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ABSTRACTS

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MSM 2011

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PREFACE

In October 2005, the 1st International Conference Mechatronic Systems and Materials (MSM) was held in Vilnius, Lithuania. The successful first conference developed into the annual scientific event. Vilnius Gediminas Technical University, Kaunas University of Technology, Opole University of Technology and Bialystok Technical University are the organizers and hosts of the MSM conferences arranged in a different city each year:

- 2005, Vilnius, Lithuania, (1st);
- 2006, Cracow, Poland, (2nd);
- 2007, Kaunas, Lithuania, (3rd);
- 2008, Białystok, Poland, (4th);
- 2009, Vilnius, Lithuania, (5th);
- 2010, Opole, Poland, (6th);
- 2011, Kaunas, Lithuania, (7th).

AIM OF THE CONFERENCE

The aim of the conference is to provide an opportunity to share information and facilitate co-operation in mechatronics and new materials and dissemination of current research results in this multidisciplinary field.

CONFERENCE VENUE

City of Kaunas

MSM 2011 is organized in Kaunas. Kaunas with nearly 350 000 inhabitants is one of the most significant cities of Lithuania. It is not only a city of old traditions, but also large centre of business and industry. It can also claim to be a city of young people with over 39,000 students studying at 5 state universities. Hundreds of years of cultural heritage are preserved in the historical and architectural monuments, museums, theatres, art galleries and churches of Kaunas.

Kaunas University of Technology

Kaunas University of Technology is the largest technological University in the Baltic States. The University shares the best traditions of classical Universities, offering almost all fields of technological studies and research. The Social and Physical Sciences are being particularly emphasized at the University, as a modern University graduate is expected to bear much more beyond the knowledge of his profession. Meanwhile the studies and research in the fields of Humanities and Biomedicine, as well as in the interdisciplinary fields, recently have been very successfully launched. New study programmes in Mechatronics, Sport Engineering, Musical Engineering, and Biomedical Engineering appeared to be very popular among the students.

ABOUT MSM 2011

The Program Committee of MSM 2011 has accepted 146 papers by authors coming from 15 countries. We would like to express our gratitude to the Scientific Editorial Committee members and reviewers for discussing and reviewing the papers, as well as for their contribution to the quality and success of the Conference.

Selected papers will be proposed for publication in a special issues of the International Journals: "*Journal of Vibroengineering*", "*Elektronika ir elektrotechnika (Electronics and Electrical Engineering)*", "*Mechanika*" and in other scientific journals of the Kaunas University of Technology.

Presentations will be discussed in the following sections:

- i. Mechatronic Systems;
- ii. Materials (properties, modeling, manufacturing and processing);
- iii. Education in the Fields of Mechatronic and Material Science.

