

**April 2-4, 2008 - Industrial Institute for Automation and Measurements PIAP.
4 plenary papers and 76 regular papers covering six topic area.**

Bellow name of the sessions and title of the papers with abstracts.

PLENARY SESSION-

1.

Remote sensing applications – new vistas for measurement and control - prof. Marek Zaremba, Département d'informatique et d'ingénierie, Université du Québec (UQO), Canada

The field of remote sensing is an area of science and technology that has undergone rapid development in recent years. This paper focuses primarily on how to exploit the capabilities made available by remote sensing and how to put them to use by combining them with a systemic approach to design and analysis in various measurement and control applications. The emphasis is placed on high-resolution satellite and Lidar sensors – the most prevalent remote sensing technologies.

2.

Methods for designing fuzzy controllers - prof. dr hab. inż. Leszek Rutkowski, dr inż. Robert Nowicki, Politechnika Częstochowska, dr inż. Agata Pokropińska, Akademia im. Jana Długosza w Częstochowie

In the paper the problem of fuzzy controllers designing is considered as the multicriterial optimization. Various Mamdani-type, logical-type and Takagi-Sugeno neuro-fuzzy systems, serving as fuzzy controllers, are studied and compared. Methods for the autoregressive order process estimation are adopted to solve problem of the trade-off between accuracy and number of parameters used to the construction of neuro-fuzzy systems.

3.

Full-field optical metrology and sensing: from micromasurements to monitoring of civil engineering structures - prof. dr hab. inż. Małgorzata Kujawińska, Warsaw University of Technology

In the paper we present recent trends in full-field optical metrology. The systems based on classical interferometry, digital holography, grating interferometry interferometric and photoelastic tomography and fringe/Gray code projection applied to static and dynamic objects studies are presented. Opto-numerical methodologies for novel materials studies and MEMS, MOEMS analysis are described including LCOS SLMs based active interferometers and digital holographic systems. The designs of novel interferometric and holographic cameras and their usage in outdoor conditions are presented. The concept of new generation of waveguide based full-field microinterferometers for micro-optics characterization is discussed and the progress on their realization is reported. Also 3D/4D data capture and processing systems for computer graphics, virtual reality and industry are presented. Numerous examples of measurement results and their applications in engineering illustrate the importance of progress in this field.

4.

An integration of unified, configurable modules as a tool for building distributed manufacturing control system - dr hab. inż. Jerzy Zając, prof. PK, Politechnika Krakowska

Replacement of dedicated control subsystems characteristic of flexible manufacturing by open, distributed subsystems applied in next generation manufacturing is an essential aspect of manufacturing systems development. The paper presents a comparison of the features of classical control systems and next generation control systems. Moreover, a three-stage procedure of discrete, automated manufacturing systems modeling is shown. The paper presents also two approaches to design of manufacturing control subsystems and shows examples of solutions which take advantage of an integration of unified, configurable modules for building manufacturing control subsystem.

SESSION I. AUTOMATION, ROBOTICS, MONITORING – part 1

5.

Selected applications of Galileo navigation satellite navigation – differences between existing systems - dr inż. Mariusz Andrzejczak, Martyna Wiedeńska, Przemysław Instytut Automatyki i Pomiarów PIAP

European satellite navigation system Galileo opens new possibilities and enables to increase comfort of thousands people work and everyday duties. Thanks to Galileo services every human will be able to feel safer and more secure even in case of natural disaster or other accident. Authorities of every country will be able to plan the investments, monitor them, manage the human and non-human resources in their everyday work as well as during crisis. This will be done thanks to services that will allow to get the needed information in the real-time. The selected application of Galileo system are described herewith.

6.

The application of mathematical methods for improvement in road transport security on example of road no 719 - dr inż. Artur Wieczyński, mgr inż. Arkadiusz Perski, Maria Baczyńska, Przemysław Instytut Automatyki i Pomiarów PIAP

The application of mathematical methods DST (Decision Support Tools) and SEROES Expert System developed as a part of international project RIPCORDER-ISEREST (Road Infrastructure Safety Protection – Core – Research and Development for Road Safety in Europe) for improvement in road transport security on example of road no 719 is discussed.

7.

The large areas soil water resources monitoring system - implementation, remote administration and exploitation experience - mgr inż. Andrzej Bratek, dr inż. Roman Szewczyk, mgr inż. Katarzyna Rzeplińska, mgr inż. Wojciech Winiarski, Przemysław Instytut Automatyki i Pomiarów PIAP

The paper presents the soil water resources monitoring system, implemented in Almeria Coast. There is focus on software solutions along with the experience of long-term exploitation of the system. Monitoring of wells is based on industrial distributed measurement subsystems and diverse data transmission means: satellite transmission, cell network and Internet. The application software integrates solutions of data interchange via Internet as well as solutions applied in

database and SCADA systems. Besides, the remote administration and maintenance methods via Internet, which have been successfully used, are also shown.

8.

Practical aspects of using Delphi method in realization the technological foresight in mazovia region – mgr Krzysztof Mieczkowski, dr inż. Roman Szewczyk, prof. dr inż. Tadeusz Missala, doc. dr inż. Cezary Lichodziejewski, dr inż. Mariusz Andrzejczak, mgr inż. Wojciech Winiarski, mgr inż. Katarzyna Rzeplińska-Rykała, mgr inż. Magdalena Komorowska, mgr Agnieszka Spróńska, Przemysłowy Instytut Automatyki i Pomiarów PIAP, mgr inż. Marta Osęka, mgr Katarzyna Pietruszyńska, mgr inż. Krzysztof Roszkowski, Ośrodek Przetwarzania Informacji

Paper presents the most important aspects of the regional foresight. Presented experience was gained during realized project of technological foresight for Mazovia region. The main principles of regional analyses together with rules of Delphi method are also presented. Achieved results are coherent, what confirms appropriateness of methodology taken for the project.

9.

Design and development of the lessons for the eLearning vocational courses in robotics and automation with utilization of dedicated ontology - mgr inż. Marcin Słowikowski, mgr inż. Jacek Zieliński, Przemysłowy Instytut Automatyki i Pomiarów PIAP

This publication presents didactic aspects of the elaborated, during the ISAR project, eLearning vocational training system in Automation & Robotics. First part is dedicated to developed common ontology which integrates different aspects of the learning system: training material, context, and manufacturing domains, as well as their interactions. The second part of the publication is dedicated to problems with eLearning system lesson design and development.

