THE THIRD NATIONAL SEMINAR ON MECHANISMS 2008

AL TREILEA SEMINAR NAȚIONAL DE MECANISME SNM'08

ABSTRACTS

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Romanian Association for Science of Mechanisms - ARoTMM
International Federation for the Promotion of Mechanism and Machine Science - IFToMM

THE THIRD NATIONAL SEMINAR on MECHANISMS

AL TREILEA SEMINAR NATIONAL DE MECANISME, SNM'08

ABSTRACTS

The third National Seminar on Mechanisms is held under the auspices/support of IFToMM Romania

EDITOR:
S.M. CRETU

Craiova, September 10-11, 2008
ROMANIA

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Dear Chairs:
Dear Participants of **The Third Romanian National Seminar on Mechanisms (SNM'08)**:

It is an honour for me, as IFToMM President, to address these few words of welcome and wishes to the participants for a fruitful conference time during **The Third Romanian National Seminar on Mechanisms (SNM'08)** in Craiova.
This conference is a very important conference forum for discussing main topics of IFToMM activity, even with the aim to promote IFToMM and MMS. The IFToMM patronage of this conference event has a particular significance for the fact that this conference event has been organized successfully with the typical IFToMM familiar atmosphere in order to provide suitable environment for enhancing and starting collaborations and disseminating last advances in TMM (now MMS). In addition the subject of the conference as related to 'research and re-evaluation of teaching methodology in the field of mechanisms in accordance with the European objectives' can be considered very strategic for the future of our activity. Indeed since the beginning IFToMM has addressed great attention and efforts to education issue in

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MMS with even a specific Permanent Commission and I wish you will contribute successfully to this awareness in the IFToMM community.
IFToMM is particularly careful to aspects both of scientific and social activity as intended to promote both MMS disciplines and IFToMM Community. I am sure that all the participants will contribute successfully to the abovementioned goals by sharing studies and results with other colleagues not only from the IFToMM Community. Therefore, I thank the participants and organizers for having supported the traditional high-quality standard of this IFToMM supported conference with your active participation.
Another important event will be the 2011 IFToMM World Congress that will be held in Guanajato, Mexico in June, 19-25 2011 where we hope to have a large participation of colleagues from all around the world, even from those countries that have not yet IFToMM Member Organizations. There we could also have more advances on TMM and therefore this is to invite all you participants to join the IFToMM World Congress 2011 too.
I am sure that the Proceedings of this **The Third Romanian National Seminar on Mechanisms (SNM'08)** will be a valuable reference for the future and I wish you a very successful participation at the conference with fruitful discussions.
I apologize for my absence that I could not plan and I hope to be able to participate at future events not only as IFToMM officer but as contributing researcher.
I wish you a wonderful time in Craiova during the next days of 10 and 11, both from technical and social viewpoints
Sincerely Yours

prof. Marco Ceccarelli Cassino, 8 September 2008
President of IFToMM (2008-2011) **www.iftomm.org**

The Third National Seminar on MECHANISMS held on September 10-11, 2008 in Craiova, Romania is mainly aimed at two scientific activities: the research in the field of mechanisms and the teaching methodology of the mechanisms courses.

Although the seminar objectives are targeting on achievements such as high level scientific and technological results by scientists and engineers working in the field of mechanics and associated sciences being compatible with those of European standards, certainly some of the results presented are interesting to all researchers working on the topics related to theory and application of mechanisms and machines. In addition, the seminar serves as an important step for achieving the National plan for research, development and innovation for the period 2007-2013 (PNII).

I have no doubt that the seminar will be successful yielding directions of up-to-date professional skills regarding technology, as well as scientific and economic achievements in Romania required for today European Union, expectations keeping simultaneously high level teaching methodology of the mechanisms courses.

Lodz, 5 September 2008

Prof. Dr. Eng. Dr. h. c. Jan AWREJCEWICZ
President of the Technical Committee for Nonlinear Oscillation of IFToMM (NO TC)

FOREWARD

The increase in the economic competitiveness represents a major direction in the Romanian Development Strategy. The contribution of engineering sciences is essential in implementing this strategy and in developing the Action Plan. It supposes modern approaches towards the product development stages, from conception to prototype up to technology transfer. This is why engineers' training and implicitly education in the field of mechanisms must be adapted to the economic needs, focusing on the integrated development of subsystems and further, of the complex systems as a whole.

These tendencies, already stated through national and European research priorities, must have an equivalent in the students' training, on different levels, during the academic studies organised in three cycles as defined by the Bologna Declaration.

