March 14-16, 2007 - Industrial Institute for Automation and Measurements PIAP.
4 plenary papers and 67 regular papers covering six topic area.

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

PLENARY SESSION

1.
Distributed control problems - prof. dr had. inż. Wojciech Grega, Akademia Górniczo-Hutnicza

Problems related to the distributed control systems design an implementation are discussed in the paper. Selection of data transmission methods and protocols, software and hardware specification of distributed control systems, and finally methods of transmission disturbances compensation are addressed in this paper. The blow heater model controlled via Ethernet network is described as an example.

2.
Current trends in robotic vision research - prof. dr hab inż. Andrzej Kasiński, Politechnika Poznańska

3.
On distributing control of multiple mobile robots - dr hab. Stanisław Ambroszkiewicz, IPI PAN; prof. dr hab. Adam Borkowski, IPPT PAN; prof. dr hab. Krzysztof Cetnarowicz, AGH, Kraków

This paper deals with the automatic coordination of a group of mobile robots. Retaining much of the autonomy of individual robots with respect to their tasks, we introduce higher layers in the control system. These layers regard the group of robots as an entity an allow us to increase considerably the efficiency of coordination. The proposed model combines the concepts of multi-agent systems and service-oriented architecture.

4.
The mathematical model of operating the production line - doc. dr inż. Oleg Filipowicz, Narodowy Uniwersytet Techniczny w Sewastopolu; mgr inż. Lech Mazurek, Państwowa Wyższa Szkoła Zawodowa w Chełmie; prof.. dr hab. inż. Wiktor Taranenko, Politechnika Lubelska; dr hab. inż., prof. PL Antoni Świć, Politechnika Lubelska

This paper introduces the mathematical model of operating the elastic productive line (EPL) of multifunctional CNC machines, that includes one redundant multifunctional CNC machine which can take over functions of every EPL machine. The graph of ELP state, relations and equations used to calculate the reliability and the productivity were shown. Article also presents Maple – the computer program for reliability and productivity calculations and the mathematical results of modelling and calculations.

SESSION I. AUTOMATION, ROBOTICS, MONITORING – part 1

5.

Open-loop control and closed-loop control of Flexible Manufacturing Systems - prof. dr hab. inż. Jerzy Honczarenko, dr inż. Andrzej Jardzioch, dr inż. Mariusz Sosnowski, Politechnika Szczecińska

The paper presents conception of open-loop control and closed-loop control of Flexible Manufacturing Systems. Open-loop control is based on schedules, which are generated with help of eM-Plant program. In second case one take under consideration the test of automatic control with the help of the existing bases of rules and Fuzzy logic blurred inference.

6.
The analysis of signal connections in robot integrated manufacturing systems - prof. dr hab. inż. Gabriel G. Kost, prof. dr hab. inż. Jerzy Świder, mgr inż. Daniel Reclik, Politechnika Śląska w Gliwicach

This paper describes the analysis of different solutions of a data flow structure in the robot flexible manufacturing integrated system in the example of a turning machine group. Different ways of signal connections, which are applied to connect the numeric lathe controller CNC type with robot controllers RJ3iB and with the SEW steering system MOVIDRIVE INVERTER MDX61B0005-5A3-4-00 with FLEXLINK plate conveyor have been described.

7.
Integration of processes planning and production control in automated manufacturing systems - prof.dr hab. inż. Jerzy Zając, Mgr inż. Grzegorz Chwajoł, mgr inż. Adam Kmiecik, Politechnika Krakowska

The paper presents a concept of multiagent system AIM which integrates processes planning and manufacturing control in automated manufacturing systems. Attention is paid to the complexity of information integration in production systems. Web services technology is presented as an implementation platform.

8.
AGVS control and cooperation - mgr inż. Wojciech Ulatowski, prof. dr hab. inż. Andrzej Masłowski, Politechnika Warszawska
This paper presents the algorithm of a transport subsystem and its modules: AGVs and Making Decision Module as well as the behaviour of Model Human Supervisor. The interactions between the modules of transport subsystem are described. The paper also presents the results of the conducted research and conclusion drawn from them.

9.
Strain gauge tool probe for NC lathes - mgr inż. Radosław Gościniak, Politechnika Warszawska

The main role of tool probes in NC machine tools. The probes 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.

10.

Vector method for NC machine tool checking in case of NC lathes - mgr inż. Rafał Wypysiński, Politechnika Warszawska

In this paper the premises and purposes of geometrical accuracy testing of movements in case of numerical control machine tools were described. The main kinds of accuracy tests and methods used in industry and developed in laboratories were characterized. New method for flat movements accuracy testing of NC machine tools was shown. Advantages and disadvantages, possibilities and limitations of different methods were presented.

11.

