pipes from heat exchangers, boilers, steam generators etc.

47. T. Kelemenová, M. Kelemen; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Wheeled in-pipe machine locomotion. The paper deals with wheeled in-pipe micromachine which locomotes in pipes with inner diameter from 36 to 38 mm. The micromachine is driven with DC motor. Prototype of micromachine has several weaknesses, which causes falling-off micromachine performance properties. There is analysing of possible ways how to improve these prototype properties via mechatronics approach.

48. M. Kľúčik, T. Sedlár; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Mechatronical device for training of the servicedogs II. This article describes the design process of the electronic control system for mechatronical device for training of the service dogs. Basis for the design of arbitrary mechatronical system is the analysis of the requirements, which are proposed to functionality and reliability of the system. The requirements analysis leads to determination of the basis solution concept. In the detail determination process of the solution was the virtual model with advantage used. Object of model design was the energy subsystem, communication subsystem and the control subsystem for mechanics. The virtual model and obtained knowledge from this model was frame for documentation and manufacturing of the device.

49. W. Kolarčík, Z. Franc, V. Rak, P. Novák; *HYDROSYSTEM project a.s., Olomouc, Czech Republic*
Computational modelling and experimental measurements of the three-phase flow. The paper deals with hydraulic transport of thin slurries. Based on mathematical modelling of three-phase flow, dynamic properties of the systems for pumping of thin slurry (water, silica sand and air) are solved. Theoretical calculations were experimentally verified in the testing laboratory. The results of the computational modelling and the technical experiment are presented in the paper.

50. Z. Konečný; *Mechanical Engineering, VŠB Technical University of Ostrava, Ostrava, Czech Republic*
Solution of inverse problem of kinematics in the pro/engineer system. There are two basic problems in kinematics of mechanisms. The direct problem, when single joint variables are known and the position and orientation of the mechanism effector are being found. If the starting position with the inverse problem is known, it is necessary to define joint variables of required position for single joints. The CAD system Pro/ENGINEER has at its disposal tools for solving mechanisms of kinematics. During creating the robot assembly, it is possible to define joints and thus create the mechanism. This mechanism can be analyzed, and results of this analysis, measures in the form of graphs or numeral values, can be used for example for the inverse problem solution. At the sample of a robot structure with three degrees of freedom (Rotation, Rotation, Translation), the inverse problem, calculation of joint variables at movement of effector robot along the line, are solved. The method Top Down Design is also used for creation of the model.

51. D. Koniar, L. Hargaš, M. Hrianka, V. Bobek, P. Drgoòa, P. Fibich; *Faculty of Electrical Engineering, Department of Mechatronics and Eletronics, University of Žilina, Žilina, Slovakia*
Kinematics analysis of biomechanical systems using image analysis. Paper deals with sophisticated kinematics analysis of biomechanical systems using videosequences acquired by light transmission microscopy. Due to special character of objects, their motion parameters, such as frequency, trajectory, position and velocity are obtained using combination of main imaging DSP tools. Our attention focuses on cilia – biomechanical system of respiration epithelium.

52. J. Kronek, R. Žitný, L. Horný, H. Chlup*, M. Beran;** *Faculty of Mechanical Engineering Czech Technical University in Prague, Prague, Czech Republic, * Institute of Thermomechanics, Czech Academy of dScience, Prague, Czech Republic, ** Food Research Institute, Prague, Czech Republic*
Mechanical properties of artery-artery connection based upon transglutaminase cross-linked gelatin. The possibility of surgical repairing of blood vessels by biocompatible adhesive represents an alternative to the conventional sewing techniques. The aim of our study was to evaluate mechanical properties of arteries glued by a cross linked gelatin. Series of quasistatic uniaxial tensile tests of two overlapping arterial strips bonded by the two component glue (gelatin linked by the enzyme transglutaminase) was carried out. The 3D digital image correlation system gave local deformations, and thus the mutual slipping of the bonded strips could be evaluated. The effect of TGA and gelatin concentrations were estimated on the basis of observed data. Recorded maximum stresses were rather small (only tens of kPa). However, cross-linking activity on contact surfaces was proved histologically.

53. M. Kubiak , W. Piekarska; *Institute of Mechanics and Machine Design, Czestochowa University of Technology, Czestochowa, Poland*
The influence of chosen hybrid laser – arc welding parameters on a weld shape. The results of investigation into the influence of chosen parameters on a weld shape in hybrid laser – arc welding process are presented in this paper. Some hybrid welding parameters, such as: relative arrangement of the laser and the arc and laser-to-arc distance, were analyzed during computer simulations of this process. The temperature and velocity fields were simulated on the basis of the transient heat transfer equation and Navier – Stokes equation. The JMA, Koistinen-Marburgeržs models and the CCT diagram were used to obtain the phase transformations in the solid state. The temperature and velocity distribution with marked fusion zone and the heat-affected zone were presented.