CONTENT

Application of guided waves and long range ultrasonic techniques for non-destructive testing of engineering structures Rymantas KAŽYS	11
Multi-criteria design optimization of micromirror considering technological uncertainties Adam MARTOWICZ, Michał MAŃKA, Tadeusz UHL	12
Integrated concept for embedded system study Raivo SELL, Sven SEILER	14
The analysis of deformability the bimetallic plates A199.8-M1E get by explosive welding method Dariusz RYDZ, Teresa BAJOR, Marlena KRAKOWIAK, Robert SKOBLIK, Krzysztof KORN	16
Investigation of wear of pneumatic elements in mechatronic systems Didzis RAGS, Oskars LININS, Irina BOIKO	18
The rings with molecular current as the model of the passive magnetic bearing Krzysztof FALKOWSKI	20
Diagnostic method of measuring hanger rods tension forces in the suspension of the power boilers combustion chamber Jerzy CZMOCHOWSKI, Artur GÓRSKI, Michał PADUCHOWICZ, Eugeniusz RUSIŃSKI	22
Research of physical properties of ferrofluid Andrius KLEVINSKIS, Vytautas BUČINSKAS	24
Upper limb active/passive exercisers – two different approaches Beniamin CHETRAN, Emoke SZELITZKY, Alexandra-Maria ALUȚEI, Dan MÂNDRU	26
Numerical and experimental identification of fluid power boiler convection chamber vibration Michał PADUCHOWICZ, Artur GÓRSKI, Jerzy CZMOCHOWSKI	28
Testing composite materials connected in bolt joints Sławomir ŻÓLKIEWSKI	30
Design alarm processing techniques and tools for on-line monitoring of mechatronic systems Antons PATLINS, Alina GALKINA, Nadezhda KUNICINA, Yelena CHAIKO	32
Simulation of the radiation therapy system for respiratory movement compensation Tomas KRILAVIČIUS, Daiva VITKUTĖ-ADŽGAUSKIENĖ, Kęstutis ŠIDLAUSKAS	34
Biomedical signal identification and analysis Agata NAWROCKA, Andrzej KOT, Marcin NAWROCKI	36
Dynamic flexibility of the supported-clamped beam in transportation Sławomir ŻÓLKIEWSKI	38
Roughness parameters of elastic materials in analysis of measuring errors Anita AVISANĖ, Janis RUDZITIS, Viktors GUTAKOVSKIS	40
Trajectory formation methods with motion resolution for mobile piezrobots Ramutis BANSEVICIUS, Asta DRUKTEINIENE, Genadijus KULVIETIS	42
Correlation between shape errors in flat grinding Mariusz DEJA	44
Aerial imagery based long-range path planning for unmanned ground vehicle Robert HUDJAKOV, Mart TAMRE	46
Relationships between railroad noise and social-economic factors Danielius GUŽAS	48
Magneto-rheological fluid mixing using ultrasound E. DRAGAŠIUS, V. JÜRĖNAS, V. MAČIUKIENĖ, D. MAŽEIKA	50
Semantics on mobile robot algorithms development Sven SEILER, Raivo SELL	52
The comparison analysis of mechanical properties and fatigue strength for wires made from TRIP steel and from high carbon steel Sylvia WIEWIÓROWSKA	54
Wood products automatic identification based on fingerprint method Ahti PÖLDER, Märt JUURMA, Mart TAMRE	55
Mechanical properties of transparent conductive oxide coating on flexible substrate Inguna STRAZDINA, Edmunds MACEVSKIS, Janis RUDZITIS, Toms TORIMS	57
Dislocation avalanches and strain bursts in the boards of radio-engineering equipment Aleksandr BOGOROSH, Nikolaj VIŠNIAKOV, Jurij NOVICKIJ, Algimantas BUBULIS	59
Surface roughness characteristic of elements manufactured by Stereolitography method Stefan DZIONK, Włodzimierz PRZYBYLSKI	61