Automatic control drilling process of deep holes - dr inż. Jarosław Zubrzycki, prof. dr hab. inż. Wiktor Taranenko, prof. dr hab. inż. Antoni Świć, Politechnika Lubelska; dr inż. Aleksander Lewczenko, Narodowy Uniwersytet Techniczny w Sewastopolu

Specifics of deep holes processing were introduced in the article. The drilling of deep holes is the very labour-consuming process and in the same time also the most often method for deep holes formation. Main methods of deep openings drilling are: full drilling (the whole material located inside the opening is transformed into chip) and collar drilling (only the collar part of material is being transformed into chip, the centre is left in intact figure). The unique aspect of deep drilling is that the tool should find way in the material without support and stiff guidance. Because of complexity of drilling deep holes process, the mechanical stresses in tool reach the critical values for constant parameters of drilling, which causes the tool deformation and the quality deterioration of produced holes, and even damage of the tool. The methodology of working out the mathematical model of drilling process was introduced as well as the model itself. The model was worked out on the ground of analytic identification. Using worked out mathematical model synthesis of regulator has been conducted. The regulator which in conditions of influence not fully known disturbances (function random in time and formatted in the result of unavoidable variation of parameters that define the machine cutting parameters) makes possible such a steering of process to reach required accuracy and quality of drilled deep holes. For introduced disturbance model the structure of regulator allows reaching the demanded steering quality. The coefficients of steering quality in this example should be considered as border, basing on which it is possible to estimate properties of systems with very simple structure of regulator.

SESSION I. AUTOMATION, ROBOTICS, MONITORING – part 2

12.

Functional properties of water and waste water network monitoring system, based on the example of Błonie - mgr inż. Wojciech Winiarski, dr inż. Roman Szewczyk, Przemysłowy Instytut Automatyki i Pomiarów PIAP; inż. Włodzimierz Puchalski, Urząd Miasta i Gminy Błonie; mgr Bogdan Ziółkowski, Miejskie Przedsiębiorstwo Wodociągów i Kanalizacji w Błoniu

Paper presents possibilities of application of mobile phone network for water and wastewater facilities monitoring. On the base of real, communal facility in Błonie advantages and disadvantages of such monitoring are presented. Presented example indicates significant economical benefits from application of SMSes sent via GSM network in monitoring of water and waste water communal facilities.

13.

Remote laboratories in E-learning environment - dr inż. Piotr Dudek, prof. dr hab. inż. Edward Wantuch, mgr inż. Tomasz Jarosz, Politechnika Krakowska

Internet and modern technologies have increasing influence upon the development of training, revolutionizing the methods used by companies to provide additional training to their employees and students . E-learning stands, most of all, for cost savings, increased productivity of employees who have undergone training, higher degree of memorized knowledge and even the teaching quality. In the proposed paper we suggest a solution that allows for creating „real distance labs", enabling remote access to a networking lab, taking into account all safety principles, in particular confidentiality of transferred data. This solution is designed as versatile, so it can be used as remote access lab to other resources, for example PLC controllers.

14.
Functional safety communication in industrial networks – state of standardization - prof. dr inż. Tadeusz Missala, Przemysłowy Instytut Automatyki i Pomiarów PIAP

In the shortened way, the structure of the set of standards dealing with the manufacturing messages transmission via industrial networks class Fieldbus is token over. On this background the requirements for the functional safety transmission, the conception of problem solving and the relations to the users safety are presented, as well the standardized network profiles intended for realization of the functional safe transmission.

15.
System Automation Level - Lessons Learned - doc.dr hab.inż. Cezary Szczepański, dr inż. Przemysław Mądrzycki, mgr inż. Dariusz Karczmarz, Instytut Techniczny Wojsk Lotniczych

Basing on the chosen subsystems included into the Stationary Terrain Observation System modules some problems, which can be met by the automatic control system designer. Those subsystems have been performed the functions with different level of automation. The real problem solutions, with taking into considerations the real life conditions have been proposed.

16.
Observation and identification abilities of the „observation system – operator" system – lessons learned - dr inż. Przemysław Mądrzycki, doc.dr hab.inż. Cezary Szczepański, mgr inż. Dariusz Karczmarz, Instytut Techniczny Wojsk Lotniczych

Lessons learned from the development, integration, testing and fielding of the Stationary Terrain Observation System have been described in the paper. The results of deep tests and validation procedures of the system abilities in the range of detection, recognition and identification have been presented and discussed also.

17.
The prospects of expert system application in airplane diagnosis for MiG-29 example - dr inż. Piotr Golański, mgr inż. Krzysztof Butlewski, Instytut Techniczny Wojsk Lotniczych

The general rules of expert system creating has been presented in the paper. The technical object diagnostic has been analyzed on the basis of MiG-29 airplane. The example architecture of the expert system for the aircraft ahs been declared. For its sake, the expert system shell choosing

analysis has been presented. At the end the idea of expert system based on the CLIPS expert system shell has been proposed.

