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1. RESEARCHES ON MATHEMATICAL MODELLING OF PROCESS FUNCTIONS REGARDING THERMAL SPRAY TECHNOLOGY OF THE POLYMER NANOCOMPOSITES PRODUCTS

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Abstract. At present, theoretical studies results concerning the properties and the manufacturing technology of the polymer nanocomposites products are significant different from the experimental results. In this paper, a nanomechanical mathematical model of the thermal spray fabrication technology of the polymer nanocomposites products is proposed. The "changes of place" and displacements during the diffusion process, produced in the structure of a polymer nanocomposites, are determined by this model.

Keywords: Polymer nanocomposites, Nano-fillers, Polymer matrix, Thermal spray.

2. STRESS RELAXATION IN TITANIUM ALLOYS AT HIGH TEMPERATURES

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Abstract. In the present work we presents a special method for testing the internal stress relaxation, also the main directions of stress relaxation process and the optimal temperature and time parameters corresponding to integral or zonal annealing of the welded titanium alloys for construction. At the base of elaborated by us testing methodology we have consider two testing methods of relaxation, largely used: the method of plan spring for thin sheet metal and the method of the ring-shaped samples, in beam format for die materials.

Keywords: titanium alloys, internal stress relaxation, annealing treatment;

3. CONTRIBUTION TO EXPERIMENTAL IDENTIFICATION AND SIMULATION PROBLEMS OF DYNAMIC SYSTEMS

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Abstract. Oftentimes identification and simulation process create the errors. These can show like anomalies between real system and model. Error detecting isn't very simple process, where using only one method is not sufficient. There is a question, what combination of methods is the best for use considering the time and precision of received results. Analytical methods of experimental identification depends on several patterns as is the option testing signal, type of the mathematical model, self identification method and evaluation his quality – verification. Keynote of this contribution is based on the option how you use various combinations. These combinations of method are applied on 2 different dynamic models.

Each unit (contains 4 basic processes) and his spirit is different from others, which gives premise, when the results from one verification are satisfactory, it doesn't premise others successful verification, where not each of them achieving necessary precision from specific viewing angle.

Keywords: Experimental identification, modelling, dynamic systems, simulation technique.

4. THE STUDY OF THE EFFECT OF PRE-SET CAM PARAMETERS FOR CUTTING SURFACE QUALITY

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Abstract. CAD system using allows realising of quality surface and shape requirements of users and technology more easily. On the other side the parameters of copying accuracy of plane by cutter have some influence to number of lines of programme, operation time and to quality of surface too. Optimisation of these parameters is important, as we need to minimize operation time and to achieve required quality of surface.

Keywords: automation, FMS, CAD, CAD/CAM.

5. PREDICTIVE CONTROL BASED ON CARIMA PROCESS MODEL AND KALMAN ESTIMATOR

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Abstract. Model Predictive Control is general methodology how to cope with optimal control problem in discrete-time domain. Integrated Controller Auto-Regressive Moving-Average (CARIMA) process model is used for future plant output predictions by Generalized Predictive Controller. Noise polynomial matrix in process model serves as a data filter to detune controller sensitivity to high frequency disturbances e.g. against measurement noise. Open question remains how to design this filter. In the paper steady-state Kalman estimator is calculated for given process model and noise parameters. Its characteristic polynomial is used as a process model noise polynomial – that means Kalman estimator as a process model is controlled. Suggested method is proved on laboratory plant control experiments.

Keywords: Generalized Predictive Control, Kalman estimator, T-polynomial matrix.

6. PNEUMATIC SPRING ACTUATOR WITH MCKIBBEN ARTIFICIAL MUSCLE

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Abstract. The pneumatic spring actuator based on linear spring and McKibben artificial muscle in antagonistic connection was designed. Two-position solenoid valves operate contraction of the pneumatic artificial muscle. Tensile force of artificial muscle is transmitted by gear to spring, which acts by its force. There are described in paper work principle of the actuator, the characteristic of linear spring, the characteristics of the pneumatic artificial muscle in variable pressure and static characteristic of the pneumatic spring actuator.

Keywords: Linear spring, artificial muscle, pneumatic actuator.

7. CNC PROGRAMS TOOL PATH SIMULATION

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Abstract. The CAD/CAM solution selected for the mechanical design activities may have or not, the NC program simulation software module, required for checking and validating the generated numerical command programs. This check operation basically means to simulate in graphic mode the tool path generated by the numerical command program internal instructions. Therefore the simulation will read the NC program internal instructions, and translate them in basic geometrical entities (point, line, circle arc). This kind of application development involve the using of graphical libraries, like the 'open sources' ones. The graphical libraries most known are: OpenGL [8] and OpenCascade [1]. In this study, the fundamentals for NC program simulation application are proposed with Visual C++ development.

Keywords: numerical command, NC, OpenCascade, tool path, simulation.

8. OBJECT ORIENTED APPLICATION DEVELOPMENT USING C++ AND OPENCASCADE

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Abstract. The graphical application development can be a substitute for a vacant CAD/CAM solution, wanted for the mechanical part design and manufacturing process, or can be an additional way to update the already existing CAD/CAM solution. Graphical development means a good understanding for a lot of mathematical algorithms used in geometrical shape display, and also means an accurate memory handling inside the program code. Using of shareware open sources graphical program libraries, can be a solution to transform the graphical application development into a easy process. The most known open sources are: OpenGL and OpenCascade [1, 6]. This paper will propose the development solution with Visual C++ and OpenCascade.

Keywords: numerical comand, NC, OpenCascade, tool path, simulation.

9. APPLICATIONS OF UNCONVENTIONAL ACTUATORS IN ROBOT SUBSYSTEMS

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Abstract. The development of new constructional materials, new actuator types and CA technologies opened the additional possibilities to improve robot subsystems design. The paper is aimed to the problem of both robot end effector actuators and power transmission mechanism solution. Some steps related with unconventional actuator application in process of multi-fingered robot hand design are presented.

Keywords: multi-fingered robot hand, Pneumatic Artificial Muscles, force-acting analysis;