The restructuring targets the development of a complex frame, including changes of the content, by adapting the mechanical systems subjects along, with the development of novel teaching/learning/evaluation instruments and methods. Experience exchange of good practices among the different academic centers becomes thus a tool in the fast optimization of the education process and of the research as well.

The National Seminar on Mechanisms should represent an opportunity for the colleagues from all the academic centers to present their achievements but also the problems they identified and the difficulties they experienced, contributing in this way to the common effort to increase the quality of the didactic and scientific research processes.

Prof. Dr. Eng. Ion Vișa
President of ARoTMM

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LECTURES

INVITED LECTURES

SOME CONTRIBUTIONS REGARDING THE SYNTHESIS OF KINEMATIC JOINTS

Radu P. VOINEA

Abstract: The problem of kinematic pairs synthesis is analytically investigated. Linear differential equations are solved. Properties of distribution of velocities for a rigid body are used and new differential equations are obtained. The well-known kinematic pairs are found again and a method for determining new kinematic pairs is presented.

GEARS SCHOOL OF CLUJ-NAPOCA. RETROSPECT AND TOPICALITY

Desideriu MAROŞ

Abstract: Here is presented the completion of the paper "Research in the field of gears at the Polytechnic Institute of Cluj-Napoca" presented in 1986 at Craiova in the frame of experience exchange, with the title: Perspective and realisation in design, execution and control of gears, volume I.
The localisation of contacts of gears, presented as problem in this volume, was solved in the meantime by three PHD Theses: for worm, spiral bevel and spiral hypoid gears. In the end, the respective methodology is presented.

LEONARDO DA VINCI, THE GENIAL PRECURSOR OF ENGINEERING DESIGN

Florea DUDIȚĂ

Abstract: Leonardo da Vinci was an artistic, scientific and technical genius of the Italian Renaissance, never seen before and never seen again. As we closely examine more than 10000 files of his manuscripts, we are more amazed by the way in which the mysteries of human creativity were combined to give birth to a giant of spirit who remains for the mortals what mount Everest is for the planet Earth's mountains. From a suite of 18 files, carefully chosen from the manuscripts of this genius of the Italian Renaissance, I gathered arguments to sustain the thesis that Leonardo da Vinci can be considered as the design founder, in general, and of engineering design, in particular.
Leonardo da Vinci was called by his descendants "uomo universale". The appellatives of "universal designer" and, implicitly, of "engineering designer", which were proposed in this paper, are equally justified.

THE ROLE AND IMPORTANCE OF COMPUTER BASED CALCULUS FOR KINEMATICAL AND KINETOSTATICAL ANALYSIS OF ARTICULATED MECHANISMS

Francisc Viliam KOVACS

Abstract: The first research in the field of Theory of Mechanisms was performed at the beginning of the 19th Century.
The methods used in this research evolved in time from simple ones towards more complicated, in order to increase their precision.
At the beginning, graphical methods were used, then analytical ones beginning with vectorial and numerical ones. The last needed automated calculus was realised in the second half of the 20th Century by means of electronic computers.

CURRENT TEDENCIES IN THE FIELD OF ROBOTICS

Mircea IVĂNESCU

Abstract: At present we consider that the advanced stage of research in the field of robotics is defined by the conception of the new generation of humanoid robots and also by aspects of connection with the new human being-robot interfaces.
The principal aspects in the design of humanoid robots are related to mechanical design, control and instructions.
The body's mechanism has to be flexible, to reproduce the natural movements of the human being. The movement has to be of biped type with the problems specific to the body's stability.
The sensory system, the artificial sight allows this new type of robot to identify the factors which define the exterior environment. Subsequently the robot decides its behaviour according to this identification of environment, it takes dynamic decisions, modifies its strategy or evolution.
From this point of view we must notice the emergence of the concept "intelligent space" where the robot acts and where we can speak of a combined action of the human and the robot.
The human being-robot relationship has also determined the appearance of several modifications in the robot's structure and architecture. These are connected to an associative function as regards the human being. The robots specialised for functioning as "nurses", for helping disabled people, for medical purposes etc. are edifying examples.

SYNTHESIS CONCERNING THE MASS AND FORCES INFLUENCE UPON THE KINEMATICAL DYNAMIC CHARACTERISTICS OF MECHANISMS

Vasile MERTICARU, Eugen MERTICARU

Abstract: A proper mathematical modelling. Calculus relations for traditional kinematical characteristics and for those dynamic-kinematical. Calculus relations which overhear mass and forces influence. Combinations of balanced and unbalanced kinematical elements. Numerical concrete data (sizes, mass, forces) for kinematical elements of structure. The results of calculation comparatively in diagrams are presented. Dynamic changes of places (positions), velocities and accelerations have much more values in comparison with the traditional ones. These results have to be considered in design calculation as well as in students' instruction.