10.

The mail system equipped with antivirus and antispam filters - dr inż. Marian Wrzesień, Przemysłowy Instytut Automatyki i Pomiarów PIAP

The implementation of the Postfix e-mail system based on the Fedora Linux operating system is presented. The e-mail system is equipped with antivirus and antispam filters embedded into the mail structure. Each of filters is controlled independently with the aid of its own software tools defined by configuration files. E-mail system and filters cooperate with each other while processing both received and sent mail messages. The method of integration applied systems is depicted as well as the actions of the software modules used to transfer process of the mail messages.

SESSION I. AUTOMATION, ROBOTICS, MONITORING – part 2

11.

Methods of improving the efficiency of CNC machines in FPS - mgr inż. Lech Mazurek, Państwowa Wyższa Szkoła Zawodowa w Chełmie, prof. dr hab. inż. Wiktor Taranenko, dr hab. inż. Antoni Świć, prof. nadzw. PL, Politechnika Lubelska

The problem of shortening time of equipping and reequipping multi - role CNC machine tools on the basis of technological methods of enlarging the flexibility and productivity of FPS

(adjustments, reequipping, tool setting including automatic) was examined in the paper. The automatic adjustment of the outlet of tool in relation to every base can be provided by using special holder mounted in the spindle of CNC machine tool. The method for adjustment the machine tool, which bases on setting the locking device (which defines the last element of the suitable chain of dimension) directly on CNC machine tool according to the special programme in conformity with the operating draft of setting the technological process was introduced. The other setting method is designed for automation of setting multirole CNC machine tools (single- and multiaxial), operating under autonomic conditions and also in FPS using the universal instruments. The main goal is increasing precision of setting and setting machined elements through elimination of locking device setting fault. The use of proposed methods of setting CNC machine tools increases precision of setting and basing the machined element by eliminating of locking device setting fault.

12.

Introduction of independent coordinate system for NC machine accuracy measurement - mgr inż. Rafał Wypysiński, Politechnika Warszawska

In this paper the purposes of numerical control (NC) machine accuracy measurement were described. The existing methods and trends in this application domain were characterized. All known methods were classified in case of different criteria. The unique conception of define measurement points positions and movements trajectory in an independent coordinate system was shown. Possibilities, advantages and limitations of described methods were presented. The results of laboratory and industrial tests were described.

13.

The basis of identifying dynamic systems of machining small stiffness shafts - prof. dr hab. inż. Wiktor Taranenko, mgr inż. Jakub Szabelski, Politechnika Lubelska, doc. dr inż. Georgij Taranenko, Narodowy Uniwersytet Techniczny w Sewastopolu

Pursuit of achieving the high quality of part processing using machines under conditions of operating various disturbances on the technological system (TS) resulted in introducing adaptive controlling systems (AC). Developing the mathematical model (MM) of the dynamic controlling object, adequate to the original object is the indispensable premise of choosing the suitable approach to the question of stability analysis for automatic controlling system as well as synthesis of devices correcting sets coefficients of controlling quality using transitory parameters.

The methodology of building the mathematical model of dynamic system of shafts turning under the condition of elastic strain and the model itself were introduced. The model was worked out basing on the analytic identification. The system of equations and general structural pattern of MM system of dynamic turning were introduced. Such prepared system of equations and structural pattern of MM takes into account the geometry of machined layer and forces of cutting during the turning, elastic properties of TS and the process of forming the section of the machined layer (ML). The process of forming the ML section takes into account the phenomenon of machining "after the trace". The specification of DS identifying for turning the small stiffness shafts was shown. The mathematical model of controlling object CO-DS controlling the elastic strain state is built on the general principle of building models of the dynamic systems of machining small stiffness elements. The specification of processing small stiffness part is taken into account by introducing suitable equations of constrains reflecting additional elastic strain in one of equations describing controlling force. MM objects comparison for various force

influences shows, that after introducing additional force influences, the object characterizes in smaller inertiality in comparison to the case of steering according to the channel of feed. Higher coefficients of the quality of dynamic control and effective reducing the disturbances caused by changing of allowance and hardness of machined elements, can be achieved by changing their stiffness along the processing in ACS and AC of elastic strain condition of element.

14.

Control of vibration processing shafts about small stiffness - prof. dr hab. inż. Oleg Draczow, Państwowy Uniwersytet w Togliatti (Rosja), prof. dr hab. inż. Wiktor Taranenko, Politechnika Lubelska, mgr inż. Witold Hałas, Państwowa Wyższa Szkoła Zawodowa w Chełmie, doc. dr inż. Georgij Taranenko, Sewastopolski Narodowy Uniwersytet Techniczny (Ukraina)

In the article talked over the place of vibratory processing the long dimension shafts about small stiffness in technological process and it's influence on the exploational reliability finished products. The introduction of the vibratory processing operation reduces the level of technological residual tensions. The introduced methods of control the vibratory processing are leaning on the control of the positions of the warming zones of semimanufactured products, it means the places of the tensions relaxation. The change of the technological parameters of the vibratory processing allows to control the degree of the preparation of every part of semimanufactured product along his axis what causes decrease of the shafts deformations in the result of the lowering of technological residual tensions.

15.

The areas of the attainable quality of controlling the process of lengthwise turning - prof. dr hab. inż. Wiktor Taranenko, dr inż. Jarosław Zubrzycki, Politechnika Lubelska, prof. dr hab. inż. Aleksander Abakumow, Samarski Państwowy Uniwersytet Techniczny, Rosja, doc. dr inż. Georgij Taranenko, Sewastopolski Narodowy Uniwersytet Techniczny

In the article was introduced the investigation of the areas of the attainable quality of controlling the process of longitudinal turning. As the coefficient characterizes the quality the work of automatic stabilisation system of cutting off force on lathes is to purposeful accept the maximum value of the dynamic breakout regulated co-ordinate. The dynamic breakouts the cutting off force generate the overload of the technological system of machine tool and they extort the reducing the stabilise value of cutting off force. It causes decreasing the intensity of the technological process and the lowering the efficiency of the machining process. By the analysis of the work of the system to postulate, that simultaneously with force reactions on the system acting controlling reactions U . The controlling reaction seems to be the relay function of the time near the presence of the simultaneous limitation, sewn on his module. Upon what one can show, that by $0 < t < t_m$ does not step out switching the reaction influence. Were also introduced the investigations of the influence of the zone of insensitivity $\square\square$ the switching \square device the controlling influence on the coefficients of the quality of the turning process. In the real system the relay device switching controlling influences has the zone of insensitivity δ . The presence of the zone of insensitivity can be considered as the additional delay. Interesting is the opinion of the value influence on the received coefficient of the quality, when one achieves the switch of controlling in the function of the deviation of the exit coordinate x . Proof of the areas of the achieved controlling quality lets solve the tasks of synthesis and the analysis of the steering system the turning processes in the well-founded way.