SESSION I. AUTOMATION, ROBOTICS, MONITORING – part 3 -

18.
Using fuzzy modeling and inference for support of the efficiency evaluation Of ERP APS system implementation - mgr Lilianna Ważna, mgr inż. Marcin Relich, Uniwersytet Zielonogórski; mgr inż. Irena Bach, Politechnika Koszalińska

There is described in the paper the conception of forecasting of selected manufacturing company indexes from ERP APS system implementation with using fuzzy modeling and inference. The purpose of the proposed method is the support of the efficiency evaluation of planned ERP APS system implementation undertaking in a medium-sized manufacturing company in uncertain terms. Proposed approach takes into account the present state of enterprise preparation for implementation with existing implementation constraints and uses experiences from the earlier implementation of the given system.

19.
The control of liquidity in small enterprise by the application of constraint logic programming - mgr inż. Marcin Relich, dr inż. Paweł Kużdowicz, Uniwersytet Zielonogórski; mgr inż. Irena Bach, Politechnika Koszalińska

This paper presents how to assure the desirable liquidity level in a small enterprise with the application of the reverse approach. It is an alternative approach as compared to the ones that have been applied so far and which were based on the setting conditions required to obtain the desirable financial liquidity level. In reverse approach was used Constraint Logic Programming. The example analysed in this paper led to the comparison of the conventional approach results with the reverse approach results.

20.
Production programmes evaluation applying expert's knowledge - dr inż. Izabela Tomczuk-Piróg, Politechnika Opolska

Decision on the choice and execution of a chosen schedule (from the set of possible ones) is to be taken by an expert from the company (e.g. production manager). It is necessary to apply subjective system of schedule utility evaluation expressed as linguistic variables and linguistic values, which should be applied in the construction of fuzzy production schedule evaluation model. Complexity of the analysed problem implies a necessity to decompose it into subproblems. Task decomposition into subproblems facilitates formulating a problem as Fuzzy Constraint Satisfaction Problem (FCSP). The fuzzy model of production schedule evaluation may be implemented by using CLP techniques as an additional production planning system module used by production managers as decision support system.

21.
Constraint logic Programming approach for SME knowlage management - mgr inż. Irena Bach, mgr inż. Grzegorz Bocewicz, prof. dr hab. inż. Zbigniew Banaszak, Politechnika Koszalińska

In this contribution a class of SME is considered, and their specification through the relevant knowledge bases consisting of accurate and uncertain data as well as linking those relations (constraints) is assumed. That means, the responses to a set of routine requests are guaranteed under a condition the knowledge base is consistent, and a decision-making (driven by an inference process) is an interactive one is guaranteed under condition the relevant inference strategies are available. The approach proposed employs the logic-algebraic method as providing a knowledge base representation, and constraints programming techniques as providing inference processes platform. The way of possible approach implementation is illustrated in the example enclosed.

22.
Model of intellectual capital in manufacturing company - dr inż. Justyna Patalas, dr inż. Sławomir Kłos, Uniwersytet Zielonogórski

In this paper the concept of assessment of intellectual capital based on efficiency indicators values is described. The expert's base and consequently the model of intellectual capital in manufacturing company based on knowledge outsourcing is discussed.

23.
Fuzzy control in designing and analyzing of the in-house transport system - dr inż. Dariusz Plinta, dr inż. Sławomir Kukla, Akademia Techniczno-Humanistyczna w Bielsku-Białej

Nowadays the modelling and simulation finds wider use in designing and analyzing of the in-house transport systems. Logistic systems are so complex systems that without computer it is impossible to analyse in detail realized inside processes. The examples of analysis of the in-house transportation are presented in this paper. There were used the modelling and simulation and the fuzzy control methods.

24.
CSP approach to scheduling problems - dr inż. Paweł Sitek, dr inż. Jarosław Wikarek, Politechnika Świętokrzyska; mgr inż. Grzegorz Bocewicz, Politechnika Koszalińska

Scheduling problems can be seen as a special type of Constraint Satisfaction Problem (CSP). This paper presents a formulating of scheduling problems as CSPs. To solve a CSP, different approaches have been developed. These approaches generally use constraint propagation to simplify the original problem and backtracking to directly search for possible solutions. To demonstrate flexibility of CSP approach, the implementation of decision support system for job-shop production based on Constraint Logic Programming (CLP) has been presented

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

25.
Four-legged robot: motion analysis considering ground-legs interaction - prof. dr hab. inż. Terasa Zielińska, Politechnika Warszawska; dr inż. Maciej Trojnacki, Politechnika Rzeszowska

The paper is devoted to the analysis of four-legged robot locomotion. Robot movement is remotely controlled by joystick therefore it can be used for inspection task. Due to the small size machine can clear very narrow corridors or can enter some small volumes. The kinematical structure of the robot,

and its prototype is presented. The new method of motion analysis taking into account legs and ground interaction is introduced. The theoretical considerations are supported by simulation results.