THE ROMANIAN PEASANT-CREATOR OF MECHANISMS

Iulian POPESCU

Abstract: The present contribution of Romanian peasants in the field of mechanisms: the takeover of solutions from others and their adaptation to local conditions, with additions and some solutions. They exemplify the mechanisms sawmills and other types of mechanisms at various installations.

OBTAINING COMPETENCES IN THE FIELD OF MECHANICAL SYSTEMS FOR DEVELOPING NEW PRODUCTS

Ion VIŞA

Abstract: Modern design and development impose novel concepts for obtaining low-cost and high quality products with short implementation duration from idea to prototype. Thus the use of modern IT instruments becomes a must and these require unitary models, as it is the Multy Body System theory for mechanisms design and optimization. Students' education must comply with this trend and must offer basic knowledge in the first cycle and specialised skills for using design software in the second cycle. The integration of this software into virtual prototyping platforms represents the next step to follow.

LECTURES

STANDARDISATION OF TERMINOLOGY OF MMS AND GRAPHICAL SYMBOLS

Păun ANTONESCU, Ovidiu ANTONESCU

Abstract: In the paper it is presented the main terms from the topological structure of mechanisms. Each term notion was transcribed in English, German and Romanian. The definition is restored in Romanian language. For certain terms the definition is given in two variants. The first chapter contains the scientific terms of machine and mechanism. The second chapter contains scientific terms of topological structure of mechanisms and machines: components, sub-assemblies, mechanisms with bars, cams and gears. The paper is closed with the diagrams (schemas) for mechanisms with bars, cams and gears. In each diagram the main kinematic components were given, being presented in English and German.

TOPOLOGICAL ANALYSIS AND FORWARD KINEMATICS OF PARALLEL MANIPULATORS

Ovidiu ANTONESCU, Păun ANTONESCU

Abstract: The paper presents a new way of the structural-topological analysis for parallel manipulators, with reference to the calculation of mobility (degree of freedom) of complex mechanisms. Parallel manipulators are complex topological structures, having the joints (as kinematical pairs) of various types. The thirty six formulas known in the literature for mobility calculation are grouped into two categories: those for a quick calculation of mobility from the visual inspection of kinematical schema, and the approaches based on the rank of kinematical constraint equations. For parallel manipulators we present a new formula for the mobility calculation in function of the kinematical chains number, considered as the identical legs. Finally the paper presents a new method for the direct kinematics of spatial parallel manipulators with six actuators.

GEOMETRY AND FORWARD KINEMATICS OF PARALLEL MANIPULATORS WITH SIX ACTUATORS

Păun ANTONESCU, Viviana FILIP

Abstract: The paper presents a new way of the topological geometry for parallel manipulators (PMp), with reference to the calculation of mobility (degree of freedom) of complex mechanisms. Parallel manipulators are complex topological structures, having joints (as kinematical pairs) of various types. For parallel manipulators we present a new formula for the mobility calculation in function of the kinematical chains number, considered as the identical actuators. A new method for direct kinematics of the spatial parallel manipulators with six actuators is presented in this paper. Two kinematical schemas of PMp namely with the leg kinematic chain of type SCS and RSS are analysed. For this PMp with six legs 18 nonlinear equations are obtained. This system of 18 equations with 18 unknowns with the help of the Mathematica program can be solved. In this case the analytical solution was not possible, but a numerical solution for particular cases was found.

MECHANISMS FOR THE INTEGRAL STEERING SYSTEM OF PASSENGER CARS

Petre ALEXANDRU, Cătălin ALEXANDRU

Abstract: Cars with two steering axles, rear and front, of which the steering of the rear wheels is made in the opposite direction to the front ones, can complete tighter turns, but they have a more reduced stability when speeding. To improve the stability, in the situation where the turning radius is reduced, the integral steering is taken into consideration, where at the beginning of the turn the rear wheels are in the same direction as the front ones, and only afterwards they are aligned and steering in opposite directions. Here are presented a series of mechanisms for the steering box of the rear axle, with a control depending on the steering wheel's rotation angle and on the driving speed of the car.

DEVELOPMENT OF AN EUROPEAN MODULE OF ECODESIGN FOR ENGINEERING COURSES

Anca BÂRSAN

Abstract: The paper presents an Erasmus Curriculum Development project, developed in an European partnership coordinated by Transilvania University of Brasov. The aim of the project is to prepare the curriculum, the syllabi and the teaching aids, necessary for the improvement and enrichment of the engineering courses curriculum, with an Ecodesign module, to allow future engineers to better face the environmental protection constrains in product engineering design.