16.

Tool wear monitoring on NC lathes - mgr inż. Radosław Gościński, Politechnika Warszawska

The main role of tool monitoring in NC machine tools. The systems used now in industry and their drawbacks. The original concept of a tool probe using one full strain gauge bridge for orientation of tool edges in four directions: +X, -X, +Z, -Z and for direct tool wear measurement. The calculation and design of patented tool probe for lathes.

SESSION I. AUTOMATION, ROBOTICS, MONITORING – part 3

17.

Project planning in multiproduct environment - mgr inż. Irena Bach, dr inż. Grzegorz Bocewicz, prof. dr hab. inż. Zbigniew Banaszak, Politechnika Koszalińska

Project planning in multi-product environment of SMEs has to be supported by interactive, task oriented decision support systems. The approach proposed employing the constraint concerning sufficient conditions guaranteeing required project management quality.

18.

Optimization and computer simulation in improvement of production processes - dr inż. Dariusz Plinta, Akademia Techniczno-Humanistyczna w Bielsku-Białej

The use of the simulation packet ARENA with the OptQuest tool for optimizing simulated processes in improving production systems is presented in the paper. In the described example, two stages were distinguished: creation of the simulation model and creating of the optimizing model. Simulation connected with optimization makes it possible to check all admissible variants of the proposed improvements and to choose the best solution.

19.

The use of outsourcing improve productivity of system - dr inż. Sebastian Saniuk, Uniwersytet Zielonogórski

In this paper a problem of production orders planning under assumed limits of enterprise is presented. This concept is connected with Theory of constraints (TOC). The basic idea lies behind the TOC principles is the need to manage the organisation constraints. This means concentrating on controlling the bottleneck resources. This paper provides a planning method of production orders sequence in the system where workflows have to pass through bottleneck. The model specification of system and planning procedure, as well as illustrative example is presented.

20.

Implementation of declarative framework for decision support in scheduling problems - dr inż. Paweł Sitek, dr inż. Jarosław Wikarek, Politechnika Świętokrzyska

Scheduling problems appear frequently at different levels of decisions. They are usually characterized by many types of constraints, which make them unstructured and difficult to solve (NP-complete). Traditional mathematical programming approaches are deficient because their representation of constraints is artificial (using 0-1 variables). Unlike traditional approaches, constraint logic programming (CLP) provides for a natural representation of heterogeneous

constraints. In CLP we state the problem requirements by constraints; we do not need to specify how to meet these requirements. In this paper we propose a declarative framework for decision support system (DSS) for scheduling problems implemented by CLP and relational SQL database. We illustrate this concept by the implementation of a DSS for scheduling problems with external resources in different production organization environments.

21.

CRM in logistics of Warehouse system distribution - dr inż. Paweł Zając, Politechnika Wrocławska

The functional features of information systems were examined to determine the latter's suitability for the integrated support of enterprise delivery chain logistic processes. The information systems have been classified according to which logistic processes they support.

A classification of the commercially available delivery chain management supporting information system packages depending on what management functions they support clearly shows that their development proceeds from simple filing-reporting systems to intelligent systems supporting broadly defined categories of an organization's goals and the dynamic control of reaching them.

As advances in information technologies are made it is crucial that enterprises use the latter to improve their management and functioning. For some enterprises such as banks and insurance and finance companies such systems are simply indispensable.

The implementation of information systems, their proper use and upgrading are the key steps in making the running of enterprises more efficient. According to the developers of such systems, the following can be gained from their application:

- flexible response to: customers' immediate needs, changes in the business plan and disruptions in production;
- a reduction in work-in-progress;
- as high as 50% improvement in execution timeliness,
- a reduction in average lead time,
- a reduction in assembly parts shortages,
- an increase in productivity,
- a reduction in inventories,
- a better mean inventory turnover index,
- an increase in sales,
- a reduction in buying costs,
- better information support of the firm's staff,
- an increase in business profit,
- increased flexibility and better adaptability to changing external conditions,
- better contacts with customers.

But to achieve the above results the potential users must meet certain requirements. The stated functional features of the offered software packages are mostly contingent on:

- the firm's organization and management level,
- the firm's information technology application area,
- the information technology hardware's class and parameters,
- the system operating conditions.

Also in Poland the enterprises have become aware of the benefits resulting from the use of logistics supporting information systems and begun spending more on firm management support

software. These expenditures amount to over 1% of the annual turnover (as compared to 5-6% in the EU).

22.

Good engineering practice facilitates european declaration of conformity - prof. dr inż.

Tadeusz Missala, Przemysłowy Instytut Automatyki i Pomiarów PIAP

The UE Directives of New and Global Approach and harmonized standards contain the requirement, the good engineering practice has to be used and documented. The principles of the good engineering practice are sketched out in relation to integrated manufacturing systems (automation islands). The necessity of elaboration of the detailed description of the system and its physical environment is underlined, as well as the necessity of fulfilling the hazard and risk analysis and document its results.

SESSION I. AUTOMATION, ROBOTICS, MONITORING – part 4

23.

Modernization of control system for TOR production center - dr hab. inż. Jerzy Zając, prof.

PK, mgr inż. Grzegorz Chwajoł, mgr inż. Tomasz Więk, mgr inż. Jarosław Zych, Politechnika Krakowska

The paper presents modernization of control system for TOR Production Center situated in Laboratory of Automated Production Systems Division of Cracow University of Technology. Hardware part of the system consists of CNC and PLC controllers integrated by using Profinet an Industrial Ethernet network. Software part of the system is developed using agents technology.

24.

Modeling of selected aspects of distributed production control system - dr hab. inż. Jerzy

Zając, prof. PK, mgr inż. Grzegorz Chwajoł, Politechnika Krakowska

Modeling plays an essential role in the process of production systems design and control. The paper briefly describes methods used for manufacturing systems modeling and presents UML models of selected aspects of distributed production control systems.