26.
ELEKTRON: A Mobile Robot for Laboratory Purposes and Its Applications - mgr inż. Rafał Chojecki, prof. dr hab. inż. Mariusz Olszewski, dr inż. Wojciech Szynkiewicz, mgr inż. Piotr Trojanek, Politechnika Warszawska

The paper presents the ELEKTRON R1 mobile robot and its application to the research of navigation and control of such devices. The robot was designed in cooperation between the Institute of Control and Robotics and the Institute of Control and Computation Engineering Warsaw University of Technology. It consists of a six-wheeled mobile platform with all of the wheels powered and a controller based on a single-board PC type microcomputer. Due to the modular structure the robot can be equipped with diverse sensor modules.

27.
Map building based on 3D laser scanner indications - dr Barbara Siemiątkowska, dr inż. Michał Gnatowski, mgr Arkadiusz Zychewicz, Instytut Podstawowych Problemów Techniki PAN

The paper presents the method which allows on-line map building based on 3D laser scanner indications. The grid-based representation is used. In each cell of the map information about 3D objects is stored. The map is used for path planning and localization.

28.
A hybrid map for mobile robots navigation - dr Barbara Siemiątkowska, Instytut Podstawowych Problemów Techniki PAN

In this paper a method of Monte-Carlo localization is present. A 2D grid map is built. The map contains the features of an environment. The observation model is used to evaluate the particles. Experiments in a real indoor environment are preformed in order to demonstrate that the system is able to track the position of a mobile robot equipped with laser range finder.

29.
Obstacle avoidance algorithm for mobile robots based on velocity space search - mgr inż. Marek Majchrowski, dr inż. Wojciech Szynkiewicz, Politechnika Warszawska

The paper presents a modified version of well–known Curvature–Velocity Method for local obstacle avoidance. The obstacle avoidance problem is formulated as one of a constrained optimization problem in velocity space. The obtained velocity commands satisfy all the constraints and maximize the objective function. The algorithm has been implemented and tested on a group of simulated robots.

30.
Analysis of the qualitative uncertainty in 2D laser scanner readings - dr inż. Piotr Skrzypczyński, Politechnika Poznańska

This paper reports the results of research concerning recognition and classification of the qualitative-type measurement uncertainty in 2D laser scanners used on mobile robots for

navigation. The main source of the qualitative-type uncertainty is the so-called "mixed pixels" effect. This effect has been investigated experimentally for two different classes of the laser range sensors, and explained by analyzing the physical phenomena underlying their operation.

31.
Making a decision by cooperative mobile robots in robot soccer competition - mgr inż. Piotr Fiertek, Politechnika Gdańska

From many years robot soccer competitions are organized by the FIRA and the RoboCup organizations. These events are prefect occasions to research and devolop variety algorithms of control group of mobile robots. This robots should cooperate with other robots to achieve common task. This paper presents structure of the control program and decision making module. Robot's cooperation is presented in the indirect shooting realization.

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

32.
The outline of the method of the selection optimal route for the underwater vehicle - mgr inż. Tomasz Leszczyński, Akademia Marynarki Wojennej

In this paper the idea of the method of the selection the optimal route for the underwater vehicle using genetic algorithms is presented. It is shown by the example of the underwater vehicle called "Ukwiał" used in Polish Navy.

33.
Stabilization of a trim of an underwater vehicle transfering a load - dr inż. Piotr Szymak, Akademia Marynarki Wojennej

In the case of use an underwater vehicle's manipulator to transfer different kind of loads, it can be observed an undesirable robot's trim effect, what has disadvantageous effect on robot's movement control. For the purpose of control of an underwater vehicle's trim, it has been examined conventional and fuzzy controllers, which were tuned with assistance of classical and artificial intelligence methods.

34.
Cycloidal thruster in ship's precise steering - dr inż. Józef Małecki, Akademia Marynarki Wojennej

In this paper is presented problem precision control of a ship's motion of assistance the cycloidal truster. Control of ship's is in automatic control system. The control object is mathematical model of navy ship corvette class with cycloidal thrusters. Simulation computer program is presented and chosen simulation results of his actions are described.

35.
Military aplication for unmanned ground vehicle - dr inż. Andrzej Typiak, Wojskowa Akademia Techniczna

This paper showed and described main tasks for the UGV's in military uses. Using them in such tasks was necessary because of the threat to human life and health. Afterwards research paths for further development of technology assuring vehicle's autonomy and mutual connection between the UGV's was presented.

36.
Flight navigation and control system for small unmanned helicopter - dr inż. Robert Głębocki, dr hab. inż. Janusz Narkiewicz, Politechnika Warszawska

In paper the conception of navigation and control system for small unmanned helicopter was presented. Main problems and requirements for navigation system based on commercial devices ware described. Next part presents solution proposition for deck computer and actuators control lows.

SESSION III DESIGN AND INTEGRATION METHODS FOR SYSTEMS – part 1

37.
Positive realization for 2D systems with delays - prof. dr hab. inż. Tadeusz Kaczorek, Politechnika Warszawska

Realization problem for positive single-input single-output systems with delays in state vector and inputs described by the 2D models is addressed. Sufficient condition for the existence of a positive realization are established and a procedure for finding a positive realization for a given proper transfer function is proposed. The procedure is illustrated by a numerical example.