54. V. Laš, P. Mìš ánek, A. Rustamov; *Faculty of Applied, Sciences, University of West Bohemia, Pilsen, Czech Republic*
Change of composite stiffness under cyclic loading. The paper deals with the stiffness decrease of unidirectional carbon-epoxy reinforced plastic called PANEX. To observe changes in stiffness versus the number of applied cycles the flexural test method was developed. Tests were carried out using simple rectangular specimens for several stress amplitudes; stress ratio ranging from 0.02 to 0.06. The methodology of test evaluation (including FEA simulation) is described. The mathematical model to predict stiffness decline was established based on the empirical results. This empirical model can be further employed in complex micromechanical models to predict composite lifetime.

55. R. Melicher; *Faculty of Mechanical Engineering, University of Žilina, Žilina, Slovakia*
Plastic deformation analysis of aluminum during ecap process. The objective of this paper is to evaluate the accumulative effective plastic strain and effective stress induced by equal channel angular pressing (ECAP) in the aluminium workpiece. Another analyzed quantity is the pressing force acting on

the workpiece after five passes in route C at room temperature using the finite element method (FEM). For this purpose two-dimensional model was developed using a plane strain condition. Created model was assumed as isothermal with frictionless condition during constant pressing speed. The deformation behaviour was studied using the commercial finite element software ADINA.

56. L. Melzerová, P. Kuklík; *Faculty of Civil Engineering, CTU in Prague, Prague, Czech Republic*
Statistical research of mechanical properties of glued laminated timber beams. Twenty beams from the glued laminated timber were subjected to the bending tests. Displacements and some local modulus of elasticity were measured during loading. Local modulus of elasticity in the fibres direction was tested in the 1448 places independently on the loading. Results both tests of local E are the same. Precisely according to experiments are made 2D isotropic FEM models of twenty beams with in segments constant E. The agreement between experiment and calculation is excellent.

57. P. Michalik, V. Molnár, G. Fedorko, I. Ristović*; *Faculty of Mining, Ecology, Process Control and Geotechnology, Technical University of Košice, Košice, Slovakia, * Faculty of Mining and Geology, University of Belgrade, Belgrade, Serbia*
Measurement of compressive forces on the rolls of a pipe conveyor by action various tensile forces in a conveyor belt. The paper deals with measuring of compressive force on rolls of a pipe conveyor by acting of various tensile forces in a conveyor belt.

58. Ľ. Miková, R. Baláž, M. Ádiová; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Options of constructive solutions flywheel undercarriages mobile service robots. Spectrum of request setting on mobile service robots is large. Right choices undercarriage is one of general tasks at early design of mobile service robot. At early analysis of design is necessary a complete knowladge all input parameters and deamands of funktion along with enviroment in which the system will work. Wheeled undercarriage are one of most often chosen form of locomotion in the present. In consideration of large scale theirs applications, in the technical practice is possible find variously constructive solution of this undercarriages.

59. V. Mostýn, P. Novák, T. Kot; *Faculty of Mechanical Engineering, VŠB – Technical University of Ostrava, Ostrava, Czech Republic*
Application of virtual reality for verification of driving properties of mobile robots. The paper deals with application of virtual reality in mobile robotics, during the prototyping phase of development. Virtual reality has been programmed as a computer graphical application and is used to simulate complex behaviour of designed mobile robots, in various conditions and with different properties. The system can be used to discover or verify driving abilities of the proposed mobile robot undercarriage defined by its kinematics structure and dimensions by performing real-time rides in virtual testing environments with various terrains and natural or human-made obstacles. The camera subsystem and control system of the mobile robot are also simulated, making the simulation complete, so that the controlling and navigation of the virtual mobile robot behaves the same as for the real robot. The software application is written in C++ and is using Direct3D for graphics rendering.

60. V. Mostýn, P. Novák, T. Kot, M. Mihola, V. Krys; *Faculty of Mechanical Engineering, VŠB – Technical University of Ostrava, Ostrava, Czech Republic*
Simulation model of manipulating arms of the service robot. The contribution deals with methods and tools that are available for building of the virtual prototypes of complex mechatronic models of the robot arms, including drive and control subsystems. The simulation of the whole mechatronic system behavior is performed and results are compared with measurements on the physical prototype of the robot.

61. J. Murín, T. Sedlár, M. Kľúčik, V. Goga; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Mechatronical device for training of the service dogs I. Modelling and design of the mechanical part of the mechatronical device for training of the servise dogs will be presented in this contribution. Softwer ADAMS has been used for creating the virtuall prototype of this device. The mechanical part has been equiped by electronical control system. Prototype of this device was designed and manufactured at the Department of Mechanics and Institute of Control and Industrial Informatics of the FEI STU in Bratislava. The technical documentation was created for manufactoring, and the patent application was reached.

