

# JEMNÁ MECHANIKA A OPTIKA

VĚDECKO-TECHNICKÝ ČASOPIS  
ROČNÍK 52 6/2007

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Cena čísla 40 Kč včetně DPH

# FINE MECHANICS AND OPTICS

SCIENTIFIC-TECHNICAL JOURNAL  
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# CONTENTS

## **Fine Mechanics and Optics at Czech Technical University in Prague (J. Hošek)..... 171**

An article gives a short overview of historical consequences and present of fine mechanics and optics education at Faculty of Mechanical Engineering of Czech Technical University in Prague. The volume and range of fine mechanics and optics education is presented with historical review of selected lecture notes published by authors of our branch. This review covers 56 years of existence fine mechanics and optics education at Czech Technical University in Prague.

## **Dynamical Superposition for Non-linearities Suppression in Actuator Position Control (I. Uhlř, J. Chyský)..... 173**

Position actuator with small DC motor, torque 1 Nm, range 210 grad, using dynamic superposition of vibrations for decreasing of friction effect and clearances in gear box.

**Key words:** actuator, DC motor, H bridge, potentiometer

## **Formal aid to the conceptual design – alternative approach**

(J. Bíla, J. Jura) ..... 176

The goal of the Conceptual Design Process is the representation and the explanation of the function for the designed system. The Conceptual Design Process, unfortunately, has no well founded formal means till nowadays and it uses various, however inappropriate formalisms. This paper deals besides with issue, why formalism of equations and in general formalism of quantitative mathematics (developed for physics) is no good for conceptual design and which are the consequences for the theory and practice. The analysis of formalisms based on explanation of four basic intentions and as a result two novel intentions are introduced: “Specifiers” and “Synthesisers”. The work with these intentions extends the Specification phase and comprehensively separates the phase of the Synthesis. The classical methodological approach that explains the world by means of properties (and their quantities) and the approach that explains the world with help of Conceptual constructions and Interpretation process, are compared.

**Keywords:** Conceptual Design, Emergent phenomena, ReDesign, ReDesign, intentions, interpretation, matroid

## **Optical quality capillary tip polishing**

(K. Studenovský, J. Hošek)..... 182

An article presents technology of grinding and polishing of small glass areas down to 1 mm<sup>2</sup> with optical quality. This technology problem relates to grant project solution “Metastable water and water vapor” GAČR No. 101/05/2214, where the surface tension of supercooled water has to be measured. We present experimental results of three possible technology approach of capillary tip finishing of final dimension 0.98/0.32 mm. Special focus is attended to capillary mounting appropriate for both machining and later experimental application too.

**Key word:** small surfaces, grinding, polishing, cleaning.

## **A Scanning system for spectrometer**

(Š. Němcová, J. Zicha)..... 185

This article describes a special scanning system associated to a spectrometer. The scanner consists of four cone mirrors. The device is used for the spectral analysis of low temperature plasma, studying a radiation at the various distances from the tube axis. A design of scanner, glowing and adjusting of mirrors is described, too.

**Key words:** scanner, cone mirrors, spectrometer

## **Laboratory model “Ball & Ellipse”**

(M. Hofreiter, M. Plhoň)..... 188

In the Faculty of Mechanical Engineering at Czech Technical University in Prague there is a common course “Automatic control” for all students in their third year. This paper describes the new and original laboratory model called “Ball & Ellipse” which has been manufactured in the Department of Instrumentation and Control Technology for practical training the fundamentals of analog and digital control. The laboratory model “Ball & Ellipse” consists of an elliptical railway pivoted at its centre in a way that its tilt can be manipulated in two perpendicular directions. The basic control task is to control the position of the ball rolling on the elliptical railway. The apparatus is controlled by MATLAB environment.

## **Fringe Pattern Analysis Using the Fourier Transform Method for Electronic Speckle Pattern Interferometry (P. Dvořáková, V. Bajgar, J. Trnka) ..... 190**

The paper deals with fringe pattern analysis obtained by electronic speckle pattern interferometry (ESPI) used to measure deformation profile of a thin steel plate. To calculate deformation phase we introduced spatial-carrier fringes that allow the magnitude of the phase to be determined. The Fourier transform method was employed for phase extraction. Once the phase distribution is obtained, it can be converted to the desired parameters, in our case, out-of plane displacement.

## **A Simulator of the Sun Radiation for Optical Raster Testing Annotation (J. Zicha, J. Čáp, B. Šourek, V. Jirka, J. Červený, J. Korečko, Š. Němcová)..... 194**

The raster based on Fresnel’s optics working as converging cylindrical optic are widely used in the range of utilization of the Sun energy as construction elements of translucent roofs and facades. The energetic balance of building’s interior equipped of these elements can be simulated mathematically and proved by experiment imitating precisely real conditions of an application. The described simulator was developed for such experiments. The angle between incoming radiation and the normal of a glass surface can be set by this simulator. This results present the functionality of the described device.

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