38.
Computation of positive realization of hybrid linear systems by using the state variable diagram method - prof. dr hab. inż. Tadeusz Kaczorek, mgr inż. Łukasz Sajewski, Politechnika Białostocka

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

39.
Relative pointwise completeness and relative reachability of a class of singular positive discrete-time systems with delay - prof. dr hab. inż., Mikołaj Busłowicz, Politechnika Białostocka

The paper considers a class of linear singular positive discrete-time systems with unit delay with canonical forms of state matrices. An analytical form of the solution of the state-equation is derived and the problems of pointwise completeness and reachability are considered. The definitions of relative pointwise completeness and relative reachability are introduced and necessary and sufficient conditions are given. The considerations are illustrated by example.

40.

Controllability of positive singular discrete-time systems with delay in state and control - dr inż. Wojciech Trzasko, Politechnika Białostocka

In the paper the positive singular discrete-time linear systems with delay in state and control is considered. Some basic properties of the fundamental matrices for canonical forms have been characterised. Conditions for controllability are established in case of delay in state and control is equal to one The considerations are illustrated by an example.

41.
Robust stability of positive discrete-time systems with one delay - prof. dr hab. inż., Mikołaj Busłowicz, Politechnika Białostocka

Simple new necessary and sufficient conditions for robust stability of the positive linear discrete-time systems with one delay in the general case and in the two special cases: 1) linear unity rank uncertainty structure, 2) linear uncertainty structure with non-negative perturbation matrices, are established. The considerations are illustrated by numerical examples.

42.
Dual linear positive discrete-time systems with one delay - mgr inż. Rafał Kociszewski, Politechnika Białostocka

The problem of duality of linear positive discrete-time systems with one delay in state is considered. It is shown that the two positive discrete-time systems are not dual in general case. These systems may be dual only in the case of systems with pure delay. Necessesary and sufficient conditions for complete reachability and complete observability of the systems with pure delay are established. A method for computing of the control sequence which transfer the system from zero complete initial state to the desired complete state and method for computing of the output sequence are given.

43.
Robust stability of control systems with integrator plants with time delay and PD controller - Mgr inż. Andrzej Ruszewski, Politechnika Białostocka

The paper presents the robust stability problem of control systems with integrator plants with time delay and PD controller. Simple method for determining the asymptotic stability region in the parameter space is given. Knowledge of this region permits tuning of PD controller and determining sets of plant parameters for which the systems are asymptotically stable. The methods proposed are based on the D-decomposition method.

SESSION III DESIGN AND INTEGRATION METHODS FOR SYSTEMS – part 2

44.
PExSim – a package for investigation of complex dynamic systems - prof. dr hab. inż. Krzysztof Janiszowski, dr inż. Paweł Wnuk, Politechnika Warszawska

In paper is presented a software package for research and modelling of dynamic processes, based on plugins technique, and integrating different forms of systems description together with statistic models derived from measurements. Package can be used for research and development of

complex systems for testing and verification of system safety, research of new control approaches and operators training with possibility of cooperation with real environment of process.

45.
Recurrent neural networks in modelling nonlinear dynamic processes - dr inż. Maciej Ławryńczuk, Politechnika Warszawska

This paper details the identification *(*learning*)* algorithm of perceptron-like recurrent neural networks which can be used for modelling highly nonlinear dynamic processes. In comparison with usually used backpropagation algorithm, which leads to one-step-ahead predictors, the described technique results in many-step-ahead predictors. The algorithm is used for modelling the impurity level of the product of the high-pressure high-purity ethylene-ethane distillation column.

46.
Real – time requirements meeting on the PC-based "soft PLC" platform - dr inż. Krzysztof Oprzędkiewicz, Akademia Górniczo Hutnicza

In the paper results of experimental tests real-time requirements meeting in the PC based "soft PLC" system are presented. To tests a typical PID control algorithm and the basic version of "soft PLC" software (without real – time kernel) were used. Results of experiments allows us to formulate conclusion, that the considered "soft PLC" system assures real – time requirements meeting during control a wide class of industrial tasks, for which a sample time can be longer than about 100 ms.

47.
Predictive control systems tolerating actuator faults: exact stabilization of the chosen output - dr inż. Piotr Marusak, Politechniki Warszawskiej

In the paper the mechanisms, that can be employed in order to improve quality of operation of the predictive control systems after actuator fault appearance, were proposed. The aim is to make continuation of the control system operation possible till the fault is fixed. The efforts were focused on the problem of assessing possibility of key output variables stabilization and the way it can be achieved. The efficiency of the proposed approach was tested in the control system of the MIMO plant. The focus of attention was the analysis of the static control plant characteristics in order to assess possibilities of the task realization by the controller. The importance of such an analysis is even bigger because it can deliver the design directions helpful in introducing the changes into the predictive algorithm.

