

14th Joint International IMEKO TC1, TC7, TC13 Symposium on Intelligent Quality Measurements – Theory, Education and Training 2011

**Held in Conjunction with the 56th IWK Ilmenau University of
Technology and the 11th SpectroNet Collaboration Forum**

**Jena, Germany
31 August – 2 September 2011**

ISBN: 978-1-61839-306-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2011) by the International Measurement Federation (IMEKO)
All rights reserved.

Printed by Curran Associates, Inc. (2011)

For permission requests, please contact the International Measurement Federation (IMEKO)
at the address below.

IMEKO-International Measurement Federation Secretariat
P.O. Box 457
H-1371 Budapest
Hungary

Phone/Fax: +36 1 353 1562

imeko@t-online.hu

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

Programme

Plenary lectures

From Verbal Models to Mathematical Models – A Didactical Concept not just in Metrology 1

Karl H. Ruhm

[ilm1-2011imeko-002.pdf](#)

The Role of Mathematical Models in Measurement outside the Laboratory 11

Marcel Boumans

[ilm1-2011imeko-004.pdf](#)

The Role of Mathematical Models in Measurement: A Perspective from Psychometrics 12

Mark Wilson

[ilm1-2011imeko-005.pdf](#)

Multichannel-EEG Measurements with Dry Electrodes N/A

Jens Haueisen

Progress on Measurement in Medicine and Biology: A Multiscale Systems Engineering Approach 19

Ronald Summers

[ilm1-2011imeko-007.pdf](#)

Fundamentals of Measurement Science

Quantity and Quantity Value 22

Alessandro Giordani, Luca Mari

[ilm1-2011imeko-025.pdf](#)

Does Measurement Need its Own System Theory - An Appraisal N/A

Klaus-Dieter Sommer

[ilm1-2011imeko-026.pdf](#)

Uncertainty in Fuzzy Scales Based Measurements 26

Eric Benoit

[ilm1-2011imeko-020.pdf](#)

How to Model and Test for the Mechanisms that Make Measurement Systems Tick 30

A. Jackson Stenner, Mark Stone, Donald Burdick

[ilm1-2011imeko-027.pdf](#)

The Quantification of Latent Variables in the Social Sciences: Requirements for Scientific Measurement and Shortcomings of Current Procedures 37

Thomas Salzberger

[ilm1-2011imeko-029.pdf](#)

Mathematical Models in Measurement

Foundational Imperatives for Measurement with Mathematical Models 43

Nikolaus Bezruczko

[ilm1-2011imeko-030.pdf](#)

Aspects of Measurement Strategy with Dynamic Programming 50

Kimmo Konkarikoski

[ilm1-2011imeko-033.pdf](#)

Lifetime Prediction of Smart Meter 55

Tino Almeroth, Olaf Kühn, Gerhard Linß

[ilm1-2011imeko-037.pdf](#)

Uncertainty Analysis of Image Features for Vision Applications in Space 63

Marco Pertile, Stefano Debei, Alessio Aboudan

[ilm1-2011imeko-035.pdf](#)

Largest Consistent Subsets in Interlaboratory Comparisons: Preference Aggregation Approach 69

Sergey V. Muravyov, Irina A. Marinushkina

[ilm1-2011imeko-036.pdf](#)

Mathematical Models of Gear Tooth Speed Sensors with Dual Outputs 74

Ji-Gou Liu, Zhe Zheng

[ilm1-2011imeko-034.pdf](#)

Modeling of 3D-Measurement Chains in Nanopositioning and Nanomeasuring Machines 79

Roland Füßl, Eberhard Manske, Philipp Kreutzer

[ilm1-2011imeko-038.pdf](#)

From Breast-Q © to Q-Score ©: Using Rasch Measurement to Better Capture Breast Surgery Outcomes 82

Stefan J. Cano, Anne F. Klassen, Andrea L. Pusic

[ilm1-2011imeko-039.pdf](#)

Applications for Intelligent Quality Measurements

Mathematical Methods for Imaging Mass Spectrometry 95

Dennis Trede, Jan Hendrik Kobarg, Klaus Steinhorst, Theodore Alexandrov

[ilm1-2011imeko-082.pdf](#)

Application of Advanced Production Metrology for Quality Improvements in Biomedical Engineering Analysis and Evaluation of Surface Structures of Dental Implants 100

P. Demircioglu, Gökçen Bas, B. Gültekin, M.N. Durakbasa, W. Pirker, P.H. Osanna

[ilm1-2011imeko-085.pdf](#)

Lensless Microscopic Imaging "P IC

Rainer Riesenberger

Optimisation of the Format Factor for Spectrometers N/A

Robert Wipf

Application of JENCOLOR Multispectral Sensors in Dermatology 105

Fredrik Hailer, Frank Krumbein

[ilm1-2011imeko-083.pdf](#)

Optical Detection of Geometrical and Wear Features of Cutting Tools 108

Heinz-Wolfgang Lahmann, Jan Klemm

[ilm1-2011imeko-086.pdf](#)

Ultra Compact OEM Spectrometer for Multiple Applications - STM N/A

Dieter Steck, Marko Snickers

Worker Assistance and Quality Inspection – Application of Optical 3D Metrology and Augmented Reality Technologies 112

Steffen Sauer, Dirk Berndt, Jost Schnee, Christian Teutsch

[ilm1-2011imeko-046.pdf](#)

Diagnostic Concepts for Automated Assembly and Workpiece Inspection Systems (AAWIS) 115

Stephan Sommer

[ilm1-2011imeko-012.pdf](#)