Research of transformation process of power stream parameters in independent wind turbine Aleksandr GUBAREV, Oksana GANPANTSUROVA	63
Transients in the electromagnetic actuator with the controlled supplier Bronisław TOMCZUK, Andrzej WAINDOK, Dawid WAJNERT	65
Evaluation of pedestrian to SUV impact kinematics – lower leg impactor and dummy approach Mariusz PTAK, Rusiński EUGENIUSZ, Jacek KARLIŃSKI	67
Fully automated system for air velocity profile measurement Miroslaw KABACIŃSKI, Roland PAWLICZEK	68
In-pipe inspection microrobot with adaptable structure Olimpiu TĂTAR, Claudiu CIREBEA, Adrian ALUŢEI, Vistrian MĂTIEŞ	70
Analysis of temperature distribution in high carbon steel wires drawn with high drawing speed Zbigniew MUSKALSKI	72
Application of self-oscillating system for stress measurement in metal Janusz KWAŚNIEWKI, Ireneusz DOMINIK, Krzysztof LALIK	73
Applications of location-aware robots and transporters M. LUIMULA, S. PIESKÄ, J. JÄMSÄ, I. SHIO, M. KOMATSUZAKI	75
The mathematical model of the dependent fatigue damage zone Vladislav TURKO	77
Hexapod robot kinematic model Tomas LUNECKAS, Dainius UDRIS	79
Aeroelastic self-oscillations of gas seal wall Jouy TEMIS, Alexey SELIVANOV	80
Investigation of geometrical and physical-mechanical parameters of braille by assessing materials Edmundas KIBIRKŠTIS, Ingrida VENYTĖ, Volodymyr MAYIK, Diana VAKULICH	82
Mechatronic technologies in bearing units Leonid SAVIN, Sergey LAVRUSHIN	84
Tribological adhesion of particles in an acoustic field Vladas VEKTERIS, Vytautas STRIŠKA, Vadim MOKŠIN, Dariusz OZAROVSKIS, Rolandas ZAREMBA	86
Assisting control algorithms for simplified operation of remotely controlled unmanned ground vehicle Maido HIEEMAA, Mart TAMRE	88
A platform for selecting materials for mechatronic systems Rima BEN MOSBAH, Sebastien DOURLENS, Amar RAMDANE-CHERIF, Nicole LEVY, Francisca LOSAVIO	90
Design of the piezoelectric actuator with two directional polarizations for controllable multi-DOF oscillations R. LUČINSKIS, D. MAŽEIKA, R. BANSEVIČIUS	92
Design and investigations of piezobender controlled electrohydraulic servovalve Dariusz SĘDZIAK, Dominik RYBARCZYK	93
Interactive service robot: mechatronics for elderly assistance and guiding tasks S. PIESKÄ, M. LUIMULA, J. MÄKELÄ	95
Indoor positioning using symmetric double sided two way ranging in welding J. JÄMSÄ, M. LUIMULA, S. PIESKÄ, O. SAUKKO	97
Diagnostic research of rotor systems with variable inertia moment Valentinas KARTAŠOVAS, Vytautas BARZDAITIS, Pranas MAŽEIKA, Marius VASYLIUS	99
Introduction to synthesis of the torsional vibrating discrete-continuous mechatronic systems by means the hypergraph and structural numbers method Andrzej BUCHACZ	101
The robust estimation of stochastic models of time series in the questions of diagnostics of mechanical systems A.N. TYRSIN, L.A. SOKOLOV, K.E. MAKSIMOV	103
Mechatronic system for technical diagnostic using Barkhausen effect Tomasz GARSTKA	105
An application of mu-synthesis to control of a small air vehicle – simulation results Arkadiusz MYSTKOWSKI	107
Mechatronics design of small type computer controlled tensile testing machine Riza GURBUZ	109
Control algorithms for mechatronic hydrostatic bearings Denis SHUTIN, Roman POLYAKOV, Leonid SAVIN	111
Modern 3D technologies for orthodontic application Arūnas LIPNICKAS, Margarita DAUKŠIENĖ	113