48.
Multilayer control systems with predictive controllers tolerating actuator faults: optimization layer modification - dr inż. Piotr Marusak, Politechnika Warszawska

The main goal of the mechanisms proposed in the paper is to make continuation of the control system operation possible till the actuator fault is fixed. The mechanisms consist not only in introduction of some changes into the predictive controller, but also in doing a modification in the economic optimization layer that usually accompanies the predictive controllers. Thanks to such an approach the exact static process model is used during fault accommodation. It brings benefits to the control performance despite easiness of the mechanism application. The

advantages of the proposed approach can be clearly seen in the results of tests per-formed in the control systems of nonlinear MIMO plant.

SESSION IV AUTOMATION AND ROBOTIC EQUIPMENT part 1

49.
Veryfication of virtual reality surgical robot modeling advantage in aspect of surgery planning and robot designing - dr Zbigniew Nawrat, Fundacja Rozwoju Kardiochirurgii w Zabrzu; mgr inż. Marek Koźlak, Politechnika Śląska w Gliwicach

Abstract: Efficiency of using a robotic equipment in an endoscope procedures significantly depends both on a proper tools geometry optimization and a correct surgery procedure planning. Accurate arrangement of setting up the robots arm with reference to an surgery table, positioning the trocars location in a patient body and right choice of a correct tools, makes the surgery procedure much more safe and harmless. Using a virtual reality technology to plan all those important steps, increases efficacy of a noninvasive surgery methods and helps to verify a benefits of using robotic systems in a various surgery treatment.

50.
Model of spherical geometry robot – the evaluation of its application for ophthalmology operations - dr Zbigniew Nawrat, Kamil Rohr, mgr inż. Wojciech Dybka, dr inż. Paweł Kostka, mgr inż. Arkadiusz Kandora, Tomasz Szwed, mgr inż. Wojciech Sadowski,ʹ Fundacja Rozwoju Kardiochirurgii w Zabrzu

Presented work describes mechanical construction and model developed for created in 2001 robotic arm based on spherical structure. The main goal of its current modification is to determine the possibilities of arm adaptation for opthalmic surgery. The modification of mechanical construction to eliminate its failures, the change of driven motors and model creation for application in control system allowed to carry out the group of robot arm qualification tests. Their results revealed the main important points, which must be taken into considerations in the future works e.g. the tooltip vibrations.

51.
User interface of Surgery robot – possible solutions for Robin Heart telemanipulator family - dr inż. Paweł Kostka, dr Zbigniew Nawrat, Kamil Rohr, mgr inż. Arkadiusz Kandora, Tomasz Szwed, mgr Zbigniew Małota, Fundacja Rozwoju Kardiochirurgii w Zabrzu

Presented work describes chosen solutions of user/surgeon interface for family of polish surgical robot Robin Heart working in Master-Slave configuration. Since 2000, during development of mentioned project, the group of Master tools was created with different structure and features. They were the base for practical tests resulting in the assessment of their functionality and ergonomic features. Authors focused on the usage of top technology gyroscopic and accelerometer sensors for velocity/position measurement, because of their rapid progress, small dimensions and continuous parameters improvement.

52.

Robin Heart Vision – telemanipulator for camera holding - dr Zbigniew Nawrat, dr inż. Paweł Kostka, Fundacja Rozwoju Kardiochirurgii w Zabrzu; prof. dr hab. inż. Leszek Podsędkowski, Politechnika Łódzka; mgr inż. Wojciech Dybka, mgr inż. Arkadiusz Kandora

Presented work describes generally the new arm Robin Heart Vision for endoscopic camera holding. It has four degrees of freedom with the interface for quick endoscope fixing. It was designed and carried out as a standalone robotic assistant for manual laparoscopic surgery or to operate together with the tool arms Robin Heart.

53.
About the design of the special gripper to the use in service robot - dr inż., Krzysztof Mianowski, Politechnika Warszawska

The design and the basic analysis of the special gripper of the own construction is presented in the paper. The main assumptions of the project was concerned with certainties of activity, functionalities and easies of service. The design of the gripper assures profitable variability of characterization of power exerted on object, dependent from magnitude of size of an opening the gripper connected with dimensions of manipulated object.

54.
Simulator of industrial robot KUKA KR 125 - dr inż. Andrzej Jardzioch, mgr inż. Szymon Krzemień, mgr inż. Piotr Pękacz, Politechnika Szczecińska

The paper presents conception of simulator of industrial Robot KUKA KR 125 built at the Department of Automated Manufacturing System of Technical University of Szczecin. The main task of this program is supporting the process of programming learning of robot in on-line mode. Equipped with additional functions Simulator can be used to programming in off-line mode as well. This Simulator is written in C++ commuter language in Microsoft Visual C++ 6.0 with use of MFC (Microsoft Foundation Class) library and with use of graphical library OpenGL.

