Analysis and comparison of two different structures of permanent magnet dual mechanical port machine

Guo Xizheng, You Xiaojie, Wen Xuhui

Abstract. Characteristics of two types of permanent magnet dual mechanical port machine (DMPM), viz. non-uniform magnetic-field DMPM and uniform magnetic-field DMPM, are compared using the finite element method. The analysis indicates that the permanent magnet flux linkage of uniform magnetic-field DMPM is higher, even with the same volume of magnets, and the electromagnetic coupling between stator and inner rotor is stronger. Because the non-magnetic material is used in the outer rotor of uniform magnetic-field DMPM, the self-inductance and mutual-inductance decrease, and the torque coupling between the stator and the inner rotor of uniform field DMPM is not significant. The analysis is verified by simulation results.

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Speed estimation of induction motor using Luenberger observer

Pavel Brandstetter, Jiří Friedrich

Abstract. A speed estimator with Luenberger observer for applications in sensorless induction motor drives with vector control is proposed and analyzed. Its complete mathematical model is described and solved in MATLAB-Simulink environment. The results of a typical example are presented and discussed.

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Multiphysics in electromagnetic devices simulation and design: an attempt of generalization

Michael G. Pantelyat

Abstract. Generalization of the basic principles of the coupled numerical analysis of electrical machines and other electromagnetic devices is presented. Two directions of generalization are discussed: determination of main interrelated multiphysical interactions during the operation of electrical machines and devices as well as their representation in graphical and table forms, and determination of main parameters to be obtained as outcomes of the coupled computer simulation from practical point of view. The analysis is based on the wide author's experience of the various practical problems solution regarding design and operation of the variety of innovative machines and devices as well as on research works carried out by other researchers. Such a general view of the fundamentals of pure and applied research in the area of multiphysical numerical modelling will be useful for "pure" researchers working in the field as well as for designers, manufacturers and even industrial operating personnel as "users" of obtained numerical results and proposed practical recommendations. An example devoted to illustration of the presented analysis utilization in the numerical solution of a multiphysics problem of practical interest is considered in detail.

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Application of continuation load flow analysis for voltage collapse prevention

Jan Veleba

Abstract. Steady-state voltage stability problem is dealt with. Attention is paid to detailed description of the problem and to both analytical and numerical solutions using theoretical background of the conventional load flow analysis. Continuation load flow analysis (CLF) is introduced for providing more robust examination of especially larger and more complex power systems in terms of voltage stability. Steady-state voltage stability optimization problem is presented, and a particular optimization tool—the NEOS Server for Optimization is introduced. Eventually, a computational tool in MATLAB environment (containing CLF algorithm) developed by the author is used for comprehensive voltage stability study of an examined ill-conditioned transmission power system. Potential improvements in voltage stability by individual remedial actions are discussed.

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Dissipation normal form and fixed-point computation

Jiří Lahoda

Abstract. Systems based on dissipation normal form are analyzed considering especially their sensitivity to round-off errors and fixed-point computation effects. First, for linear system properties the dissipation normal form system structure is compared with standard digital filter structures. Then nonlinear systems generating chaotic oscillations are dealt with. The dissipation normal form is used for chaotic systems synthesis. New class of chaotic systems with switching in system parameters is proposed. Nonlinear systems are digitalized in n bits, and fixed-point computation effects are investigated.

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Effects of partial slip on boundary layer stagnation-point flow and heat transfer towards a stretching sheet with temperature dependent fluid viscosity

Krishnendu Bhattacharyya,
Swati Mukhopadhyay, Gorachand Layek

Abstract. A steady two-dimensional boundary layer stagnation-point flow of a viscous incompressible fluid over a stretching sheet is studied in presence of partial slip and temperature dependent fluid viscosity. The viscosity is assumed to vary as a linear function of temperature. Similarity transformations are used to convert the governing PDEs to self-similar ODEs. Numerical computations are carried out for several values of the parameters involved in transformed ODEs with the help of shooting method, and the results, so obtained, show that the flow field and heat transfer are influenced appreciably by different parameters, namely, the viscosity parameter A, the velocity ratio parameter a/c, slip parameter δ and Prandtl number Pr. Due to increase in A, the momentum boundary layer thickness increases. With increasing slip parameter, the velocity increases when $a/c = 2$ but it decreases when $a/c = 0.1$. The results pertaining to the present study indicate that rate of heat transfer increases with increasing δ for $a/c = 2$ and it decreases with increasing δ for $a/c = 0.1$.

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On rheological behaviour of PVB solutions in the process of electrospinning

Petra Peer, Petr Filip, Daniela Lubasova

Abstract. Described is suitability of various polyvinylbutyral (PVB) solutions for the process of electrospinning in which, under a strong electrostatic field, fibres are created and deposited on a template. The 6, 10, and 14 wt% PVB solutions were prepared with the following four solvents: methanol, ethanol, isopropanol, and butanol. A rotational rheometer equipped with the electrorheological cell (bob and cup arrangement, diameter of 17 mm), and a scanning electron microscope were used to compare the electrorheological behaviour of the materials studied and their potential for use in the process of electrospinning. It was proved that an application of better solvents of PVB implies worse quality of an electrospun material and vice versa. This is documented by behaviour of a curve expressing dependence of the ratio of shear viscosities in presence and absence of an electric field on a shear rate.

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Numerical study of transition between rolling and saltation movement of spherical particles

Irina Kharlamova, Alexander Kharlamov,
Zdeněk Chára, Pavel Vlasák

Abstract. Modelling of rolling and saltation movements of particles is dealt with, transition between rolling and saltation is described and the flow condition for it is found. This investigation is based on a suggestion that rolling might be considered as a saltation with small leaps. A numerical model of spherical particle saltation in turbulent flow in a channel is used and several criteria of difference between saltation and rolling modes based on both the average length and the average height of saltation leap were proposed.

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