25.

The influence of maximum order quantity for production order on total production time for jobs - mgr inż. Tomasz Witek, prof. nzw. dr hab. inż. Tadeusz Witkowski, Politechnika

Warszawska

The paper presents the application of the Theory of Constraints (TOC) which was used to solve flexible job-shop scheduling problem (FJSP). The influence of maximum order quantity for production order on total production time for jobs were investigated. The computer experiments with using APP software and achieved results and conclusions have been described.

26.

The influence of process type and flexibility of machines to makespan in production system

- prof. nzw. dr hab. inż. Tadeusz Witkowski, mgr inż. Arkadiusz Antczak, mgr inż. Paweł Antczak, Politechnika Warszawska

In the paper the influence of process types and flexibility of the machines in manufacturing operations to makespan is discussed. The flexible job shop scheduling problem (an extension of the classical job shop scheduling), which provides a closer approximation to real scheduling problems is analyzed. To estimate makespan the heuristic algorithms were used.

27.

About possibility diagnosing in the flexible manufacturing systems - prof. dr hab. inż. Jerzy Honczarenko, Politechnika Warszawska, dr inż. Mariusz Sosnowski, Politechnika Szczecińska

Below in paper authors propose concept of supervision and diagnostics the system which already building. This conception rest on working real manufacturing system and working its modeling object at the same time, and next identification of damage through confrontation times of realization the same functions in both systems. In Department of Automated Manufacturing Systems was built the Miniature Flexible Manufacturing System which served as object of study. All will be prepare in eM-Plant. Authors propose also plans intelligent diagnostic system based on modern microprocessor with ARM's core.

SESSION II. MOBILE ROBOTS SOFTWARE, EQUIPMENT AND APPLICATION - part 1

28.

Androidal robot ROMAN expressed emotions - dr inż. Krzysztof Mianowski, Politechnika Warszawska, prof. Karsten Berns, Norbert Schmitz, University of Kaiserslautern, Niemcy

Future service robots will more and more be able to communicate with humans in a natural way. The communication between humans is not only based on speech in fact movements and emotions are very important. The expression of those emotions is a combination of neck, eyes and skin movements. Therefore the paper presents the construction of the humanoid robot head ROMAN with artificial eyes and neck. The head includes actuators, sensors and mechanical parts which are all integrated into the head. The current design enable the robot to include a complex sensors system and a complete emotional system. The artificial skeleton consists of the entire head and the lower jaw which are attached to the main plates together with the servo motors. The silicon skin is glued to the skeleton and can be moved with the help of 8 small metal plates which are connected to the servo motors with cables.

29.

Selected problems of dead reckoning navigation for mobile robots - dr inż. Stanisław Popowski, Instytut Lotnictwa, Warszawa

Navigation systems used in mobile robots are usually limited to dead reckoning navigation system supported by simple bearing navigation system. The paper presents the discussion focused on methods of pitch and roll angles measurement as well as roles of such measurements in considered navigation system. Selected methods that allow to maintain the linear relationship between the error of determined location and time are also presented for the case of inertial navigation.

30.

Radial CNN in mobile robot navigation - dr inż. Michał Gnatowski, dr Barbara Siemiątkowska, Instytut Podstawowych Problemów Techniki PAN

In the article a method for path planning, based on laser3D data, for a mobile robot is presented. Data from a laser3D is used to build a 2D radial map of an environment. The map is used to determine available directions. The main advantage of the method is a possibility to generate obstacle-free path in rough terrain. It is not possible 2D laser only.

31.

The navigation system of a mobile robot ELEKTRON - dr inż. Barbara Siemiątkowska, mgr inż. Rafał Chojecki, Maciej Zajac, Politechnika Warszawska

In this paper a method of mobile robot navigation in an unknown indoor environment is presented. The robot is equipped with a laser range finder. The data of the 2D scanner are used to build the dual grid-based and feature-based map of an environment. Particle filters method is used for localization. The obstacles-free path is generated using cellular neural network. The method has been tested with the use of mobile robot ELEKTRON.

32.

Design of holonomic robot – Pathfinder - Łukasz Jakóbiec, Mariusz Żelażewski, Polsko-Japońska Wyższa Szkoła Technik Komputerowych

In this paper we present our approach to building mobile robot with full holonomic motion possibilities with basic suspension. Article is divided into three parts. First summarizes most common approaches to holonomic motion. Second part shows our approach to this problem and our proposals for overcoming common problems. Finally we show example applications parts of Pathfinder and future plans for this robot.

33.

On using mobile robots for search in collapsed buildings - mgr inż. Dominik Puchan, dr hab. inż. Piotr Skrzypczyński, Politechnika Poznańska

Nowadays, urban search and rescue (USAR) is one of the most important application fields for the mobile robots. Unfortunately, this potential is not widely recognized by robotics researchers in Poland. This paper considers such issues as: what tasks can be performed by robots in the USAR domain, how the robots can fit into the existing structure of a rescue team, and what is the optimal configuration of both the locomotion system and the sensors of such robots. Some guidelines to the design of USAR robots have been proposed, and a concept of a miniature robot intended for trapped victims search in collapsed buildings has been developed.

34.

The evaluation function in the method of the route selection - mgr inż. Tomasz Leszczyński, Akademia Marynarki Wojennej

The proposal of the solving of the problem of creating of evaluation function for the method of route selection for unmanned underwater vehicle is presented in this paper. Moreover, the assumptions enabling the creating this function and its simplification on the grounds of problems of computational complexity of calculations are also described. Finally results of calculations of this method are shown.

SESSION II. MOBILE ROBOTS SOFTWARE, EQUIPMENT AND APPLICATION - part 2

35.

Mobile robot ATRVjr application for risky scenario - mgr inż. Janusz Będkowski, prof. dr hab. Andrzej Masłowski, Przemysłowy Instytut Automatyki i Pomiarów PIAP

Presented paper shows the result of the implementation of the intelligent controller for the autonomous mobile robot ATRVJr applied for risky scenarios. The implemented algorithm based on artificial neural network fuzzyART shows an advantage while working in real environment with the unknown structure and provided not completed information. The main task for controller is to achieve the maximum speed in order to maximizing the prediction problem. The controller manages the damage of the sensor of the robot, due to the goal can be achieved by mobile platform in case of sensor problem. Presented experiments shows the advantages of the controller and proof the need of the usage artificial neural network to implement intelligent control unit for achieving the goals in risky scenario.