55.
Application of an expert system for a choosen ship power subsystems design - dr inż. Ryszard Arendt, mgr inż. Andrzej Kopczyński, Politechnika Gdańska

This paper presents a concept of application of simulation investigations and an expert system with a knowledge-base and data-base to improve design procedures of a ship power subsystem. Exemplary structures and component elements of ship thrusters are also shown.

56.
Ovation system simulators - dr inż. Józef Szaban, Emerson Process Management

Short description of Ovation system simulators development and at present for power industry are given.

57.
Translating a discrete process control algorithm written in SFC language into a PLC program in ladder diagram language - dr inż. Bogdan Broel-Plater, Politechnika Szczecińska

In the paper a simple method for translating a discrete process control algorithm written in SFC language into a PLC program written in ladder language is presented. The method enables one to

create quickly an easily implementable and modifiable faultless utility program for any type of PLC. Due to its easiness the method is also effective if employed by non-experienced PLC users or even process engineers who are not familiar with PLC features. The presented method may also be used to create programs in other languages typical for PLC programming.

SESSION IV AUTOMATION AND ROBOTIC EQUIPMENT part 2

58.
The implementation of the FPGA devices in the control system of the magnetic bearing actuators - prof. dr hab. inż. Zdzisław Gosiewski, dr inż. Zbigniew Kulesza, Politechnika Białostocka

FPGA devices are a kind of semiconductor programmable logic devices. As opposed to their counterparts, the specialized ASIC devices, the FPGA devices operation depends on the type and the number of the logical blocks used and on the hierarchy of the interconnects between the blocks. The main advantages of the FPGA devices in this case are higher performances than in specialized digital signal processors (DSPs), lower costs and higer flexibility than in ASIC devices. In the article we present the example implementation of the Xilinx's FPGA chip as the controller of the magnetic bearing actuators. We discuss the problems that should be solved and the decisions that should be taken by the designer who wants to implement the given algorithm in an FPGA device.

59.
Mechatronic system of the active vibration control of the rotating shaft line with a magnetic bearing - prof. dr hab. inż. Dorota Kozanecka, Politechnika Łódzka

This paper presents an idea of programming a level of vibrations in the operating range of the rotating system of the flexible rotor (including critical speeds) using an additional digitally controlled magnetic bearing. It causes a qualitative change in dynamic properties of the system. Some experimental investigations and numerical simulations of flexible rotor dynamics carried out on the test stand with an additional, digitally controlled magnetic bearing are discussed.

60.
The optimal robust control of rotor position in active homopolar magnetic bearing - prof. dr hab. inż. Zdzisław Gosiewski, mgr inż. Arkadiusz Mystkowski, Politechnika Białostocka

Simulation and experimental results of optimal (H_∞ and H_2) robust control of the non-rotating rotor supported in homopolar magnetic bearing are described in the paper. A mass supported in magnetic field of homopolar bearing (bearing with permanent magnets) is a control plant. The supported mass has two degrees of freedom. For the defined plant the robust controllers H_∞ and H_2 were designed. The digital signal processor was used to realize the control laws. Next, the dynamical states of magnetic suspension system were analyzed. The stabilization of rotor in case of control disturbances and start process of magnetic suspension are the main problems considered in the paper.

61.

The passive magnetic bearing - dr inż. Krzysztof Falkowski, Politechnika Białostocka

The project of axial passive magnetic bearing was presented in the article. This bearing is used to support the flexible rotor. There showed the mathematical model of passive bearing and the result of verification of the axial passive magnetic bearing.

SESSION V MEASUREMENTS DEVICES AND SYSTEMS

62.
Time on earth and in space – chosen aspects of time and frequency metrology - dr Albin Czubla, mgr Paweł Fotowicz, Główny Urząd Miar

This paper is aimed at making contemporary time and frequency metrology more familiar to the readers. Two most important issues of today's time and frequency metrology are presented here: determination of international atomic timescales as well as maintenance and operation of global navigation satellite systems. Additionally, same aspects directly connected to the practice of measurements in this field have been described herein.

63.
Reliability of diagnosis - dr inż. Paweł Szczepański, Wojskowa Akademia Techniczna

In work was introduced the method of describing reliability of the diagnosis of the most popular testing programs. Appropriate analyses were conducted with omission Bayesa's methods and implied by them - serial reliability block diagram

64.
Software analyser of flue gas from combustion boiler - dr inż. Anna Jankowska, Politechnika Warszawska

The software analyzer of effluent gas from combustion boiler is presented in the paper. The virtual analyzer is created as an artificial neural network model for on-line work. This analyzer realized in target grant of KBN Nr 03103/C.T10-6/2002 is applied in BOT Turów S.A. power plant. In the paper are presented properties of the artificial neural network models and then necessary preprocessing of measured data of combustion process. Very important for the analyzer's on-line work is reconstruction of missing data, too. The quality of virtual analyzers is estimated and the methods of actualization the ANN models are considered.