62. T. Náhlovský; *Faculty of Mechatronics, Informatics and Interdisciplinary Studies***,** *Technical University of Liberec, Liberec, Czech Republic*
Linearized model of steam reheating unit realized by fuzzy nets. This paper presents a possibility of modeling the projected steam reheating process. The model is based on the Takagi-Sugeno fuzzy models (TSFM). The steam reheating unit model is in the fact the full nonlinear with distributed parameters in space. Computing time can be very long in this case. The simplification tendency of nonlinear model is ranked among main reasons of using the fuzzy nets approach. This can be useful in developing of new control algorithms. The identification is done for nonlinear model of technological unit and the identification process is made on power level 70-100%. Obtained transfer functions have order N with various time constants and gains. The power level and changes of input variables are loaded to the TSFM. The output temperature is generated via transfer function with variables parameters, which are obtained from output of fuzzy blocks. The results are compared with a full nonlinear model and are presented.

63. L. Novotný; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Finite element method employement to obtain material properties for elasto-plastic simulations. A finite element method is employed to obtain material properties for application of Von Misses elastic–plastic material model. Finite element model of tensile specimen was constructed using plane element. Iterative solution to get stress-strain curve from experimental data utilize finite element method. Example of solution result is described and plotted.

64. L. Novotný; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Finite element method stress analysis of a container for metal sheets. A finite element method is employed to analyze displacements and stress field distribution in a container for metal sheets. Finite element model of the container was constructed using beam element. Loading of structure infers from weight of metal sheets. Displacements and stress analysis of the loaded container are described and plotted.

65. L. Novotný; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Simulation of void growth in ductile steel under mechanical loading. A finite element method is employed to analyze displacements and stress field distribution in a container for metal sheets. Finite element model of the container was constructed using beam element. Loading of structure infers from weight of metal sheets. Displacements and stress analysis of the loaded container are described and plotted.

66. I. Onderová, Ľ. Šooš, M. Kováčová; *Faculty of Mechanical Engineering, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Experimental determination of the cutting machine accuracy. At present there is a permanently increasing demand from machine-tool users for metalworking and fabrication machines for high speed cutting (HSC), which are the basic trend of the intensification of processes that means shortening of cycle times. The progress in building and applications of a new generation of machines was enabled by new cutting materials and tools, high revolution spindles, sophisticated types of leading, linear drives, etc. Actually, this progress is remarkable when it comes to the increase of the output of energy beam sources (laser, plasma, water beam) in the machines for cutting of material. That also increases demands for highly effective, high dynamic technological tables that create the support for cutting heads, while the demands for the quickness of these tables are extremely high with speeds up to 300 m/min.

67. E. Ostertagová, O. Ostertag*; *Faculty of Electrical Engineering and Informatics, Technical University of Košice, Košice, Slovakia, * Faculty of Mechanical Engineering Technical University of Košice, Košice, Slovakia*
Aplication of laplace and poisson equations in photoelasticimetry. There are lot of problems in the load stress determination of orthotropic models. The most difficult task is the separation of individual stress components. If it is necessary for the experimental process to be quicker as well as it is necessary to eliminate influence of subjective factors with suitable software, then it is important to formulate the initial conditions for this software product. The one of article tasks is also needed to formulate the isolines mathematically.

68. E. Ostertagová*, O. Ostertag, P. Šarga; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia, * Faculty of Electrical Engineering and Informatics, Technical University of Košice, Košice, Slovakia*
Comparison of tensometric and photoelasticimetric methods for residual stresses determination. Residual Stresses are often sources of many accident creations. They determine according to various techniques and methodologies. Semi-destructive drill-off method seems to be the easiest from point of view quantification. There is used a technology of deformation relax at this method. Tensometry is applied for scanning of small deformation, so-called photoelasticimetry. Above-mentioned method makes possible to determine residual stress only in observed point. Its advantage is quick application and stand-by stress evaluation.

69. E. Ostertagová, O. Ostertag*; *Faculty of Electrical Engineering and Informatics, Technical University of Košice, Košice, Slovakia, * Faculty of Mechanical Engineering Technical University of Košice, Košice, Slovakia*
Mathematical formulation of the optical constant of orthotropic optically sensitive material. This article deals of the analytic determination of the optical constants of orthotropic optically sensitive material. The knowledge about optical constants creates the basic condition for automatization of process in determination load stress for 2D models, which are made from orthotropic material.

70. E. Ostertagová, O. Ostertag*; *Faculty of Electrical Engineering and Informatics, Technical University of Košice, Košice, Slovakia, * Faculty of Mechanical Engineering Technical University of Košice, Košice, Slovakia*
Utilization of automation in separation of stresses components in the optically sensitive material. For small surface deformations of solids there is required to solve the application of photoelastic measuring for the basic task of stress separation. This problem is time demanding, therefore it is more suitable to automate experimental processs. For isotropic materials there are well-known methods of stress separation. However, it is difficult to apply the methods of stress separation for orthotropic materials, predominately in the case of experimental process automatization. It is possible to solve the Laplace's and Poisson's equations by means of various techniques. On the base of Newton's method and method of characteristics it seems to be the more suitable to apply network-method. Theoretical analysis confirms the correctness of network-method application for both kinds of materials as well as for process automatization, which enables to determine main stresses for surfaces of loaded solids. The reflex film on the examined subject is photographed. All data that are needed for stress analysis are obtained with polariscope analyser using software.