36.

The computer graphic approach of the advanced mobile robot simulation design - mgr inż. Janusz Będkowski, mgr inż. Grzegorz Kowalski, prof. dr hab. Andrzej Masłowski, Przemysłowy Instytut Automatyki i Pomiarów PIAP

The following paper presents the computer graphic approach of the advanced mobile robot simulation design. Modern graphic computing provides a possibility in approaching the simulation and visualization of the sophisticated mobile robots in advance stage of the design, as well in it's real time mode. The virtual reality which facilitated and composed by the graphic technology allows us to observe the execution of the advanced autonomous algorithms of the mobile robots. The special effects which inherent in the technology such as particle system, reflection, shadows are able to approach the sophisticated scenario designs. This approach systematically is able to provide an effective and efficient production. Therefore, The implementation of the advanced mobile robots simulation decreases the cost of the configuration of the robot perception design, also the cost of the developing the autonomous navigation algorithms and the training customers.

37.

Automatic control of self propelled charge to the aim of mine counter along desired trajectory - dr inż. Piotr Szymak, Akademia Marynarki Wojennej

Successful mine counter mission with the assistance of a self propelled charge requires precise control of a robot movement in an underwater environment. In the paper automatic control system of an underwater vehicle called Gluptak has been presented, which can support execution of presented mission. For the purpose of Gluptak's control, it has been considered using of classical controllers PD and artificial intelligence controllers, particularly with fuzzy data processing. Moreover mathematical model of Self propelled Mine Counter Charge SMCC called Gluptak and selected results of numerical research have been inserted.

38.

Mobile robots and safety - dr inż. Piotr Szynkarczyk, mgr inż. Rafał Czupryniak, Przemysłowy Instytut Automatyki i Pomiarów PIAP

Mobile robots - review of mechanical design as well as new trends of their development in the context of safety and increasing a public menace by terrorism.

39.

Detection of vegetation and water obstacles in surroundings of unmanned ground vehicle - dr inż. Andrzej Typiak, Wojskowa Akademia Techniczna

Results experimental research focusing on detect vegetation and water obstacles in surroundings of unmanned vehicle are presented. To detect vegetation analysis video images through their segmentation, objects classification, and segmentation through watershed using is applying. To water obstacles detect color video camera and laser telemeter are used.

40.

Using video camera for object's localization in surroundings of unmanned vehicle - dr inż. Andrzej Typiak, Wojskowa Akademia Techniczna

The growing importance technology based on unmanned systems which allow the usage of highly automated transport types requires a lot of research work on developing it's steering systems. Steering solutions shown in this paper are a base for further work on developing a fully automated unmanned transport platform. Results research using video camera for object's localization in surroundings of unmanned vehicle are presented.

SESSION III DESIGN AND INTEGRATION METHODS FOR SYSTEMS – part 1

41.

Robust stability of linear continuous-time fractional system of commensurate order with characteristic function linearly dependent on one uncertain parameter - prof. dr hab. inż. Mikołaj Busłowicz, mgr inż. Tomasz Kalinowski, Politechnika Białostocka

The problem of robust stability of linear continuous-time fractional systems of commensurate order with characteristic polynomial linearly dependent on one uncertain parameter is considered. This problem is equivalent to the problem of robust stability of convex combination of two fractional commensurate degree polynomials. Frequency domain methods for robust stability analysis of such a combination are given. The method proposed are based on the zero exclusion condition known from the theory of robust stability of families of natural degree polynomials. The considerations are illustrated by numerical example.

42.

Stability of linear continuous-time fractional systems of commensurate order - prof. dr hab. inż. Mikołaj Busłowicz, Politechnika Białostocka

New frequency domain methods for stability analysis of linear continuous-time fractional systems of commensurate order are given. The methods proposed are generalization of Mikhailov stability criterion and modified Mikhailov criterion known from the theory of natural number order systems. The considerations are illustrated by numerical example.

43.

Stabilization of inertial plants of fractional order with delay using fractional PI controllers - mgr inż. Andrzej Ruszewski, mgr inż. Aneta Sidorowicz, Politechnika Białostocka

The paper presents the problem of stabilizing of inertial plants with time delay using a fractional-order PI controller. Using the classical D-partition method, a simple and efficient computational method for determining stability regions in the controller parameters space are given.

44.

Controllability of composite linear positive discrete-time systems with delays - mgr inż. Rafał Kociszewski, Politechnika Białostocka

The problem of controllability of composite (connected in series) linear positive discrete-time system with delays in state is considered. Necessary and sufficient conditions for controllability of composite systems are established. A method for computing the control sequence which transfers the system from nonzero initial state to the desired nonnegative final state is given. Considerations are illustrated by numerical example.

45.

D-stability regions of control systems with integrator plants with time delay and PD controller - mgr inż. Andrzej Ruszewski, Politechnika Białostocka

The paper presents the D-stability problem of control systems with integrator plants with time delay and the PD controller. Simple methods for determining D-stability regions in the plant and the controller parameters space are given. Knowledge of these regions permits tuning of the PD controller and ensures required damping ratio and level of stability of the system. The methods proposed are based on the D-partition method.

46.

Synthesis of an equivalent model of multistroke and multidimensional control system - doc. dr inż. Wadim Kramar, Sewastopolski Narodowy Uniwersytet Techniczny (Ukraina), dr hab. inż. Antoni Świąć, prof. PL, Politechnika Lubelska

They present a mathematical model of a multidimensional system on the basis of a matrix approach. It enables drawing up elements of computer based systems of analysis and designing the multidimensional and multistorke continuous-discrete systems of automatic control.

47.

Reachability and controllability of positive fractional discrete-time systems with delay - dr inż. Wojciech Trzasko, Politechnika Białostocka

In the paper the positive fractional discrete-time linear systems with delay in state is considered. Necessary and sufficient conditions are established for the positivity, reachability and null controllability in case of delay in state is equal to one The considerations are illustrated by an example.

SESSION III DESIGN AND INTEGRATION METHODS FOR SYSTEMS – part 2

48.