65.
Selected aspects of the test station development for industrial force sensors - mgr inż. Andrzej Bratek, mgr inż. Jan Goska, mgr inż. Piotr Kostrzewa, Przemysłowy Instytut Automatyki i Pomiarów PIAP

In this paper we present a measurement station for testing force sensors applied in industrial machinery. A measurement station serves for periodical checking metrological characteristics of sensors applied in machines' overload protection equipment. Standard force is produced with a help of a hydraulic system and controlled by standard sensors. A considerable variety of sensors' measurement ranges implies using replaceable standard sensors. To simplify operating a station there were implemented solutions to enable repeatable mechanical positioning of sensors and auto-selecting measurement ranges of mounted sensors. A station is equipped with a PLC controller to support an operator. A controller registers succeeding checking points on an

operator's demand and evaluates a relative error of a verified sensor's signal in relation to a standard sensor's signal.

66.

Modeling of Magnetic properties of Amorphous glasses - dr inż. Roman Szewczyk, Przemysłowy Instytut Automatyki i Pomiarów PIAP

Paper presents result of the modeling of magnetic characteristics of $Fe_{40}Ni_{38}Mo_4B_{18}$ metallic glass. Jiles-Atherton-Sablik model was applied. Parameters of the model were determined for each magnetic hysteresis loop. Results indicated, that used model is suitable for modeling of characteristics of metallic glasses. Achieved Pearson r^2coeficien exceeds 0.99 and is useful for technical applications.

SESSION VI EKONOMICAL AND SOCIAL ASPECTS OF AUTOMATION AND ROBOTIZATION

67.

Method CPM/Cost and approach in the Pareto sense for management of projects tasks - dr hab. inż. Tadeusz Witkowski, mgr inż. Arkadiusz Antczak, mgr inż. Paweł Antczak, Politechnika Warszawska

CPM/Cost is an accounting system that can be used determine the progress of a project during its completion. In particular, it can determine whether the project is on schedule and within budget. If the project is not, the system can indicate areas where corrective action may be taken to bring the project closer in line with targets. Activity scheduling is an important factor in ensuring both the timelines and cost effectiveness of a project. In this paper, we use Pert/Cost method and other algorithms to find optimal paths in project network. Furthermore, multiobjective approach (in the Pareto-sense) for evaluation of projects is presented.

68.

Fuzzy methods of planning and evaluation for project of information systems - dr hab. inż. Tadeusz Witkowski, mgr inż. Paweł Antczak, mgr inż. Arkadiusz Antczak, Politechnika i Warszawska

The fuzzy methods are very effective for the solution of optimization problems. This paper presents use a fuzzy techniques for two management project problems. PERT is an efficient tool large project management. In actual project control decisions, PERT has successfully been applied to business management, project scheduling control, logistics support, etc. However, classical PERT requires a crisp duration time representation for each activity. This requirement is often difficult for the decision – makers due to the fact that they usually can not estimate these values precisely. In recent years, some fuzzy PERT methods have been proposed based on fuzzy set theory for project management. In this paper, we use a fuzzy PERT algorithm to find multiple possible critical paths in project networks. Furthermore, fuzzy approach for multiobjective evaluation of information systems is presented.

69.

The transfer and implementation of knowledge about innovative product and system solutions - Bożena Kalinowska, Kazimierz Majdan, Przemysłowy Instytut Automatyki i Pomiarów PIAP

The mutual relationships and dependence between productiveness and innovative ability are in the centre of attention of boards enterprises and many institutions; they are also the object of applied research and developmental work. The aim of this paper is to present the meaning of different synergic activities favourable to creating new product, process and system-organizational solutions. Vocational trainings of professionals from technical industry, led by experienced designers of advanced technologies were described. A system approach towards training processes was presented; training process was discussed as an element of activities coherent with processes of production and the implementation of innovative solutions.

70.
Audit realization of system ERP on the basis of standard PN–EN 61069, for example microsoft business solutions Axapta - mgr inż. Daniel Gąska, prof. dr hab. inż. Antoni Świć, Politechnika Lubelska

The paper presents problems with audit realization of Enterprise Resource Planning system in the context of new standard PN-EN 61069, which to possibility to be source standardized actions leads to estimate of system. There has been discussed well-known with literature and were proposed the own criterions of estimate of ERP system. This paper contains suggestions to possibility to execute audit informatics system consistent with Standards for Information Systems Auditing – SISA.

71.
Internet business mapping – research in the range of automation and measurements - dr inż. Małgorzata Kaliczyńska, Politechnika Opolska

The article presents a non-standard technique of using the Internet resources for finding new and discovering existing business contacts – contractors, partners and distributors. In the survey to identify web link connections, methods used in marketing research and social network sciences have been employed. The analysis has been based on 37 enterprises trading on the Polish market in the field of automation and measurement systems and their web pages. The research has been conducted using the most popular Internet search engines - Google, Yahoo! and Live Search Microsoft. Multidimensional scaling method allowed to visualize the results achieved in the form of a 2D maps.