71. P. Padevìt, P. Bittnar; *Faculty of Civil Engineering, Czech Technical University in Prague, Prague, Czech Repubic*
Creep of cement pastes from cem I. The paper describes and analyses the properties of cement pastes. Material properties are tested in compression tests. Creep of cement pastes was tested on the cylinfrical specimens with diamemeter 10mm. Tests were focused for the pastes made from Portland cement and water, whose water-cement ratio was 0.3; 0.4 and 0.5. Tested specimens for measurement were waterlogged and dried. Shrinkage of cement specimens was measured too. After finalization of the measuring were specimens used for compression tests. History of creep, material properties, history of specimens are inputs for simulation by finite element method.

72. P. Padevìt, O. Zobal; *Faculty of Civil Engineering, Czech Technical University in Prague, Prague, Czech Repubic*
Material properties of small specimens from cement paste. Material proterties of cement pastes are input parameters for the simulation of the creep cement pastes. For determination of properties of the cement pastes is the necessary the specimens teting in compression. From compression test is possible determine compression strength and Modulus of elasticity. Besides this parameters is possible from small specimens determine flexural strength. The paper is focused on properties of cement paste exposed for influence of the high temperature. Compression strength, tension strength, modulus of elasticity are tested on the small specimen made by w/c ratio 0.5 and 0.4.

73. Ľ. Petrovič, L. Jurišica; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Multisensor fusion and sensor validation of the mobile robot. Paper describes new approach for multisensor data fusion by using analytical and mathematical methods for faultless environment representation of the mobile robot. The main method is based on data analysis of the mobile robot laser scanner sensor and ultrasonic scanner sensor which data are fused by using Nadaraya-Watson kernel estimator. Paper describes comparison between existing methods such as neural network sensor fusion and our proposed method. Paper also describes approach for sensor validation based on Nadaraya-Watson kernel estimator for better fault detection.

74. W. Piekarska, M. Kubiak; *Institute of Mechanics and Machine Design, Czestochowa University of Technology, Czestochowa, Poland*
The numerical analysis of thermal phenomena in hybrid laser – arc welding process with convective motion in the melted zone. This paper presents numerical analysis of thermal phenomena in hybrid laser – arc welding. Temperature field was obtained by solution of the heat transfer equation with activity of moving heat sources. Fluid flow in welding pool was determined by solution of the Navier – Stokes equation. Natural convection and fluid flow through porous medium in mushy zone were considered in computations. The analysis of phase transformations in the solid state was obtained on the basis of JMA and Koistinen-Marburgeržs models as well as on the CCT diagram. The results contain temperature field, velocity field in the melted zone and volumetric fractions of the formed phases in the weld and heat affected zone.

75. T. Plachý, P. Padevìt, M. Polák; *Czech Technical University in Prague, Prague, Czech Republic*
Dynamic young's modulus evaluation of concrete specimens. The paper presents comparison of results of two methods for Young's modulus evaluation of concrete specimens. The dynamic Young's modulus was calculated based on measured natural frequencies of longitudinal vibration of concrete specimens. The major advantage of this method is its nondestructive character. The excitation was done by the impact hammer and the response was measured by piezoelectric acceleration transducer. Natural frequencies were evaluated from resonant peaks of Frequency Response Functions (FRF). Then the standard destructive compression test was done. At the end of the paper, the results of comparison of static and dynamic moduli of elasticity are summarized.

76. T. Plachý, P. Tesárek, P. Padevìt, M. Polák; *Czech Technical University in Prague, Prague, Czech Republic*
Comparison of static and dynamic young's modulus of gypsum blocks. The paper presents comparison of results of two methods for Young's modulus evaluation of gypsum blocks. The dynamic Young's modulus was calculated based on the measured natural frequencies of longitudinal vibration of the gypsum blocks. The major advantage of this method is its nondestructive character. The excitation was done by the impact hammer and the response was measured by piezoelectric acceleration transducer. Natural frequencies were evaluated from resonant peaks of Frequency Response Functions (FRF). Then the standard destructive compression tests were done. At the end of the paper, the results of comparison of static and dynamic Young's moduli are summarized.

77. M. Polák, T. Rotter, T. Plachý; *Czech Technical University in Prague, Prague, Czech Republic*
Long - time monitoring of vibration on the slab-on-girder bridge. The paper presents long-time monitoring of vibration on the road concrete-steel composite slab-on-girder bridge in Prague - Barrandov. The long-time experiment is focused on investigation of the bridge response caused by intensive truck traffic. Evaluated results (the fatigue stress levels, heavy duty truck passage density over the bridge) are presented in the paper.