Agent-based methodology for developing mechatronic systems Laura KIZAUSKIENĖ, Egidijus KAZANAVICIUS, Rimvydas GAIDYS	114
Colour 3D depth map building using camera with 2D laser scanner Kęstas RIMKUS, Arūnas LIPNICKAS	115
Heuristic methods: a key to inventive design Sebastian KOZIOLEK, Tadeusz SMOLNICKI	116
Structural determinants maximising wear resistance of friction joints Wojciech ŻUROWSKI	117
The application of wavelets vector quantization of polish speech Mirosław TARASIUK, Zdzisław GOSIEWSKI	119
Deformation of details projection of components created by rapid prototyping method Stefan DZIONK	121
The analysis of the control system for the bearingless induction electric motor Maciej HENZEL, Krzysztof FALKOWSKI, Mariusz ŻOKOWSKI	123
Flexible control for the discrete systems, presented in the form of cyclic modules Aleksandr GUBAREV, Oleg YAKHNO, Oksana GANPANTSUROVA	125
Mechatronic system of the MZGS-200E stand for fatigue tests under variable amplitude non-proportional bending with torsion Henryk ACHELNIK, Zbigniew MARCINIAK, Dariusz ROZUMEK, Ewald MACHA, Cyprian T. LACHOWICZ, Czesław MARCIAK	127
Mechanical and electrical elements in reduction of vibrations Katarzyna BIALAS	128
Determining the torsional natural frequency of underframe of off-road vehicle with use the operational modal analysis procedure Mariusz KOSOBUDZKI, Krzysztof JAMROZIAK	129
Evaluation of the resistance force of magnetorheological fluid damper Egidijus DRAGAŠIUS, Vytautas GRIGAS, Dariusz MAŽEIKA, Anatolijus ŠULGINAS	131
Field-circuit modeling of AMB system for various speeds of the rotor Jan ZIMON, Bronisław TOMCZUK, Dawid WAJNERT	133
Active synthesis of machine drive systems using a comparative method Tomasz DZITKOWSKI, Andrzej DYMAREK	135
Analysis of composite beam with piezoelectric actuator based on the approximate method Andrzej BUCHACZ, Marek PŁACZEK	137
Object protection by foam materials Jouy TEMIS, Mikhail BIRYUKOV	139
Utilization of advanced self-diagnostic functions implemented in frequency inverters for the purpose of the computer-aided identification of operating conditions Jerzy ŚWIDER, Mariusz HETMAŃCZYK, Piotr MICHALSKI	141
Extended diagnostics system for earth fault, duplicate address detection and noise detection in AS-interface networks Jerzy ŚWIDER, Piotr MICHALSKI, Mariusz HETMAŃCZYK	143
Investigation of dissipative properties of liquid crystalline lubricant layer Vadim MOKŠIN, Artūras KILIKEVIČIUS, Vladas VEKTERIS	145
Balance platform system dynamic properties Andrzej KOT, Agata NAWROCKA	147
Synthesis as a designing of mechatronics vibrating mixed systems Andrzej BUCHACZ, Damian GALEZIOWSKI	149
Kelvin Voigt model of single piezoelectric plate Andrzej WRÓBEL	151
Accelerometer model substitute for applications in modelling Vincas BENEVICIUS, Vytautas OSTASEVICIUS, Rimvydas GAIDYS, Mantas VENSLAUSKAS	152
Experimental investigation of interference fit connection of mechanical components Jurgis MIKOLAINIS, Bronius BAKŠYS	153
Reasons behind MEMS energy harvesting employing polyvinylidene fluoride Vytautas OSTASEVICIUS, Ieva MILASAUSKAITE, Rolanas DAUKSEVICIUS	155
Evaluation of dynamics of robotic system operating in heavy loaded high speed conditions M. ŠTRIMAITIS, R. URBANAVIČIUS, A. KILIKEVIČIUS, M. JUREVIČIUS, V. STRIŠKA, A. TRUMPA	156
Piezoelectric scanner dynamics control using magnetorheological fluid Ramutis BANSEVICIUS, Algimantas BUBULIS, E. DRAGAŠIUS, V. JURENAS, V. MAČIUKIENĖ, S. NAVICKAITE	158