Reachability of fractional positive continuous-time linear systems - prof. dr hab. inż. Tadeusz Kaczorek, Białystok Technical University

A new class of fractional linear continuous-time linear systems described by the state equation is introduced. The solution to the state equations is derived using the Laplace transform. Necessary and sufficient conditions are established for the internal and external positivity of the fractional systems. Sufficient conditions are given for the reachability of the fractional positive systems.

49.

Computation of positive realizations of singular hybrid linear systems - prof. dr hab. inż. Tadeusz Kaczorek, mgr inż. Łukasz Sajewski, Politechnika Białostocka

The realization problem for 2D positive singular linear hybrid systems is formulated and a method based on the state variable diagram for finding a positive realization of a given improper transfer function is proposed. Sufficient conditions for the existence of a positive realization of a given improper transfer function are established. A procedure for computation of a positive realization is proposed and illustrated by a numerical example.

50.

Suboptimal predictive control based on neural FIR modes - dr inż. Maciej Ławryńczuk, Politechnika Warszawska

This paper describes a suboptimal nonlinear Model Predictive Control (MPC) algorithm based on FIR (Finite Impulse Response) neural models. Multilayer Perceptron (MLP) neural network is used. The algorithm is computationally efficient because it results in a quadratic programming problem, which can be easily solved on-line by means of a numerically reliable software subroutine. The algorithm gives good closed-loop control performance, comparable to that obtained in the nonlinear MPC technique, which hinges on nonlinear optimisation.

51.

Identification of recurrent RBF neural models - dr inż. Maciej Ławryńczuk, Politechnika Warszawska

This paper details an identification (training) algorithm of RBF (Radial Basis Function) recurrent neural networks which can be used for modelling nonlinear dynamic processes. In comparison with the widely used classical backpropagation algorithm, which leads to one-step ahead predictors, the described one results in many-steps ahead predictors. The algorithm is used for modelling a chemical reactor.

52.

Takagi–Sugeno fuzzy models in control systems with integrated predictive control and set–point optimization - dr inż. Piotr Marusak, Politechnika Warszawska

Control systems with integrated predictive control and set-point optimization are used in cases when variability of disturbances is comparable with dynamics of the control plant. In these structures, in the optimization problem solved by the integrated predictive controller, two control plant models are used: a dynamic model from optimization problem of a predictive algorithm and linearized steady-state model. The idea proposed in the paper consists in application of only one fuzzy (nonlinear) dynamic control plant model for realization of both tasks: predictive control

and set-point optimization. Such an approach gives simplification of the problem and may give results very close to those obtained when two models are used. It is demonstrated using an example of a control system of a nonlinear chemical reactor with inverse response.

53.

Predictive controllers with presumed trajectory of control changes and efficient mechanism of control signal constraints handling - dr inż. Piotr Marusak, Politechniki Warszawskiej

A new formulation of predictive control algorithms is proposed in the paper. The idea of the approach consists in assumption that future trajectory of changes of a control signal is presumed in advance. Thanks to such an approach it is easy to take control signal constraints into consideration. Moreover, in the case of analytical predictive controllers, it is possible to take these constraints into consideration on the entire control horizon. Except typically available methods of predictive algorithm tuning, in the case of those presented here, thanks to appropriate choice of a trajectory of future control signal changes, it is possible to influence behavior of the control system. Thus, a designer has more freedom to tune the control algorithm.

SESSION IV AUTOMATION AND ROBOTIC EQUIPMENT part 1

54.

Modeling of the beam as a control plane for the vibration control system - prof. dr hab. inż. Zdzisław Gosiewski, mgr inż. Andrzej Piotr Koszewnik, Politechnika Białostocka

An active vibration damping system with the use of piezoelements fixed to the structure is presented in the paper. The optimal location of the piezo-strips on the structure is calculated for given cost functions. Coefficient correlations between control forces, strains, mode shapes, frequencies changes, modal masses, modal stiffness are analyzed to find simpler method for calculation of the quasi-optimal localization of piezo-sensors and piezo-actuators.

Reduced model of the open-loop system was identified and we have carried out simulation investigations to find the best controller which reduce the amplitude of vibrations. The correct choice of the controller was verified and investigated experimentally.

55.

Optimal control of high speed rotor dynamic supported magnetically - mgr inż. Arkadiusz Mystkowski, prof. dr hab. inż. Zdzisław Gosiewski, Politechnika Białostocka

In the paper the robust control method was applied in the active magnetic bearings system (AMB). The dynamical behavior of closed-loop system in wide range of rotation speed was investigated. The input and output signals of the closed-loop system and the disturbances were limited by the weighting functions. The H_∞ robust controller was designed and the H_∞ closed-loop system was investigated. The H_∞ closed-loop system is robust stable in spite of unbalance and structural instability of AMB. Finally simulation and experimental results show the effectiveness of the control system as well as good initial responses/transient responses, unbalance compensation and robustness of the designed controller.

56.

The computer system for support of design and optimizing human-machine interface for military aircraft cockpit - dr hab. inż. Cezary Szczepański, Przemysłowy Instytut

Telekomunikacji, mgr inż. Krzysztof Butlewski, mgr inż. Dariusz Karczmarz, mgr inż. Roman Marchwicki, dr inż. Przemysław Mądrzycki, mgr inż. Wojciech Puchalski, Instytut Techniczny Wojsk Lotniczych

This paper describes the hardware architecture and the concept of the system of the computer-based test and design simulator. It presents some analyses of software and hardware solutions of the selected test benches of the simulator.

57.

Knowledge representation for the set of admissible decisions determination problem in cockpit optimization for the research simulator - dr inż. Piotr Golański, Instytut Techniczny Wojsk Lotniczych

This paper presents the concept of automated method of admissible decisions set determination in cockpit optimization problem. In this method an expert system approach has been applied. After the problem model definition, the knowledge representation for this problem solution has been determined. The knowledge representation is the rules set, fired by the inference engine CLIPS expert system shell.

58.

Gasodynamic controll system for small aircrafts' bombs - dr inż. Robert Głębocki, Politechnika Warszawska

In refer some results from researches of gasodynamic controlled bombs were presented. In presented solution controlled bomb has inertial navigation system, calibrated by GPS direct before release and set of correction engines to control the flight.

59.

Direction control system for unmanned electric vehicle - dr inż. Robert Głębocki, Politechnika Warszawska

In refer were presented some results of researches about navigation and control system in application to unmanned ground vehicle. Research and development results were applied and tested on electric car melex.

SESSION IV AUTOMATION AND ROBOTIC EQUIPMENT part 2

60.