78. Z. Poruba, J. Szweda; *VŠB – Technical University of Ostrava, Ostrava, Czech Republic*
Simulation and optimization of the electromotor cooling. The contribution presents the relations used for CFD simulation of the flow around the body and the procedures used for the frame shape optimization. At the beginning the procedures for creation of practically usable computer model of bigger mechanical parts and application of its boundary conditions are described, obtained results are presented and create necessary support for the further shape optimization. For the following optimization the two numerical models with the aim to show the influence of used model geometry on the optimization problem properties are used. The parameters of used computational models (the models differ in used symmetry conditions) and the application of boundary conditions are presented. The obtained results show the necessity to take into account the authentic rib space arrangement in model simulations of optimization problem.

79. I. Ristović*, N. Husáková, J. Dečmanová; *Faculty of Mining, Ecology, Process Control and Geotechnology, Technical University of Košice, Košice, Slovakia, * Faculty of Mining and Geology, University of Belgrade, Belgrade, Serbia*
Tests of personal cable lift with the possibility of solution comparison in simulation program. The article describes the testing of personal cable lift „fall" before its first starting up. Technical tests are conducted by building societies normative with the participation of Technical inspection of SR where is important the nominal speed of cage. After this speed exceeding the other mechanismes are setting into operation, by the help of them the lift is off. Effects of these mechanismes are verified in agreement with valid standards and in the case of fulfillment of demands, the lift can be put into operation.

80. J. Rodina, P. Hubinský; *Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Stability control design of segway™ like differential drive by using mems sensors. This article is concerned with using motion MEMS sensors, processing signals from these sensors and by its mutual fusion using complementary filter. This processed signal is used for stability control of Segway™ like differential drive. It describes design of complementary filter and mathematical model of the stability control. This structure was verified on real model which is based on DSP microcontroller with one 3 axis MEMS accelerometer and 2 axis MEMS gyroscope.

81. J. Rojíček; *VSB – Technical University of Ostrava, Ostrava, Czech Republic*
The set of experiments – analysis by inverse identification method. The article describes identifications of material parameters (Inverse Method, FEM) from set of experiments. The experiments were made with hollow cylindrical specimens šsteel (11375)ć. In this paper there are used data obtained from 5 experiments with different loads (axial force, torque and their combination). The article uses multilinear isotropic material model (3. material parameters) and Hill anisotropy material model (9. material parameters). The paper shows two algorithms (experiments solved apart or en bloc) to identify material parameters from set of experiments. The solutions were found by FEM (Inverse algorithm, Probability algorithm) and were compared with the experimental data.

82. J. Rosenberg, M. Svobodová*; *New Technologies Research Centre, University of West Bohemia in Pilsen, Pilsen, Czech Republic, * Faculty of Applied Sciences, University of West Bohemia in Pilsen, Pilsen, Czech Republic*
Continuum remodeling and thermodynamics with internal variables. The contribution brings together the theory of growth and remodeling (GRT) [3] and the irreversible thermodynamics with internal variables [5]. At the beginning is given the short overlook of the GRT corresponding theory and the irreversible thermodynamics. The main part is devoted to the GRT formulation including the internal variables. The influence of these variables on the dynamical properties of the GRT model is shown on a simple example. The suggested approach can be applied e.g. to biomechanics or the modeling of different smart materials.

83. M. Sága, M. Handrik, P. Kopas; *Faculty of Mechanical Engineering, University of Žilina, Žilina, Slovakia*
Contribution to computer simulation of induction bending of large diameter pipes. Induction bending is the best method for bending large diameter pipes. An important problem in bending process is prediction and also improvement of the bending quality process. In this article, an thermo-elastic-plastic mechanical model was built to simulate induction bending of large diameter pipes. The bending experiments of the API 5L X65 induction bend pipes were performed to clarify the deformation behavior of the pipes. The large deformation behaviors of these experiments were simulated by finite element method, using ADINA software.

84. A. Sapietová, V. Dekýš, M. Vaško; *Faculty of Mechanical Engineering, University of Žilina, Žilina, Slovakia*
A numerical model of rotating machine having unbalance and the measurements of its dynamical properties. The paper deals about the problems of rotating machine having unbalance and results this unbalance from point of view decreasing of noise and vibration this machine. By using a numerical model was analysed chosen dynamical parameters of machine including of modal and stress analysis of side sheet panel in ADAMS/AutoFlex. The measurement of vibration was done on chosen pars too. The results from these measurements as the vibration spectrums and frequency response function were interpreted.