Numerical modelling of the flat bars rolling process with dimensions 190x6 mm in cutting-bent grooves with the affected widening Tomasz SKURA, Sebastian MRÓZ, Henryk DYJA	160
Description of a composite material deformation by the degenerated model consisting of nonlinear elastic element Krzysztof JAMROZIAK	162
Influence of the non-uniform temperature distribution on the metallic charge length on dimensional accuracy round bars Piotr SYGUT, Sebastian MRÓZ, Konrad LABER, Henryk DYJA	164
Physical and numerical modelling of Cu-Al bimetallic rods rolling process Sebastian MRÓZ, Piotr SZOTA, Anna KAWALEK, Andrzej STEFANIK	166
Improvement of the quality of protective-decorative coatings by modifying them with nanoadditives Eugenia KOROBKO, Anatoly SVIRIDENOK, Natallia BEDIK, Alexander BARTASHEVICH, Ludmila IGNATOVICH, Sergey SHETKO	168
Analysis of the deep drawability of M63 and M70 brass strips Anna KAWALEK, Henryk DYJA, Sebastian MRÓZ	170
Analysis of the global stability of the aluminium foam stand-alone energy absorber Artur ILUK	172
Numerical analysis of the microstructure change during flat bars normalizing rolling process Andrzej STEFANIK, Piotr SZOTA, Sebastian MROZ, Henryk DYJA	174
Using the high-speed camera as measurement device in the dynamic material tests Artur ILUK	176
Application of thermovision technique for the investigation of influence of temperature change on the metallic charge length on the energy and force parameters during industrial plain round bars rolling process Konrad LABER, Piotr SYGUT, Sebastian MRÓZ, Henryk DYJA	178
Fracture analysis of the feeder load-carrying structure in the caterpillar girder and steering frame connection area Eugeniusz RUSIŃSKI, Jerzy CZMOCHOWSKI, Paweł KACZYŃSKI	180
Method of active synthesis of discrete restrained mechanical systems Andrzej DYMAREK, Tomasz DZITKOWSKI	182
Investigation of the structure and mechanical properties of the GX40NiCrNb45-35 cast steel after high temperature treatment Raimondas SKINDARAS, Algirdas Vaclovas VALIULIS, Wojciech L. SPYCHALSKI	184
Application of object-oriented methods to the modeling composite structural elements Andrzej BAIER, Michał MAJZNER	186
The influence of ageing process on microstructure and mechanical properties of GX12CrMoVNbN9 – 1 (GP91) cast steel Grzegorz GOLAŃSKI, Paweł WIECZOREK	188
Precipitation process in VM12 steel after ageing at 650°C temperature Joanna KĘPA, Grzegorz GOLAŃSKI, Adam ZIELIŃSKI, Alina BRODZIAK - HYSKA	190
The influence of rolling process parameters and lengthening grooves shape on closing internal material discontinuities Kamila SOBCZAK, Henryk DYJA	192
Residual stress in a thin-film micro-opto-electromechanical (MOEMS) membrane K. MALINAUSKAS, V. OSTAŠEVIČIUS, R. DAUKŠEVIČIUS, V GRIGALIŪNAS	193
The analysis of phase transformation in experimental complex-phase steel during continuous cooling after hot deformation Justyna RAPALSKA, Henryk DYJA, Bartosz KOCZURKIEWICZ	194
Influence of erosive particles impact energy on epoxy coatings wear intensity Andrzej KOTNAROWSKI, Grzegorz WRONKA	195
Effect of epoxy and polyurethane coating modification with nanofillers on their resistance to erosive wear Danuta KOTNAROWSKA, Michał PRZERWA, Małgorzata WOJTYNIAK	197
NiSi vs NiPdSi as possible interconnect and electrode materials for FBARs and MEMS Aliaksandra KARABKO, Egidijus DRAGAŠIUS	199
Ultrasonic cavitations research in flowing liquids, with low depth of duct Piotr VASILJEV, Regimantas BAREIKIS, Arūnas SRUCKAS	201
Ultrasonic systems for liquid pulverizer Piotr VASILJEV	202