MECHANISMS PROMOTION BY MEANS OF INTEGRATED PLATFORMS

Adriana COMĂNESCU, Ileana DUGĂEŞESCU

Abstract: Integrated platforms are used in the educational process to deliver lectures for various disciplines and applications (seminars, design or laboratory activities), to achieve partners' interactivity such as professor-student or student-student, for the continuous or final student evaluation and to obtain the students opinions about the academic activity quality of involved professors.

EXPERIMENTAL KINEMATIC PARAMETERS DETERMINATION OF A PROSTHETIC MECHANICAL SYSTEM USED IN PROSTHESES OF THE HUMAN LOCOMOTOR APPARATUS

Petre-Cristian COPILUŞI, Nicolae DUMITRU

Abstract: This paper proposes by experiments the kinematics analysis of prosthetic joints from the human lower limb structure, for the following activities: walking, going up or down the stairs, and changing body stance (sitting down on a chair or standing up from a chair). Based on this experimental kinematics analysis, motion laws were obtained by using of special software called SIMI Motion generated by each joint mentioned above, with regard to prosthetic mechanical system improvement.

STUDY IN DYNAMIC REGIME OF IMPLANTS USED IN ANKLE JOINT DISARTICULATIONS FROM THE HUMAN LOWER LIMBS

Petre-Cristian COPILUŞI, Nicolae DUMITRU, Mihnea MARIN

Abstract: In this paper there is proposed a study incident to the behaviour in a dynamic regime of an endo-prosthetic system used in ankle joint prosthetics from the structure of human locomotor apparatus. This study consists in endo-prosthetic virtual model elaboration based on the existent considerations in the specialty literature, the identification by experiments of the generalized coordinates variation laws from the human lower limb articulations, dynamic inverse analysis of the lower limb equivalent mechanism and the behaviour analysis in the dynamic regime of the endo-prosthetic system through finite element modelling.

TENSEGRITY CONCEPT-FROM NATURAL SYSTEMS TO ROBOTS

Simona-Mariana CREȚU, Gabriela Catalina BRÎNZAN

Abstract: Tensegrity theory has attracted, among others, engineers, biologists, anatomists and recently it seems to be one of the most suitable ways to optimally design mobile robots which are capable of high performances, as in real life.
This paper presents:
- the tensegrity concept applied to inorganic matter (the construction of the "buckyball" model for water; the tensegrity icosahedron for the hexagonal model of water, proposed by the authors);
- a review of the natural tensegrity forms found in living life, from micro to macro level and different tensegrities which approximate them, including some realisations of the members of the scientific association "Methodology of technical sciences teaching", from the Faculty of Mechanics, University of Craiova (the construction of the cell model proposed by D. Ingber and some experiments with it; the construction of the forearm models, proposed by S. Levin, T. Flemons and S. M. Cretu);
- new trends towards optimally designing mechanisms and mobile robots.

PRODUCT DEVELOPMENT AND E-BUSINESS

George DOBRE, Marin NEACŞA, Radu Florin MIRICĂ

Abstract: Product development is an academic and research activity of great importance today and in future. A main task of the teams of product developers even from high education level is to connect the product development activity with the market. The work of product developers is marked by the modern way of internet use. After the presentation of some definition elements regarding product development, e-business and e-commerce, the necessity to adopt databases for business aims is justified. Examples of databases for a specific application of product development (biomass pelleting presses) are accordingly discussed. Final conclusions point out the main approaches of the paper, emphasising the authors' contributions.

CONTRIBUTIONS TO THE STUDY OF ROTATING MIRRORS SCANNING SYSTEMS

Virgil-Florin DUMA

Abstract: The paper presents a brief review of our contributions regarding the analysis and synthesis of the scanning systems with rotating elements. We highlight the way the theory of mechanisms was used in this optomechatronic domain, in order to solve its specific problems. The monogon, polygon and galvanometric mirror scanners were approached considering them as cams, while the laser beam has played the role of the follower. The duty cycle, which is a basic parameter in gears, has proved to be an essential parameter in scanners, too. Analytical, numerical and experimental studies were performed for each type of system, and the results obtained verified each other, leading to an improvement of their designing calculus.

CAD-CAE INTEGRATED SYSTEM FOR THE KINEMATIC AND DYNAMIC STUDY OF MECHANISMS AND MACHINES

Nicolae DUMITRU, Mihnea MARIN, Althahbi ZUHAIR

Abstract: A methodology for the analysis of the dynamic response of mechanisms with deformable kinematic elements is presented in the paper.
The paper consists of two parts:

- in the first part, the Finite Element Method is promoted for the dynamical study of mechanisms with deformable elements. The aim is to couple the rigid body's movement with that of an elastic body.
- in the second part of the paper, the results of an experimental study on the slider-crank mechanism are presented.