85. P. Sivák, O. Ostertag, I. Delyová; *Faculty of Mechanical Engineering Technical University of Košice, Košice, Slovakia*
Alternative esa, cae and calculation prescriptions aplication on fatigue life prediction. This article handles the problematic of technical capability prolongation of earlier built heavy supporting steel structures. Closely relating is the problematic of exhaustion fatigue life prediction based on conclusions from random loading process execution. One of the main process execution methods is application of methods and options of calculation prescriptions from STN 73 1401 design of steel structures. This standard also specifies supporting elements of structures, which are not required to evaluate on fatigue. Additionally it states the conditions at which, considering maximum stress amplitude and total vibration count in random loading spectrum, no evaluation on fatigue is needed. Appropriate analyses are currently performed using methods and means of ESA (experimental stress analysis) and CAE (computer aided experiment).

86. P. Sivák, R. Keruľ-Kmec; *Faculty of Mechanical Engineering Technical University of Košice, Košice, Slovakia*
Areal constructions of protective safety frames designing. Article tackles the problem of design and strength analysis of protective cages or so called safety frames for competition and race cars. Its primary function is to decrease body shell deformation in crew section in the case of a crash and thus minimize the risk of injury or at least ensure crew survival. Protective frames designing follows strict international rules. There are multiple construction layout types of protective frame according to its application purpose. Important factor is assembly method. We recognize prefabricated and welded frames. Further on article includes brief description of designing, strength analysis and selection of optimal alternative of protective frame for specified type of automobile.

87. T. Skrzypczak, E. Wêgrzyn-Skrzypczak; *Institute of Mechanics and Machine Design, Technical University of Czêstochowa, Czêstochowa, Poland, * Instiute of Mathematics, Technical University of Czêstochowa, Czêstochowa, Poland*
Computer simulation of solidification process with natural convection of liquid and shrinkage cavity formation. Presented paper is focused on numerical simulation of binary alloy solidification process with additional phenomena such as natural convection of liquid phase and macroscopic defects

formation. These defects are often called shrinkage cavities. Governing equations of mathematical model are presented. Main assumptions of numerical model based on finite element method are described. Influence of motion of the fluid on shape and localization of shrinkage cavity is considered. The main focus is put on the algorithm of shrinkage cavity creation process. On the base of mathematical model, a computer program is made. Results of digital simulation compared to experimental results are presented.

88. L. Sowa, A. Bokota; *Institute of Mechanics and Machine Design, Czestochowa University of Technology, Czêstochowa, Poland, *Institute of Computer and Information Sciences, Czestochowa University of Technology, Czêstochowa, Poland*
Numerical analysis of solid phase growing depending on pouring of the continuous casting mould. The mathematical and numerical simulation model of the growth of the solid metal phase within a continuous cast slab is presented in this paper. The problem was treated as a complex one. The velocity fields are obtained by solving the momentum equations and the continuity equation, whereas the thermal fields are calculated by solving the conduction equation with the convection term. The problem was solved by the finite element method. A numerical simulation of the cast slab solidification process was made for different cases of continuous casting mould pouring by molten metal. The influences of cases of the continuous casting mould pouring on the velocity fields in liquid phase and the solid phase growth kinetics of the cast slab were estimated, because these magnitudes have essential an influence on high-quality of a continuous steel cast slab.

89. E. Spišák, J. Slota, J. Majerníková; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
The evaluation of mechanical properties of tinplates as input parameters for simulation of deep drawing processes. For modelling and simulation requests, the input data optimization for used material is required. The material properties (mechanical and technological) are depend not only on chemical composition and structure but also on processing conditions or stress conditions in specific product. The paper deals with evaluation of mechanical and plastic properties of tinplates in various stress-strain conditions, that are characteristics for uniaxial tensile test, biaxial tensile test and springback test. The relationships among mechanical properties determined by above mentioned tests are described. The influence of different mechanical properties of tinplates on result of the deep drawing simulation is discussed.

90. E. Stanová*, G. Fedorko, V. Molnár, N. Husáková; *Faculty of Mining, Ecology, Process Control and Geotechnology, Technical University of Košice, Košice, Slovakia, * Faculty of Civil Engineering, Technical University of Košice, Košice, Slovakia*
Geometrical model of the trihedral strand (3+9+15). The paper deals with the steel rope of type 6(3+9+15) created from trihedral strands. There are geometrical position of structural strand elements described. The parametric equations of the wire axis in a strand winding around the rope axis are derived on the principle of geometric rope structure. This mathematical expression enables to create the geometrical model of strand. The model in the paper is made use of softvares Excel and SolidWorks.

91. P. Šarga , F. Trebuňa; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Determination of residual stresses by software mezvyna. Residual stresses are those stresses which remain in a component following manufacture, processing, fabrication or assembly. With the continuing drive to optimise material performance and minimise component weight, there is an increasing emphasis on understanding the role of residual stress. Residual stresses can be beneficial or detrimental to performance; they may be critical or insignificant. Each case must be examined on it's own merits. It is therefore important to know measure residual stresses. There are a variety of techniques available. One of them is the hole-drilling strain gage method. This thesis treats of determining residual stresses by hole-drilling method, which is one of the most used. The scope of this work was developing software for determinig of this stresses. We can use this software for both most useful measurement systems RS-200 and SINT MTS-3000. We used this software for determining residual stresses in projects on our workplace.