160	Control of a small robot by haptic joystick with magnetorheological fluid Andrzej MILECKI, Pawel BACHMAN, Marcin CHCIUK	203
162	Modelling and design of a flexure – based precision positioning system Giedrius AUGUSTINAVIČIUS, Audrius ČEREŠKA	205
164	Calibration machine for linear scales Gyula HERMANN	207
166	Control of six phase induction drive Roma RINKEVIČIENĖ, Saulius LISIAUSKAS, Benas KUNDROTAS	209
168	Modeling and diagnostic of vertical axis rotary system powered by multi gear drive Vytautas BARZDAITIS, Jurgita GRIGONIENĖ, Pranas MAŽEIKA, Artūras TADŽIJEVAS	211
170	The concept of transducer for detection of trackway surface condition basing on frictional coupling of wheel with a rail and its experimental verification Andrzej NIEDWOROK, Andrzej BAIER, Łukasz ORZECZ	213
172	Fuzzy logic detection system of water in paper İsmet GÜCÜYENER	214
174	Automotive sensors investigation for future development possibilities Julius BARZDŽIUKAS, Saulius JACĖNAS	216
176	Measuring parameters of the material surface using method: the feasibility study Vladas JUSKA, Tomas GADISAUSKAS, Vytautas DUMBRAVA	217
178	Optimization of control of automatic assembly process of parts with cylindrical shape Natalija MOZGA, Ivans GRINEVICHS	219
180	Application of electroplated diamond tools for flat grinding of ceramics Mariusz DEJA	220
182	Parts placement and orientation on metal sheet influence analysis in punching processes Inga SKIEDRAITĖ, Dovilė KAŽĖVAITĖ, Alvydas KONDRATAS	222
184	Performance of linear electric drive at localizing of dust explosion Roma RINKEVICIENE, Zita SAVICKIENE, Algimantas Juozas POSKA	224
186	Experimental research of dynamic damping of rigid beam transversal vibration Svetlana POLUKOSHKO, Olga KONONOVA, Igor SCHUKIN, Raisa SMIRNOVA	226
188	A study on biocompatibility of steel 316L in plasma (human body liquid) by using biomedical engineering approach Ahmet ÇOŞGUN, Cemal OKUYAN, Nafel DOĞDU, Ümit YALÇIN	228
190	Optical focusing method of laser beam for measuring qualitative parameters marks of disc of the angular sensor Vladas JUŠKA, Edgaras VAŠTAKAS, Edvardas IBENSKIS	230
192	Design and research of the laser trainer with all the functions of the G-36 Algimantas FEDARAVIČIUS, Laima PATAŠIENĖ, Minvydas RAGULSKIS, Egidijus SLIŽYS, Arvydas SURVILA	231
194	Frequency domain identification of the active 3D mechanical structure for the vibration control system Andrzej Piotr KOSZEWNİK, Zdzisław GOSIEWSKI	233
196	Dynamic analysis of vibratory alignment process under passive compliance Bronius BAKŠYS, Jolanta BASKUTIENĖ	235
198	Inventive design and tile glazing process Sebastian KOZIOLEK, Mateusz ŚLUPINSKI, Mariusz PTAK	237
200	Review of the new technological developments for lightning protection in the electric networks with isolated neutral Dovilė SAKAUSKAITĖ, Arūnas LIPNICKAS	239
202	Methodology of conceptual design with the use of TRIZ and DFSS Sebastian KOZIOLEK, Tadeusz SMOLNICKI, Mateusz ŚLUPINSKI	241
204	Determination of the piezoelectric coupling coefficient for arbitrary deformation Marcus NEUBAUER, Jörg WALLASCHEK	243
206	Investigation of control signal of tactile device with electromagnet Ramutis BANSEVIČIUS, Arūnas ŽVIRONAS, Marius GUDAUSKIS	244
208	Research of electric motor-generator vibrations Remigijus JONUŠAS, Egidijus JUŽENAS, Kazimieras JUŽENAS	246
210	Methods of identifying plastic wear of large-size bearing tracks Tadeusz SMOLNICKI, Sebastian KOZIOLEK	248
212	Problems of control and safety in aspect of productivity and reliability in the automatic line for final assembly of fuse-links Zbigniew PILAT, Marek GRABIŃSKI, Wojciech J. KLIMASARA, Wiesław KOPACZ	250