DESIGN AND MOTION ANALYSIS OF MALTESE CROSS MECHANISMS

Viviana FILIP, Luminița DUȚĂ, Alexis NEGREA

Abstract: Maltese cross mechanisms are intermittent motion mechanisms, made of a driving link (carry over element) and a driven link (Maltese cross). The corresponding time for the rotation of the driven element depends on the number of the cross channels. The paper presents some aspects of the design, modelling, simulation and motion analysis of the Maltese cross mechanisms, using Meca3D under SolidWorks software, and examples are given for a 4 channels cross.

CLASSICAL AND MODERN METHODS FOR MECHANISMS ANALYSIS AND SYNTHESIS FROM THE FARMING MACHINE STRUCTURE

Ionuț GEONEA, Nicolae DUMITRU, Daniela VINTILĂ

Abstract: In this paper there are presented schemas for some mechanisms, used for farming machines. These mechanisms are founded in the sowing machines, harvester machines, and soil process machines. There is presented the kinematical and dynamical analysis of a mechanism for the harvester machines (the kinematics parameters variations and of forces and moments of bound in the joints) and the kinematical, and dynamical analysis with the help of the finite elements method of a mechanism for the farming tractors serve. For the dynamic analysis of this mechanism experimental dates are used.

REEVALUATION OF TEACHING METHODOLOGY IN THE FIELD OF MECHANISMS AT THE POLITEHNICA UNIVERSITY OF TIMIŞOARA

Erwin-Christian LOVASZ, Iosif CĂRĂBAŞ, Inocenţiu MANIU, Dan PERJU, Voicu MESAROŞ-ANGHEL, Valeria VĂCĂRESCU, Liana DEHELEAN

Abstract: Teaching and research in the area of mechanism theory has a long tradition at the Politehnica University of Timişoara. After the political change, new impulses originated in the area of mechanism theory through international cooperation. Common research in the area of the mechanism theory concerns belt and rolling-bars mechanisms, cam and linkage mechanisms, mechanisms with noncircular gears, and combined mechanisms. In the paper, some selected examples are presented.

THE SYNTHESIS OF THE RIGID MEMORY OF A TRANSFER MANIPULATOR OF PARTS OR PALLETS

Victor MOISE, Barbu GRECU, Stela IONIȚĂ, Iulian TABARĂ

Abstract: There are situations, in the case of transfer of parts, blanks or pallets from a working place to another one, in the horizontal plan, when a little displacement on the vertical direction at the beginning and end of the stroke is necessary, to avoid damage to the manipulator or even the parts. In the paper, the synthesis of the rigid memory of a transfer manipulator of parts or pallets is done, so that to ensure the grippers displacement under the given laws.

CAMS DYNAMIC EFFICIENCY DETERMINATION

Florian Ion PETRESCU, Adriana COMĂNESCU, Barbu GRECU, Constantin OCNĂRESCU, Relly Victoria PETRESCU

Abstract: The paper presents an original method to determine the efficiency of a mechanism with cam and follower. The originality of this method consists in eliminating the friction modulus. In this paper one analyses four types of cam mechanisms: 1.The mechanism with rotary cam and plate translated follower; 2.The mechanism with rotary cam and translated follower with roll; 3.The mechanism with rotary cam and rocking-follower with roll; 4.The mechanism with rotary cam and plate rocking-follower. For every kind of cams and followers mechanism one uses a different method to determine the most efficient design. One takes into account the cam's mechanism (distribution mechanism), which is the second mechanism in internal-combustion engines. The optimizing of this mechanism (the distribution mechanism), can improve the functionality of the engine and may increase the comfort of the vehicle too.

GEARED TRANSMISSIONS DYNAMIC SYNTHESIS

Florian Ion PETRESCU, Barbu GRECU, Adriana COMĂNESCU, Relly Victoria PETRESCU

Abstract: In this paper one succinctly presents an original method to obtain the efficiency of geared transmissions in function of the cover grade of the gearing. With the presented relations one can make the dynamic synthesis of geared transmissions, having in view increasing the efficiency of gearing mechanisms.

CAM GEARS DYNAMICS ILLUSTRATED IN THE CLASSIC DISTRIBUTION

Relly Victoria PETRESCU, Adriana COMĂNESCU, Florian Ion PETRESCU

Abstract: The paper presents an original method to determine the general dynamics of mechanisms with rotation cams and followers, particularised to the plate translated follower. First, one presents the dynamics kinematics. Then one solves the Lagrange equation and with an original dynamic model (see [1]) with one degree of freedom, with variable internal amortisation, one makes the dynamic analysis of two models.