92. P. Šarga , F. Trebuňa; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Developing of software mezvyna used for determination of residual stresses. The hole-drilling strain gage method allows determine residual stresses near to unloaded surface of the structural member. By specially configured strain gage rosette bonded to the surface and a hole introduced into the structure through the center of the gage, the released strains are measured and according to formulas for hole through the entire part as well as for blind hole it is possible to assess the principal normal stresses. This articel treats about software which was developing for determining of this stresses. Developing software is cling to the newest version of ASTM E837-01 standard which is not used in analyzed softwares. In our software are used new coefficients of strain gage which have a big influence for precision of this calculation. We can use this software for both most useful measurement systems RS-200 and SINT MTS-3000. We used this software for determining residual stresses in projects on our workplace.

93. F. Šimčák, F. Trebuňa, V. Berinštet, M. Štamborská; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Application of numerical and experimental modelling for analysis of plastic deformation of steel sheets. For the processing of steel sheets by cold forming and also for loading of thin-walled elements is necessary to know the conditions under which the material of sheet comes to plastic state as well as analysis of deformations and stresses during evolution of plastic deformations. It is known, that plastic anisotropy appears during plastic deformation of cold rolled sheets. For determination of deformations and stresses in elastic and plastic areas are often used numerical or experimental methods. In the contribution are presented knowledges that was obtained by numerical and experimental evaluation of plastic behaviours of cold rolled steel sheets in plane stress state.

94. P. Šolek, M. Horínek; *Faculty of Mechanical Engineering, Slovak University of Technology in Bratislava, Bratislava, Slovakia*
Actuator/sensor placement for two-dimensional flexible systems. This paper deals with the investigation of optimal actuator and sensor placement. An approach proposed in this article is based on the valuate of the H_2 and $H_?$ norms. The optimal actuator and sensor placement satisfied the conditions of controllability, observability and spillover prevention. The flexible structure is defined as a finite dimensional, controllable and observable linear system. The results of the optimal placement are valuate for two dimensional system.

95. M. Šupák; *Faculty of Mechatronic, Alexander Dubček University of Trenčín, Trenčín, Slovakia*
Check computation of lifting platform through fem method. Real models production in order to do the loading tests seems to be rather expensive. Fortunately, there is a method making use of 3D models for a load simulation on PC at present. This paper describes utilization of 3D model of lifting platform for a load simulation through Finite Element Method (FEM). Deformation and tenseness of the main parts were evaluated and then the change of dimension had to be done.

96. M. Šupák; *Faculty of Mechatronic, Alexander Dubček University of Trenčín, Trenčín, Slovakia*
Lifting platform design with computer exploitation. This paper deals with utilization of 3D CAD programs for technical application projection. Created 3D models of technical parts and follow-up assembly on PC are helping with kinematics a dimension control. As a concrete application the lifting platform with shear design was used.

97. J. Timko, J. Žilková, P. Girovský, I. Kušiak; *Faculty of Electotechnics and Informatics, Technical University of Košice, Košice, Slovakia*
Controlling the tinning line input stage. The paper covers neural controlling of tinning line drives. Mathematical model of the tinning line entry section's individual drives consists of the decoiler system and drawing rolls, when considered is flexible coupling. Indirect control of the pull, which provides required strip tension between the decoiler and drawing rolls in both steady and dynamic states of the line, is used in current and speed control. The

second part of the present paper focuses upon design of neural controllers that are used to control the tinning line. Properties of neural controllers are compared with conventional PI controllers, and the results indicate suitability of neural networks when used to control complex technological lines.

98. J. Tkáč, A. Chovanec; *Faculty of Mechatronic, Alexander Dubček University of Trenčín, Trenčín, Slovakia*
The application of neural networks for detection and identification of fault conditions. Vibration analysis has long been used for the detection and identification of machine fault conditions. The specific characteristics of the vibration spectrum that are associated with common fault conditions are quite well known. The spectral or cepstral components reflecting bearing defects and peaks at the rotational frequency in the spectrum or cepstrum indicating the degree of imbalance and fault conditions. This paper demonstrates that the presence of a bearing defect makes it impossible to determine the degree of imbalance based on a single vibration feature. In such a case, it is necessary to employ diagnostic techniques that are suited to processing of multiple features. Neural networks are the best known technique to approach such a problem. The paper dealt with analyses of diagnostic signals. There are analysed signals on output piezoelectric accelerometer sensors of a diagnosed object. Methods of spectral, cepstral and time-frequency analyses on diagnosed object, that is bearing, have been applied. Neural techniques for detecting and identification of fault conditions have been used.