Fuzzy models of discrete stochastic processes for technological processes characteristics - dr hab. inż. Anna Walaszek-Babiszewska, prof. Politechniki Opolskiej, mgr inż. Anna Czabak, mgr inż. Katarzyna Błaszczuk, Politechnika Opolska

In the paper the method of the construction of time series fuzzy models have been presented. The Mamdani type fuzzy models have been used as well as weights of elementary rules, representing probabilities of fuzzy events occurring in the antecedents and consequents. The values of weights have been calculated by means of the association rules for experimental data. The inference operators have been examined.

61.

Wireless ZigBee network for the industry - dr inż. Piotr Dudek, prof. dr hab. inż. Edward Wantuch, Politechnika Krakowska

The wireless communication technologies are rapidly spreading to many new areas, including the automation and the importance of the use of wireless technologies in the data acquisition, building control, monitoring systems and automation of manufacturing processes will grow. From the existing wireless standards seems very promising the new international standard ZigBee. The article describes this wireless technology and it's benefits.

62.

The simplified method of reconstruction of three dimensional object position with the two-camera vision system - mgr inż. Andrzej Bratek, dr inż. Andrzej Syrczyński, Przemysłowy Instytut Automatyki i Pomiarów PIAP

In this paper we present the method, simple to implement in software, which determines position coordinates of an object in the 3D scene on the basis of data gathered by the two-camera vision system watching the scene. The method was developed during research works on synthesis of robot trajectory, which reflects motion of a tool driven by a man manually.

The paper describes undertaken assumptions and bounds of the above method. Then, the mathematical model of image formation process in cameras, the calibration algorithm of model's parameters as well as the procedure of reconstructing the scene are presented. There are also shown test results based on real data obtained from the sample object 3D reconstruction. The conclusion points out how to increase the accuracy of results achieved.

63.

Neurocontrolling the Process of the Grinding of cement basing on the quasi-continuous measurement of fragmenting the step - mgr inż. Gerard Bursy, Instytut Szkła, Ceramiki, Materiałów Ogniotrwałych i Budowlanych, prof. dr hab. inż. Ryszard Rojek, Politechnika Opolska

High heat of the grinding process, force us, to search many new things in grinding in process, of mineral resources. Apart from up-grade many technology parts, we attract attention on modernization, and and improvement of quality in control systems. To take every grinding process into consideration (like: not-linear, delay, not-stationary object – like the sphere mill is). So creating new tools of better control is on purpose. In this paper, we attempt to find a solution to a problem, based on artificial neuron network. To provide a diagnosis of control, on sphere mill as example, worked in closed pattern with air separator.

64.

Application of mathematical models in design process of ship power systems - dr inż. Ryszard Arendt, mgr inż. Andrzej Kopczyński, Politechnika Gdańska

This paper deals with the problem of mathematical models applications and simulations in design process of ship power systems. In this paper design procedures and mathematical models of ship power systems are presented. The models will be used in expert system for aided design of ship power systems.

65.

A trajectory coordination model of two cartesian manipulators for a transport operation -
dr inż. Adam Słota, Politechnika Krakowska

In the paper a model of trajectory correction of a Cartesian manipulator cooperating with the second manipulator to transport an object is presented. For flexible mounting of a transported object to the robots proposed trajectory correction aims at limiting the change of distance between manipulators' effectors. For the models of proportional and proportional-integral correction and selected values of model parameters simulation is performed and results are presented.

SESSION IV AUTOMATION AND ROBOTIC EQUIPMENT part 3

66.

The 2 ½ d method in planning process of robot trajektory - mgr inż. Daniel Reclik, dr hab. inż. Gabriel G. Kost, prof. Pol. Śl., Politechnika Śląska w Gliwicach

In this paper there is presented the method of 3D manipulator's work-space analysis. The analysis of robot's work-space is necessary for generation the safety movement path. There was used 2 ½ D method, which is based on algorithm of following sections defining in robot work area. The heights of those sections are determining by another algorithm. Those sections are explored by using flat analysis, but the results are transposed into graph form. This graph is the record of all possible movements, so to get the optimum movement there must be used Floyd algorithm. This, shortest trace is optimized and smoothed by using NURBS and B-Spline curves.

67.

The control console of surgical robot Robin Heart - dr Zbigniew Nawrat, mgr inż. Wojciech Dybka, mgr inż. Kamil Rohr, Fundacja Rozwoju Kardiochirurgii - Zabrze, dr inż. Paweł Kostka, Fundacja Rozwoju Kardiochirurgii - Zabrze, Politechnika Śląska w Gliwicach

Idea, functional analysis and innovative construction of Man-machine interface designer for polish Tele-manipulator Robin Heart is presented. Main idea is based on the assumptions, that the whole construction corresponds to natural surgeon environment "in the inner of patient body" during operation. Master tools as well as foot pedals are used to control the movements of two surgery tool arms and one robot for vision channel positioning. Real operation view and technical system information with on-line patient's diagnostic and advisory system are easy and intuitive accessible for surgeon during procedure.

68.

Innovative semi-automatic Robin Heart uni laparoscopic tools - dr Zbigniew Nawrat, mgr inż. Wojciech Dybka, mgr inż. Kamil Rohr, Fundacja Rozwoju Kardiochirurgii - Zabrze, dr inż. Paweł Kostka, Fundacja Rozwoju Kardiochirurgii - Zabrze, Politechnika Śląska w Gliwicach

Present medicine develops in considerable measure thanks to the use of newest achievements of sciences as well as new methods, techniques and technologies introduction,. Accessible means and surgical repair methods allow onto modification of state of vascular arrangement and repair or exchange of part or the whole heart. Presented article is the review of directions of surgery tools development used in mini invasive surgery with special regard of own experiences arrangement – project Robin Heart Uni Tools.

69.

Application of haptic joystick with magneto-rheological fluid for control of virtual electro-hydraulic servo drive's model - mgr inż. Paweł Bachman, Uniwersytet Zielonogórski

The article describes operation of haptic devices and magneto-rheological fluids' main properties. The model of electro-hydraulic servo drive used in research and prepared using Matlab/Simulink software is presented in the article. The last section forms specification of construction and researches of rotary magneto-rheological dumper and haptic joystick

70.