CAM GEARS DYNAMICS IN THE MODULE B (WITH TRANSLATED FOLLOWER WITH ROLL)

Relly Victoria PETRESCU, Adriana COMĂNESCU, Florian Ion PETRESCU, Ovidiu ANTONESCU

Abstract: The paper briefly presents an original method for determining the dynamics of mechanisms with rotation cam and translated follower with roll. First, one presents the dynamics kinematics. Then one performs the dynamic analysis of a few models, for some movement laws, imposed on the follower, by the designed cam profile.

MODELLING AND ANALYSIS OF DYNAMIC PROPERTIES OF TILT TRAY MANIPULATOR

Tomasz PIATKOWSKI

Abstract: The paper concerns dynamic modelling and analysis of the sorting process of the unit loads stream (e.g. postal parcels) realized with the help of a tilt tray manipulator. The loads are treated as particles, and the tray of the manipulator as the stiff body. The characteristic of the driving system of the tray tilting mechanism is worked out on the basis of the cubic b-spline curve. This curve is numerically optimised in terms of time minimisation of the tray working motion and fulfilment of safety and reliability conditions of handled objects. The test results of the model of sorting process may be used as guidelines during the manipulator's design and as instructions for proper sorting parameters applications.

OPTIMIZATION OF CAMS USED IN COMPLEX MECHANISMS

Claudia Mari POPA, Nicolae PANDREA, Marinică STAN, Dinel POPA

Abstract: In this paper there is presented the optimization algorithm of cams used in complex mechanisms. Starting with the synthesis of the cam in the case of the mechanism with a flaw follower, the values obtained from the cinematic analysis and those obtained from synthesis are compared. In the case where there are differences, the mechanism is optimised by using circular followers of different radius. The algorithm is based on combining the theoretical methods with those specific to assisted design.

SOME CONSIDERATIONS ON THE SYNTHESIS OF CAMS OF COMPLEX MECHANISMS

Dinel POPA, Claudia Mari POPA, Marinică STAN

Abstract: In this paper there is presented the synthesis method of cams with CAD software. The method was named "by cutting" and combines the way of obtaining cams by positioning the follower in successive positions while the cams are spinning, by removing excess material, a process similar to manufacturing cams.

WORLD PLANTS - SOURCE OF INSPIRATION FOR CONSTRUCTION OF MANIPULATORS

Iulian POPESCU, Alina Elena ROMANESCU

Abstract: We start from the movements of plants due to layers of air, and it comes to controlled movements of manipulators operated by compressed-air jet, conducted according to the specified laws. We study the resulting movements.

AN HELICAL CONVEYER CALCULUS

Alexandru POZDÎRCĂ

Abstract: The paper presents the calculus of a carrier, used for cereal escapement in farm implements. The escapement's system is based on a helical conveyer made by welding a helical flank on a cylinder core. As in the case of a Grower rove, we can obtain a pitch of this helical flank by deforming a planar circular table. The initial data for planar table computation are: diameter of cylinder core, pitch of helical flank, clearance between the external cylinder envelope and the flank.

THEORETICAL-EXPERIMENTAL RESEARCH TOWARDS THE MOVEMENT OF A MANIPULATOR OPERATED BY COMPRESSED-AIR JET

Alina Elena ROMANESCU, Iulian POPESCU

Abstract: departing from a skeleton diagram of a manipulator activated by compressed air jets and there are theoretical and experimental studies on a layout. The movement of the characteristic point is determined, by means of calculation and experiment, proving that such a manipulator can have controlled movements.

OPPORTUNITIES OF TECHNOLOGICAL TRANSFER OFFERED BY BUSINESS INCUBATORS

Dan SĂVESCU

Abstract: The paper presents some aspects regarding the Technological and Business Incubators, the specific activities in these entities, strategies of incubation's process, selection of incubates, incubation spaces, having a real example, ITA Pro-Energ, an institution built under Transilvania University of Braşov, having like research applications "Products and Technologies in Sustainable Energy".

A MODELLING OF JOINTS WITH CLEARANCES

Nicolae-Doru STĂNESCU

Abstract: In this paper we propose a modelling of shaft-rim joints with clearances. The fluid in the joint is modelled by n identical mass less the springs. For this model we obtain the equations of motion of the shaft in the rim and we determine the equilibrium positions. Finally, we present a numerical application.

