Modeling and identification of positioning part of KUKA robot

Abbas Chatraei, Václav Záda, David Lindr

Abstract. An experimental procedure for identifying the friction and dynamic parameters of the industrial robot manipulators is presented. A new approach is offered for obtaining the excitation trajectory based on the parametrization of the trajectories by means of the B-spline functions. In order to estimate the friction and dynamic parameters of the robot, a weighted least square algorithm is used to solve the linear regression problem. The presented procedure is demonstrated on an industrial robot manipulator from the family of KUKA robots.

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Radio-frequency properties of carbon nanotubes and applications

Pinaki Mukherjee, Bhaskar Gupta, Evor L. Hines

Abstract. Radio-frequency and other electrical properties of carbon nanotubes (CNTs) are investigated. The response of a CNT to an electromagnetic wave is a topic under intensive research. A theoretical study is also performed on the basis of 1D quantum physics for explaining the properties of CNTs. Finally, observations regarding their potential of application in wireless communication along with a description of such a probable scheme are presented.

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Large Eddy Simulation: subgrid-scale models

Jaroslav Volavý, Matěj Forman, Miroslav Jícha

Abstract. Subgrid modelling in Large Eddy Simulation is proposed and analysed. The main idea of Large Eddy Simulation is to separate the eddies containing large energy from small dissipative eddies (scales). The large eddies are solved explicitly, the small ones are modelled. For modelling of these smallest scales so called subgrid-scale models are used. The paper contains a short description of the most used subgrid-scale models, particularly Smagorinsky model, dynamic Smagorinsky model, subgrid kinetic energy model, dynamic subgrid kinetic energy model and mixed model. These models are consequently tested on the case of a turbulent channel flow. The calculations are performed using an open-source code OpenFOAM. The results are compared with the DNS data.

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Design and application of LCL filter for high-power three-phase voltage source PWM rectifier

You Xiaojie, Guo Xizheng

Abstract. The mathematical model and control strategy of PWM rectifier with LCL filter are deduced and a new design method of LCL filter is presented. An example (600 V, 500 kW) is given and the construction of the system is introduced. The analysis is validated by simulation and experiments.

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Simple models of nanofiber motion in electro spinning

Pavel Pokorný, Miloslav Košek, Aleš Richter

Abstract. Fundamentals of electro-spinning representing a modern sophisticated technology for production of nanofibers in a very strong electric field are analyzed. From the physical viewpoint, the process of nanofiber formation is very complicated and many effects take place there, starting from nanofiber extraction from the melt or liquid. The second stage, movement of the nanofiber to the collector in electric field, is also not as simple as it appears. This stage is characterized by complex transformations whose complete measurement is not possible. In principle, the shape of nanofiber beam moving to the collector depends on the strength and distribution of electric field and its shape can be changed strongly by electrode changing. A simple electrostatic model includes all basic forces acting on the beam. Because of the process complexity, only qualitative agreement with the basic experimental results was achieved. In more complicated case the only explanation is possible. More sophistical models would require more exact measurements that are planned in the future.

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Voltage surge wave propagation in transformer winding

Antonín Předota, Zdeňka Benešová

Abstract. Very fast transient phenomena in the transformer winding are studied. A one-phase transformer is considered and the time–space voltage distribution in a transformer winding is investigated. The winding model is created as a circuit with distributed parameters. Resistance, inductance (including turn-to-turn inductive coupling), conductance, and both the turn-to-turn capacitance and the turn-to-iron core capacitance are considered. Parameters can vary along the length of the winding. The solution is obtained numerically in the time–space domain and various approximations of derivatives are tested. The inner resistances of various input voltage sources are implemented. The influence of various rates of rise of the input signals on the voltage distribution is observed and various types of the load are also considered.

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Lagrange's method for derivation of long line equations

Barbara Grochowicz, Witold Kosiński

Abstract. A new method for deriving telegraph equation is proposed which is based on a variational principle of stationary action. The existence of a variation principle for given field equations gives the availability of analytical or approximate solution of the equations. The main idea of the derivation is based on the observation, that for non-conservative systems and irreversible processes the variations of partial time and/or spatial derivatives of a field is different from the partial time and/or spatial derivative of the variation of the field, respectively. It means that a non-commutativity of those operations is allowed. Hence from the same action integral containing a density of a Lagrangian and known for a conservative system, equations of a non-conservative system may be obtained by the variational principle, provided a particular form of the non-commutativity of operations is assumed.

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