Robot arm's control using a multiaxial haptic joystick with magneto-rheological fluid and force feed-back - mgr Marcin Chciuk, Uniwersytet Zielonogórski

The article describes selected existing haptic devices and briefly features the construction of the robot used in the research. The last section includes multiaxial haptic joystick's specification, studies of rotary dampers with magneto-rheological fluid and description of robot's control system.

71.

Robotisation of welding in last 20 years - mgr inż. Marek Petz, mgr inż. Zbigniew Pilat, Przemysłowy Instytut Automatyki i Pomiarów PIAP

Development of robotized welding was described, mainly basing upon experience of authors.

SESSION V MEASUREMENTS DEVICES AND SYSTEMS

72.

New challenges in European Metrology Research Programme - dr Albin Czubla, mgr inż. Anna Otczyk, mgr inż. Dobrosława Sochocka, Główny Urząd Miar

With the overall goal of accelerating innovation and competitiveness, generating data and knowledge necessary to improve quality of life, and providing better tools for the scientific community the European Metrology Research Programme (EMRP) aims, through European integration, to develop new measurement capabilities which have strategic impact for Europe.

The European Metrology Research Programme aims to join relevant European national programmes and activities to accelerate the development of vital research capabilities that on the one hand supports competitiveness and on the other hand provides an infrastructure that supports EU policies. The Joint Programme is based on Article 169 of the European treaty. The European Commission will co-fund this Joint Programme through Article 169 - the most advanced instrument for the integration of European Research. The EMRP will play an important part in the construction of the wider European Research Area.

The context of the programme is to enable Europe to respond to the growing demands for cutting-edge metrology as a tool for innovation, scientific research and support for policy, particularly in emerging technological areas.

The programme objective is to accelerate the development of new measurement capabilities and to significantly improve dissemination and application of the knowledge generated throughout the stakeholder community.

The Governance of the EMRP is assured by executing the Joint Programme through a common structure. The common structure is set out as a non-profit association according to German civil

law with the legal title of EURAMET e.V. This legal entity is constructed with a perspective that goes even beyond the execution of the EMRP and will be able to include tasks and obligations related to the European and global harmonisation of metrology. Membership of EURAMET e.V. is generally open to all European countries through their national metrology institutes. Thus, the EMRP partners effectively establish a substructure of the wider EURAMET e.V. for all matters of the EMRP.

73.

A gyroscope as a device for stabilizing the angular position of on-board sensors used for detection and location of overhead high-voltage power lines - dr hab. inż. Zbigniew Koruba, dr inż. Janusz Tuśnio, Politechnika Świętokrzyska

The paper discusses the problems related to the construction of on-board instruments for detection and location of the angular position of objects emitting an electromagnetic field such as overhead high-voltage power lines. Signals disturbing the operation of devices in motion are presented and analyzed. One of the methods of reducing disturbance signals is the application of active filters. A preliminary analysis was conducted to determine if a gyroscope could be used for stabilizing the angular position of sensors and reducing the slow-varying disturbances caused by the oscillations of the flying vehicle.

74.

Measuring system for determination of position of punctual source of light - dr inż. Izabela Krzysztofik, mgr inż. Adam Rozenau, Politechnika Świętokrzyska

The paper presents measuring system for determination of position of punctual source of light. This system is applied in the homing missiles. There are results of measurements for select optical modulators and conclusions.

75.

Locating the sources of low-frequency electromagnetic radiation as potential air-attack targets - dr inż. Janusz Tuśnio, dr hab. inż. Zbigniew Koruba, Politechnika Świętokrzyska

The work discusses the new concept, mathematical model and estimates for locating the angular position of electromagnetic equipment.

76.

Problem of estimation and visualization of attitude angles in selected measuring systems - mgr inż. Anna Gałach, dr inż. Stanisław Popowski, Instytut Lotnictwa, Warszawa

The paper presents problems focused on estimation and visualization of attitude angles, which are used for control and navigating in light aircraft. The article presents the idea of the solution and realization of the lab model of such system based on PC-104 computer platform.

77.

The uses of computer aided for analyses of machine parts surface condition - dr Mirosław Malec, dr inż. Piotr Penkała, Politechnika Lubelska

The article describes one of the possible uses of the Talyprofile computer program for analysing the surface condition as one of the important factors defining the properties of the material

analysed including the tribologic properties. They have presented possibilities of TalyProfile software in relation to study of Surtronic3+ machine. Next they discussed research stand by support of Surtronic3+. And next they have presented methods of surface condition measure, particularly in roughness and waviness parameters. They have presented advantages and faults of contact method of study these parameters.

78.

The possibilities of automation of laboratory machines - dr inż. Jacek Domińczuk,
Politechnika Lubelska

The possibilities of automation of laboratory machines were introduced in the paper by the means of the example of the tensile testing machine. Solutions of control system problem, which enable the widest use of machine for tensile research, were presented. The article shows the possibility of remote controlling as well as controlling specific executive elements of the machine and the possibility of direct processing the measurements results.

SESSION VI EKONOMICAL AND SOCIAL ASPECTS OF AUTOMATION AND ROBOTIZATION

79.

Supervising the stationary state of modernized technological processes - mgr inż. Kazimierz Majdan, Przemysłowy Instytut Automatyki Pomiarów PIAP

The development and modernization investments in industry are often undertaken to improve the usable properties of technological process, however with the condition of maintenance of bases of its functionality. The cognitive researches and specific tests joined with the assessment of partial solutions effectiveness serve the systematic development of process. These are some utilitarian investigations of resistance of devices on stresses from different influencing factors. The tests, proper for expected functionality of process, usually are executed during projecting and assembling the system components. The results of these tests as well as the continuous monitoring of the critical events during exploitation are helpful in validation of introduced changes of process. To this are leading also: the investigation of threats, the measurements of usable properties and the systematic assessment of effectiveness of introduced modifications. The implications and positive effects from the connection of analytic and experimental methods are showed here. Such synergic activities contribute to the maintenance of stationary state of technological process, with assurance of durability its key parameters.

80.

Globalization instruments and their impact on a human being life - dr inż. Małgorzata Kaliczyńska, Politechnika Opolska

The paper deals with a sound problems of globalization indicating some aspects of them. Selected instruments of globalization has been discussed both hardware ones like satellite communication, GPS, RFID and software including data bases, Internet servers, community networks. The positive impact of globalization on the human being has been discussed and some negative influences bounding the possibility of every person and loss of her/his privacy.