ANTROPOMORPHIC GRIPPING SYSTEMS WITH JOINTED BARS OR WHEELS AND WIRES FOR INDUSTRIAL ROBOTS – CONSTRUCTIVE SYNTHESIS, ANALYSIS AND DESIGN

Ionel STAREȚU

Abstract: The anthropomorphic grippers for robots are similar to the human hand and they can have: two, three, four or more fingers, with two or three phalanxes. The anthropomorphic grippers for robots in comparison with other mechanical grippers have more advantages such as: a bigger degree of dexterity, a larger domain of utility (more types of objects can be grasped) and the micro-movement of the grasped objects can be effected. In this paper two variants of anthropomorphic grippers for robots are described : with linkages and with ropes and pulleys. For the first variant, one family of grippers with four fingers are described and for the second variant two main solutions are described. Concisely, the stages of synthesis, analysis, design and functional simulation are shown too.

DETERMINATION OF THE CONFIGURATIONS BELONGING TO A DIRECTED GRAPH OF ROBOTIC ASSEMBLY STATES

Iulian TABĂRĂ, Anton HADĂR

Abstract: This paper presents a conventional representation of every assembly plan of a given product by using a directed graph. This kind of representation forms the background for effective planning algorithms that allow an improvement in assembly system flexibility by permitting an intelligent robot to pick a course of action according to the instantaneous conditions. This paper describes a directed graph of assembly states that includes all feasible montage plans for a given assembly.

MODERN RESEARCH IN THE AREA OF MECHANISMS-MECHANICAL SYSTEMS FOLLOWING THE NEW SCIENTIFIC POLICY IN THE PERIOD 2007-2013

Doru TALABĂ, Gheorghe MOGAN, Csaba ANTONYA

Abstract: After the Romanian integration into the European Union, the National Plan for Research and Development adopted for the period 2007-2013 is fully aligned with the 7th RTD Framework Programme of the European Commission, being structured on the same thematic areas and using very similar instruments. This meant a significant change of scientific policy that requires an effort of adaptation by the RTD performers. In regard to the traditional RTD area of Mechanical Engineering – Mechanism and Machine Theory (TMM), the new policy doesn't mean that this has become obsolete but only that there is the need to focus the research on certain scientific and technological goals that are relevant for the FP7&PN II priority areas.
This paper presents an approach at the Robotics and Virtual Reality Research unit of the Transilvania University of Brasov to adapt the traditional research interest in the field of TMM to the new policy context. The approach is illustrated with best practice and specific projects that are or have been carried out at both National and EU level.

MEDICAL APPLICATIONS BASED ON INTELLIGENT MATERIALS

Daniela TARNIȚĂ, Dan TARNIȚĂ, Nicu BÎZDOACĂ, Florin CISMARU

Abstract: A group of metals referred to as shape-memory alloys (SMAs) have remarkable properties of thermal shape memory, superelasticity and force hysteresis. The alloy nitinol, in particular, has a broad and continually expanding array of applications, including various prostheses and disposables used in orthopaedics surgery, in vascular and general surgery. Nitinol is biocompatible and more compliant than other alloys such as stainless steel. This review presents a basic description of the history, physical properties, biocompatibility and medical applications (surgical and commercial devices made from this special material).

MODELLING AND SIMULATION AIDED EDUCATION AND DESIGN IN THE MECHANISM AND MACHINE SCIENCE

Iosif TEMPEA, Adriana-Madălina LIVADARIU, Marin NEACŞA

Abstract: The paper illustrates some applications of the integrated solution CATIA V5 for instructing students of the Mechanical Faculties, in Mechanism and Machine Science-MMS. The modelling of plane mechanisms in CATIA V5 is realised on two levels: a quick but summary level in *Sketcher* and the second more complex but high-performance in *Part Design, Assembly Design* and *DMU Kinematics*. The simulation and modelling techniques of some plane mechanisms are exemplified by some samples. The modelling of a 6-degrees of freedom serial robot is also presented.

SOFTWARE PLATFORM FOR ANALYSIS AND OPTIMIZATION OF MECHANICAL SYSTEMS

Ion VIŞA, Cătălin ALEXANDRU, Codruța JALIU

Abstract: The paper presents a unitary concept for kinematic & dynamic analysis and optimization of mechanical systems, by using a complex software platform for testing in a virtual environment. The digital platform integrates software solutions for evaluating the form, fit, function and durability of the mechanical & mechatronic systems. The platform is developed in the concurrent engineering concept, integrating the mechanic and electronic components at the virtual prototype level.

