

# Minimization of switching frequency oscillation of voltage inverter

TOMÁŠ VEČERKA

**Abstract.** Pulse-width modulations for voltage inverters of medium and higher output are proposed minimising the oscillations of the switching frequency and reducing the pulsations of current and torque of induction motors fed from them.

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# Mathematical model of five-phase induction machine

LUDĚK SCHREIER, JIŘÍ BENDL, MIROSLAV CHOMÁT

**Abstract.** Analysis of a five-phase induction machine based on the space vector method is carried out. It shows the necessity of considering the spatial harmonic waves of the current layer, magnetic field density and flux in the yoke. A system of equations describing the five-phase induction machine is derived. Based on these equations, a numerical model of the machine is set up. The higher spatial harmonics significantly influence the properties of the machine particularly in fault states or in the case of unbalanced feeding voltages.

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# Charging capacitors of multilevel inverter from dc intermediate circuit

MARTIN BEJVL

**Abstract.** Computer simulations of charging flying capacitors of a multilevel inverter from DC intermediate circuit using an auxiliary source of voltage are considered. Waveforms of voltage at various places of the converter during this transient process are estimated. Several ways of charging, which differ in switching power semiconductor switches, are compared.

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# On reliability of 3D reconstructions of thermal plasma jet radiation by inverse Radon transform

ZUZANA SEKEREŠOVÁ, JAN HLÍNA

**Abstract.** Three-dimensional reconstructions of thermal plasma jet radiation were acquired by inverse Radon transform from records by a high-speed CCD camera from three directions separated by angles of  $120^\circ$ . The complexity of measured radiation profiles has been changed due to varying gas flow rates. Reconstructed three dimensional images of plasma radiation were projected back to individual detection planes and these projections were compared with the original two dimensional records. The complexity and accuracy of reconstruction were examined depending on the resolution of input information and parameters of the inverse Radon transform.

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# Generalized correlation dimension— a way to analyze short time changes in non-linear dynamics of thermal plasma

JAN GRUBER

**Abstract.** Method of windowed correlation dimension estimates based on correlation dimension ( $D_2$ ) estimates by Grassberger–Procaccia algorithm is presented. Concept of generalization of correlation dimension ( $D_C$ ) is demonstrated by softening the requirements of  $D_2$  estimation algorithm and by iterative approach to determine the optimal parameters of this algorithm. The whole modified method is thoroughly demonstrated on model data (2D grid of points and Lorenz attractor). This method is then applied, and generalized correlation dimension is calculated for thermal plasma dynamics in subsequent chunks of data. For noise-free data with clearly defined dimensionality,  $D_C$  approaches correlation dimension  $D_2$ .

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# Implementation of fuzzy filters in EIT image reconstructions

KSENIA OSTANINA, JARMILA DĚDKOVÁ

**Abstract.** An implementation of various fuzzy filters in an image reconstruction process based on the Tikhonov regularization method is presented. A description of the new algorithm is provided together with a presentation of certain reconstruction results. The properties of reconstruction process in their entirety are discussed and compared.

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# Free vibration analysis of non-homogeneous visco-elastic circular plate with varying thickness subject to thermal gradient

ARUN KUMAR GUPTA, LALIT KUMAR

**Abstract.** The analysis of free vibration of non-homogeneous visco-elastic circular plate with varying thickness in the radial direction subjected to thermal gradient is performed. The effect of linear temperature variation on Young's modulus and Shear's modulus is considered only in radial direction. The thickness of circular plate varies parabolically in radial direction. For non-homogeneity of the circular plate material, density is assumed to vary linearly in radial direction. To solve the governing differential equation the method of separation of variables is applied. An approximate but quite convenient frequency equation is derived by using Rayleigh–Ritz technique with a three-term deflection function. Yet the method used for the solution of the problem provides an approximate solution but it is quite convenient and authentic. Deflection (at two different instant of time), time period and logarithmic decrement for the first two modes of vibration are computed for a non-homogeneous visco-elastic circular plate of parabolically varying thickness with clamped edge conditions for various values of non-homogeneity constant, taper constant and temperature gradients, and these are shown graphically for the Voigt–Kelvin model.

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