99. F. Trebuňa, F. Šimčák, J. Bocko, M. Pástor; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Application of vibro-isolation elements in supporting piping systems of compressor stations. In piping systems of compressor stations there are rigid supporting feet replaced by vibro-isolated elements with metallic shock absorbers. Because significant part of working life of piping systems has been already exhausted, the suggested modifications allow us to increase their residual lifetime. Proposed methodology of theoretical and experimental analysis of quantification of vibro-isolation effect permits to tune up very complex dynamical system that without doubt the piping system of compressor station represents. The methodology was verified in working conditions of the compressor station and the results of measurements were confirmed using sophisticated numerical methods.

100. M. Vaško, M. Sága, S. Dunajčan; *Faculty of Mechanical Engineering, University of Žilina, Žilina, Slovakia*
Proposition of the computational algorithm for elasto-plastic analysis of the beam element. The paper deals with the analysis of the chosen hysteresis computational models and their application in the beam's bending theory. It will present chosen continuous differential models and approaches based on step by step solution respecting the elastic and plastic conditions. In our centre of attention there will be the plastic zone progress description. Results obtained from MATLAB's programs will be compared with FEM models (Adina).

101. J. Vavro, H. Hajska, J. Vavro Jr., A. Vavrová; *Faculty of Industrial Technologies, University of Trencin, Trencin, Slovakia*
The experimental and theoretical analysis of separations extension in personal tyres. The article is dealing about experimental and theoretical analysis of separations extension in personal tyres for the car. The measurement of the tyre impurities circulation by the dynamic loading along with the disc. There are made measurements for the various tyre velocities on the roadway by the constant inflation pressure in tyre and by the tyre constant external loading and time service longitudes. In the article is suggested the process of the measurement evaluation by the method of the active factor experiment.

102. R. Vlach; *Faculty of Mechanical Engineering, Brno University of Technology, Brno, Czech Republic*
Complex model of asynchronous machine as traction machine in mining. A complex approach to problem solving is demanded in all engineering fields today. This project is concerned with complex simulation of asynchronous machine heating during duty cycle. The asynchronous machine is used as traction machine in mining industry. The Complex model consists from electromagnetic model, ventilation model and thermal model. This paper shows the possibility for a new approach to the problem of cooling electrical machines in engineering practice.

103. J. Winczek; *Institute of Mechanics and Machine Design, Czestochowa University of Technology, Czestochowa, Poland*
Modeling of phase transformations in rectangular prismatic s355 steel elements by zigzak bead weld surfaced. The association of the movement of the welding head along object with simulaneous sways across the weld bead, gives zigzag trajectory of welding electrode. Heat-affected zones have been determined. Progress of diffusional phase transformations was described basing on equation of kinetics JMA-K and Koistinen-Marburger's for martensitic transformation. Deliberations have been illustrated by computational example of surfacing S355 steel element. Accepted technological parameters of rebuilding gave results that reproduce geometry of padding weld and HAZ confirmed experimentally. In heat-affected zone welding heat cycles are distinguished by multiple heating and self-cooling caused by overlaying next padding welds as well as the sways of electrode, what leads to repeated phase changes in HAZ.

104. M. Žmindák, P. Novák, J. Meško; *Faculty of Mechanical Engineering, University of ŽIlina, ŽIlina, Slovakia*
Numerical simulation of arc welding processes with metalurgical transformations. The welding is a thermal process with convection between fluid flow and welding body, between welding body and environment. The thermal and metallurgical history is obtained in first solution step and in next solution step the stress field is calculated using computed thermal load and material properties from metallurgical history. In this paper, a brief review of weld simulation and residual stress modelling using the finite element method (FEM) is presented. Thermo-elastic-plastic formulations using a von Mises yield criterion with nonlinear isotropic hardening has been employed. The commercial FEM code SYSWELD was used for uncoupled thermal-mechanical analysis. The Leblond's model was used to simulate ferritic and bainitic phase transformations and Koistinen - Marburger model was used to simulate martensitic transformation.

105. J. Wagner; *European Polytechnical Institut, Kunovice, Czech Republic*
Contribution to the design optimization of electromechanical actuators of mechatronics systems. The contribution deals with application the theoretical basis of the method the static optimization by the design of electromechanical actuators. In contribution are presented the example of application this method by design of small induction machine. They are derived the optimization functions for defined optimization criteria. The results are elaborated in form diagrams, graphs and recommendation for optimization design these types of electric motors.

106. P. Demeč, M. Varchola, J. Svetlík; *Faculty of Mechanical Engineering, Technical University of Košice, Košice, Slovakia*
Useing of mechatronics systems in designing of manufacturing machines. Construction of manufacturing machines cannot be managed without using a knowledge of mechatronics systems at the present time. Nowadays, in growing competition among producers of manufacturing facilities, it is necessary to look for the systems and processes leading to improvement of parameters of manufacturing machines in each aspect. It should be considered in general view on the overall design concept of complex mechatronic system not only to focus on improvement of selected problematic parts of the machine. This should lead to a higher quality and efficiency, and shouldn't imply a complication of any part of the system.