DYNAMIC ANALYSIS OF SPUR GEARS WITH TOOTH PROFILE MODIFICATIONS

Virgil ATANASIU, Ioan DOROFTEI,
Dumitru LEOHCHI, Cezar OPRIŞAN

Abstract: Gear tooth modifications are used in order to reduce the dynamic loads and transmission error due to the periodic time-varying stiffness of gear pairs. The paper develops a computer aided procedure for minimising the dynamic load and transmission error of spur gear pairs by using tooth profile modifications. The relationships between time-varying mesh stiffness, profile modifications and dynamic characteristics are investigated.
The amount of the optimum profile modifications depends upon the magnitude of the variable mesh stiffness of the contacting tooth pairs. An accurate model and the variation of the gear mesh stiffness as a function of contact point along the path of contact are presented in the paper. The effects of the addendum modifications and the tooth tip relief on the dynamic factor are studied under various loading conditions.

COMPUTER-AIDED LECTURES AND EXERCISES: GRAPHICAL ANALYSIS AND SYNTHESIS IN MECHANISM THEORY

Corves BURKHARD

Abstract: A lot of methods for analysis and synthesis of mechanisms are based on geometric constructions which allow either a rapid analysis of a given mechanism or an easy dimensional synthesis of a mechanism for a given task. Examples are the synthesis of the four bar linkage for given coupler positions and the Roberts-Theorem which states that three different planar four bar linkages trace identical coupler curves. Especially for the education of engineering students who are to be introduced into the fundamentals of mechanism theory, a new approach using geometry programs will be shown in this article. By presenting different examples applied in the current lectures and exercises, the use of commercially available software and its benefits for students' education are proved.

This paper was also presented at:
The 11th World Congress in Mechanism and Machine Science
April 1-4, 2004, Tianjin, China

RESEARCH CONCERNING THE COMPLIANT MECHANISMS

Vencel Iosif CSIBI, Simona NOVEANU, Ion LUNGU

Abstract: In this paper, the flexibility of compliant mechanisms currently used in micro-mechanical structures is discussed. The angular range of motion of a flexure joint is limited by the elastic range of material deformation, which is influenced by the geometry and the material properties of the joint. The analysis of geometrical shapes of flexure joints is presented and experimental results are given and discussed. Modelling, simulation and optimization have been performed using the finite element method. Finally, the authors' prototypes of minigrippers are presented.

OMNIDIRECTIONAL MOBILE PLATFORM FOR EDUCATIONAL AND RESEARCH PURPOSES

Ioan DOROFTEI, Virgil ATANASIU, Cezar OPRIŞAN

Abstract: Industrial and technical applications of mobile robots are continuously gaining in importance. They are already widely used for surveillance, inspection and transportation tasks. A further emerging market is that of mobile entertainment robots.

One of the main requirements of an autonomous mobile robot is its ability to move through the operational space, avoiding obstacles and finding its way to the next location, in order to perform its task, capabilities known as localisation and navigation. In order to know where to go, the robot must have accurate knowledge of its current location. It means, it should use a great variety of sensors, external references and algorithms.

In order to move in tight areas and to avoid obstacles mobile robots should have good mobility and maneuverability. These capabilities mainly depend on the wheel design. Research is continuously going on in this field, to improve the autonomous navigation capability of mobile robotic systems.

This paper introduces an omnidirectional mobile robot for educational and research purposes. The robot has full omnidirectional motion capabilities, thanks to its special Mecanum wheels. The present chapter provides some information about conventional and special wheel design, mechanical design aspects of the Mecanum wheel and also of the robot, kinematic models, as well as electronics and control strategies: remote control, line following, autonomous strategy. Thanks to its motion capabilities and to its different control possibilities, the robot discussed in this chapter could be used as an interesting educational platform. This report is the result of research conducted at the Robotics Laboratory of the Mechanical Engineering Faculty, Gh. Asachi Technical University of Iasi, Romania.

ASSEMBLY TASK ANALYSIS USING MECHANICAL ROBOT HANDS

Alexandru RUS, Ion BRATU, Alexandru PELE

Abstract: Assembling components presents a variety of problems that appeared to be solvable with the stiffness control approach. The chances of successful assembly are highest if the compliance matrix associated with the grasped part is diagonal at the point where the part first touches a mating component. In this paper an approach for computing the stiffness and compliance of a grasp is developed. The effective stiffness matrix of a grasp is expressed as the sum of the structural compliance, the kinematic and elastic properties of fingers and the servoing compliance of the joints. The positive definiteness of the stiffness matrix determines the instantaneous grasp stability. Stiffness control allows the programmer to think in terms of desired part trajectories during assembly. With knowledge of expected constraint conditions in the assembly task the programmer is able to shape the stiffness specification to match the particular task and thereby prevent part jamming and undue friction forces during assembly.

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