Use of the ICT in vocational training in the area of industrial robotics and automation Zbigniew PILAT, Tadeusz GOSZCZYŃSKI, Wojciech KLIMASARA, Marcin SŁOWIKOWSKI, Jacek ZIELIŃSKI	252
Desing and production of biochip robot A. VILKAJS, S. DJACENKO, E. KOVALS	254
Presentation the concept of stability of the hybrid powertrain by the Lyapunov theory Gabriel KOST, Andrzej NIERYCHŁOK	256
Tribological properties of porous sinters Alicja LABER	258
Resistance to cast iron seizure determined by the technological condition of the surface layer Stanisław LABER, Alicja LABER	259
The investigation of chosen properties of high dispersion padding welds produced by the laser technique of designed on units machine engines about raised resistance to waste under friction Wojciech NAPADŁEK, Agnieszka LABER	261
Investigation of magneto-rheological fluid parameters using cantilever type piezo actuator Egidijus DRAGAŠIUS, Vytautas JŪRĖNAS, Viktorija MAČIUKIENĖ, Sigita NAVICKAITĖ	263
Spindle position control in an active journal bearing using ultrasonic squeeze film levitation Sebastian MOJRZISCH, Kai-Alexander SAALBACH, Jörg WALLASCHEK	265
The robust controller for the bearingless electric motor with permanent magnets Maciej HENZEL	266
Laser ablation in the car varnishing coats analysis Wojciech NAPADŁEK, Izabela KALMAN	268
Formation technological surface layer strokes cylinder liner by using a laser ablation micromachining Wojciech NAPADŁEK	269
Investigation of dynamic and precision characteristics of low frequency vibration measurement device Vitalijus VOLKOVAS, Ernestas ULDINSKAS, Marija EIDUKEVIČIŪTĖ	270
INDEX	272

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Design alarm processing techniques and tools for on-line monitoring of mechatronic systems

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The composition of mechatronic systems of traditional mechanical and electrical components discussed, however the application of "smart" devices with incorporation of sensors, actuators, computer control systems are investigated for the industrial applications. The integration mechanical systems and microelectronics opens many new possibilities for process design automatic functions in industrial electronics. After analysis the mutual interrelations between design of the mechanical system and application of sufficient digital electronic system the different ways of integration within mechatronic systems and the resulting properties are described.

The information processing organisation in multi level, ranging from low level control through supervision to general process management. The example of intelligent control system application is described.

Mechatronic systems are typically composed of traditional mechanical and electrical components, but are referred to as "smart" devices or systems because of the incorporation of sensors, actuators, and computer control systems. Over the years, the term "mechatronics" has come to mean the integrated methodology for designing products that exhibit fast, precise performance.

Mechatronics is an emerging field of engineering that integrates electrical engineering, mechanical engineering, computer science, control engineering and information technology. In layman's terms, mechatronics combines these areas of engineering to allow the design, development and application of "smart devices" in an integrated, cross-disciplinary manner. The mechatronic concept establishes basic principles for a contemporary engineering design methodology. In this methodology, engineering products and processes have components that require manipulation and control of dynamic (moving) constructions to the required high degree of accuracy. Also, the design process requires integrating enabling technologies such as information technology and control engineering. A key factor for the design process involves integrating modern microelectronics and engineering of software into mechanical and electromechanical systems.

Mechatronics is a synergistic approach to the integrated and optimal design of a mechanical system and its embedded control system, where solutions are sought that cross the borders of different domains. Mechatronics has a great impact in many industrial activities. It is a systematic approach to the integration of information technology in all kinds of mechanical systems. The impact ranges from consumer goods to high-precision production machines, robots and automobiles. The value of the 'electronics' in a higher-end car (motor management, safety systems like air bags and electronic stability control, and a little bit further ahead, the automated highway) is already higher than those of the classical mechanical components. This will hold for many more products that traditionally had mainly mechanical components (Figure 1), [K.Craig].

