

# JEMNÁ MECHANIKA A OPTIKA

VĚDECKO-TECHNICKÝ ČASOPIS  
ROČNÍK 59 10/2014

## OBSAH

<b>Zobrazení magnetického záznamu v IT pomocí mikroskopie magnetických sil</b> (J. Kudělka, V. Křesálek, T. Martínek, M. Navrátil).....	271
<b>Výzkum biometrických systémů založených na rozpoznávání lidské chůze</b> (K. Sulovská, M. Adámek) ....	273
<b>Taktilní navigační systém pro nevidomé</b> (J. Volf, F. Škeřík) .....	276
<b>Celooblohová kamera s extrémně širokoúhlým zorným polem</b> (P. Janout, P. Páta).....	281
<b>Žádost o finanční podporu pro nápad</b> (M. Miler).....	283
<b>Optická soustava boroskopu pro pozorování plamene ve viditelném a infračerveném světle</b> (J. Keprt, L. Pospíšil, M. Hrabovský, L. Bartoněk).....	284
<b>Photonics Prague 2014 (Photonics, Devices and Systems) - 7. mezinárodní konference</b> (P. Tománek).....	287
<b>3D optický dvouzrcadlový skener s čočkou proměnné ohniskové vzdálenosti</b> (P. Pokorný).....	288
<b>Z technické knihovny</b> (J. Novák) .....	292
<b>Přichází nová éra robotiky – KUKA LBR iiwa</b> .....	294
<b>Společnost Micro-Epsilon představuje nabídku nové technologie 5osého obrábění</b> .....	295

Bližší informace o poslání časopisu, pokyny pro autory, obsah časopisu apod. je uveden na internetu: <http://jmo.fzu.cz/>

Informace o předplatném podá, objednávky přijímá, objednávky do zahraničí vyřizuje: SLO UP a FZÚ AV ČR, 17. listopadu 50, 772 07 Olomouc, tel.: 585 631 576, e-mail: eva.pelclova@upol.cz.

Cena čísla 40 Kč včetně DPH

# FINE MECHANICS AND OPTICS

SCIENTIFIC-TECHNICAL JOURNAL  
VOLUME 59 10/2014

## CONTENTS

<b>Imaging of magnetic record in IT by magnetic force microscopy</b> (J. Kudělka, V. Křesálek, T. Martínek, M. Navrátil).....	271
<b>Research on Biometric Systems Based on Recognition of Human Gait</b> (K. Sulovská, M. Adámek).....	273
<b>Tactile Navigation System for Blind Persons</b> (J. Volf, F. Škeřík) .....	276
<b>All-sky camera with extreme wide-field of view</b> (P. Janout, P. Páta).....	281
<b>Appeal for funding the idea</b> (M. Miler).....	283
<b>Optical system of borescope for flame observation in visible and infrared light</b> (J. Keprt, L. Pospíšil, M. Hrabovský, L. Bartoněk).....	284
<b>Photonics Prague 2014 (Photonics, Devices and Systems) - 7th International Conference</b> (P. Tománek) .....	287
<b>3D optical two-mirror scanner with a focus tuneable lens</b> (P. Pokorný).....	288
<b>From technical library</b> (J. Novák).....	292
<b>New age of robotics coming – KUKA LBR iiwa</b> .....	294
<b>Company Micro-Epsilon presents new technology of five-axis machining</b> .....	295

For further information about the journal intention, instructions for authors, contents etc. please refer to <http://jmo.fzu.cz/>

Information on subscription rate and on ordering gives the SLO UP a FZÚ AV ČR, 17. listopadu 50, 772 07 Olomouc, tel.: 585 631 576, e-mail: eva.pelclova@upol.cz.

Price for single copy: 40 Kč incl. VAT

# CONTENTS

---

## **Imaging of magnetic record in IT by magnetic force microscopy**

(J. Kudělka, V. Křesálek, T. Martínek, M. Navrátil).....271  
This work deals with magnetic force microscopy (MFM) which comes out from atomic force microscopy (AFM). This method was applied on selected samples – 3.5” floppy disc and magnetic tape. Their topographical and magnetic properties were visualized. Atomic force microscope Agilent 5420 was used.

## **Research on Biometric Systems Based on Recognition of Human Gait**

(K. Sulovská, M. Adámek).....273  
A great boom in employment of biometric systems in praxis can be noted from the year 2001, when the total demand for protective systems increased. This paper deals with the introduction to human gait (bipedal locomotion) analysis as a tool for security improvement not only for private or commercial purposes, but as a possible part of surveillance in cities as well. The potential of human gait as one of the biometric characteristics, which is not well known for public, is big although the researches of this area are still in progress. However, existing results are really satisfactory. So the gait is getting to be a perspective biometric system.

**Keywords:** gait recognition, 3D analysis, VICON, bipedal locomotion, biometric systems, gait biomechanics

## **Tactile Navigation System for Blind Persons**

(J. Volf, F. Škeřík).....276  
This article describes a system of navigation elements used by blind people for orientation in unknown terrain. This compensation tool, named “tactile navigation system”, is composed from three basic elements: camera, control unit and tactile activator. The tactile navigation system converts the camera image to the tactile information perceived by blind person via vibration of the tactile activator placed on his antebrahium, so that he can recognize the approaching obstacle and decide to continue walking. This device does not rival the blind stick but significantly complement it. The detection time of obstacles is shorter with this system in comparison with any other compensation tool and in such a way it makes an orientation in terrain easier.

**Keywords:** tactile systems, blind people, navigation, camera, tactile activator

## **All-sky camera with extreme wide-field of view**

(P. Janout, P. Páta).....281  
WILLIAM stands for a wide-field all-sky image analysing monitoring system. This stand-alone system, based on algorithms for detection of star objects, can monitor the night sky and then evaluate

the weather conditions suitable for star observation. The system employs the single lens reflection (SLR) camera with fish-eye lens. By the means of processing of night sky frames one can decide whether conditions are suitable for star telescope. Identification of visible stars is a consequence of frames processing using the database system WILLIAM.

**Appeal for funding the idea** (M. Miler) .....283

## **Optical system of borescope for flame observation in visible and infrared light**

(J. Keprt, L. Pospíšil, M. Hrabovský, L. Bartoněk).....284  
This paper deals with a design of borescope optical system intended for flame observation in thermal boilers used for various industrial applications that uses the image transfer to CCD camera or other sensing unit. Proceeding the works [1], [2] this article describes usage of the mechanical construction of INDEL borescope type. Both observation of flame image and its control in visible and near infrared light may enlarge the possibility to improve the combustion process and its ecological impacts.

**Keywords:** VIS, NIR, optical system of borescope, flame observation in VIS and NIR, NIR image record

## **Photonics Prague 2014 (Photonics, Devices and Systems)**

– 7<sup>th</sup> International Conference (P. Tománek) .....287

## **3D optical two-mirror scanner with a focus tuneable lens**

(P. Pokorný).....288  
The paper presents formulas for a ray tracing in the optical system of a two-mirror laser scanner with a focus tuneable lens. Furthermore, equations for the calculation of the focal length which ensure focusing of a beam at the desired point in a detection plane are derived. The chosen vector approach is general; therefore, the application of the formulas in various configurations of the optical systems is possible. In the case studies the author derived the formulas for mirrors’ rotations and the focal length depending on the position of the point at the detection plane.

**Keywords:** optical scanner, focus tuneable lens, circle of confusion

**From technical library** (J. Novák) .....292

**New age of robotics coming – KUKA LBR iiwa**.....294

## **Company Micro-Epsilon presents new technology**

**of five-axis machining** .....295