The need for mechatronics will continue to expand as the global demand for cost-effective product design and manufacturing accelerates. The ongoing "virtualization" of the mechanical elements of design will demand that computer-based modeling, simulation, and control remain deeply ingrained in the life-cycle management of mechatronic systems. This increasing reliance on information driven technology, or "infomatics," will drive the need for multidisciplinary technology and technicians. It will only be a matter of time before industry, frustrated by the "silo" mentality and traditional boundaries, will begin to seek out this multi-talented employee. The efficiencies gained will justify a competitive wage in return for a more functional and knowledgeable employee.

In the area of mobile applications, the drive toward mechatronic design principles based on open international standards will continue to mature. This is a very cost-competitive, end-user driven market sector with extremely short time-to-market windows.

The concept of a next generation alarm processing algorithm augmented with control decisions and recommendations was presented and discussed in this paper. The addition of decision

making and action-taking modules or agents is significant for future alarm processing tools. This is the case since the enabling of automatic and autonomous controls for non-critical events offer the potential to improve power system response. It is important to carefully choose the allowable control actions and to guarantee that any automatic controls do not jeopardize the stability of the system. Considerations of retaining fully enabled power marketing are also an issue to be considered in control system design.

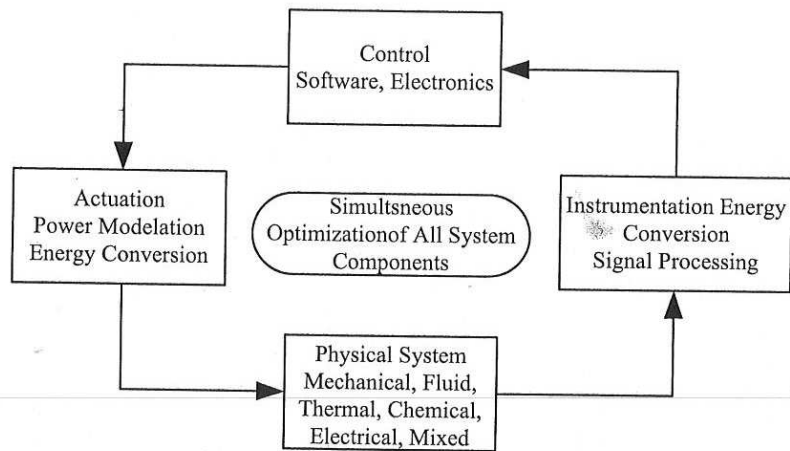


Fig. 1. Modern multidisciplinary engineering system: a mechatronic system

Successful mechatronics design can lead to products that are extremely attractive to the consumer in terms of quality and cost effectiveness. Conversely, products designed in the more traditional sequential manner do not possess optimum design capabilities and lack consumer appeal. A major factor in the development of an intelligent and flexible mechatronic system is the concurrent use of automated diagnostic systems using sensors to handle machinery-maintenance and process-control operations. Sensor-fused intelligent control systems can be used to evaluate and control the manufacturing process, and to provide a link to basic design. Increasing demands on the productivity of machine tools and their growing technological complexity call for improved methods in future product development processes. Mechatronics is also influenced by intelligent devices for the online and real-time monitoring, which includes diagnosis and control of processes.

Alarm systems are important in safe operations of NPPs. In order to handle alarm avalanches, alarm processing is necessary to reduce the number of alarms. It is found that showing causal and important alarms separately during the plant transients helps the operators to mitigate the transients. The alarm cause tracking function, which shows active causes of a specific alarm, is also helpful to the operators. Also, links to the ARPs with active cause highlighting in these alarm systems help to reduce operator response time. For alarm presentation matters, it is important that the systems should provide alarm presentation formats in ways familiar to the operators. Alarm pattern recognition capabilities, which the operators have acquired through their operation with conventional alarm systems, should be supported also in a new computerized alarm system design.