Concept of a Measuring System for Large Diameters of Ball Bearings 123

André Göpfert, Matthias Rückwardt, Maik Rosenberger, Gerhard Linß

[ilm1-2011imeko-076.pdf](#)

Compact Roughness Sensor Using Light Scattering Techniques N/A

Tobias Herffurth, Gunther Notni, Angela Duparré

Optical Identification of Concrete and Demolition Waste by Using Image Processing and Machine Learning Methods 126

Katharina Anding, Elske Linß, Hannes Träger, Matthias Rückwardt, André Göpfert

[ilm1-2011imeko-073.pdf](#)

Characteristics of a Monolithically Integrated Micro-Displacement Sensor 133

Toshihiro Takeshita, Yao Peng, Nobutomo Morita, Hideyuki Ando, Eiji Higurashi, Renshi Sawada

[ilm1-2011imeko-015.pdf](#)

Upgrade of Optical Microscopes for 3D- Surface Measurements N/A

Torsten Machleidt, Dietmar Kollhoff

Special Session on the Role of Mathematical Models in Measurement

Application of Mathematical Models in Optical Coordinate Metrology 139

Susanne C.N. Töpfer

[ilm1-2011imeko-008.pdf](#)

Measurement Modelling: Foundations and Probabilistic Approach 144

Giovanni Battista Rossi

[ilm1-2011imeko-009.pdf](#)

The Role of Mathematical Modelling in the Analysis and Design of Measurement Systems 154

Sanowar Khan, Ludwik Finkelstein

[ilm1-2011imeko-010.pdf](#)

Application-Oriented Approach to Mathematical Modelling of Measurement Processes 160

Roman Z. Morawski

[ilm1-2011imeko-011.pdf](#)

New Education and Training Methods

New Education Strategy in Quality Measurement Technique with Image Processing Technologies 171

Gerhard Linß, Maik Rosenberger, Matthias Schellhorn, Patrick Werner, Steffen Lübbecke

[ilm1-2011imeko-040.pdf](#)

Unified Education and Training at the European Imaging Academy 175

Peter Keppler, Mark Williamson

[ilm1-2011imeko-041.pdf](#)

Machine Vision Experts Programme for Image Processing in Industry, Medicine and Environment N/A

Karl-Heinz Franke

Smartphone Measurement Engineering and Quality Assurance – The Breakthrough of Game Changers 178

Dietrich Hofmann, Gerhard Linss, Randolph Margull, Paul-Gerald Dittrich, Eric Düntsch, Michael Rockstroh, Gulfikar Siltama Ultri Rinjani

[ilm1-2011imeko-043.pdf](#)

Measurement, Metrology and the Coordination of Sociotechnical Networks 181

William P. Fisher, Jr.

[ilm1-2011imeko-017.pdf](#)

An Opinion to Construct Framework of Measurement Science on Education Knowledge System 190

Komyo Kariya, Sigeru Takayama

[ilm1-2011imeko-014.pdf](#)

OptoNet MASTER+ - A Model Program for the Promotion of Young Talents N/A

Peggy Lerner, Klaus Schindler

From Paper Books to Smart Books – A Breakthrough of Green Game Changers 194

Paul-Gerald Dittrich

[ilm1-2011imeko-044.pdf](#)

Measurements in Biology

Segmented Flow Technique in Life Sciences – Applications of the Technological Platform „Pipe Based Bioreactors“ 198

Gunter Gastrock, Andreas Grodrian, Karen Lemke, Jörg Schemberg, Stefan Wiedemeier, Josef Metz

[ilm1-2011imeko-053.pdf](#)

Potential of Microfluidics in Bioanalytical Applications N/A

Jörg Weber

Design of a Cell-Based Lab-on-a-Chip with Integrated Electrochemical and Optical Detection 200

M. Schimmelpfennig, U. Neubert, A. Bogen, S. Michaelis, J. Wegener, K.-H. Feller

[ilm1-2011imeko-054.pdf](#)

Mesoscale Sensor/System-Integration based on Multilayer Ceramics N/A

Michael Stelter, Uwe Partsch

Fully Automated System for Pollen Concentration Measurement in Ambient Air 204

E. Schultheiss, U. Heimann, R. Möller, D. Zühlke

[ilm1-2011imeko-057.pdf](#)

An Innovative Laser-Based Sensing Platform for Realtime Optical Monitoring of Oxygen 207

Dörte Steinbrück, Elmar Schmälzlin, Frank Peinemann, Michael U. Kumke

[ilm1-2011imeko-058.pdf](#)

Multimodal Simulation of the Phage- λ Decision Cycle 212

Ryan Imms, Colin Warburton, Ron Summers

[ilm1-2011imeko-059.pdf](#)

Measurements in Medicine

Non-Invasive Spectral Domain Optical Coherence Tomography Combined with Innovative Software Solutions or Better Eye Diagnoses N/A

Tobias Winkler

Measuring Retinal Vessel Diameters in the Rat in Vivo N/A

Dietmar Link, Clemens Strohmaier, Bernd-Ulrich Seifert, Herbert A. Reitsamer, Walthard Vilser, Jens Haeisen

The Necessity for Measuring a Spectacle Frame by Image Processing 221

Matthias Rückwardt, André Göpfert, Katharina Anding, Mathias Schellhorn, Gerhard Linß

[ilm1-2011imeko-062.pdf](#)

The Quality Control Parameters of the Medical Radiological Equipment 224

Sorin Bercea, Constantin Cenusu, Aurelia Celarel

[ilm1-2011imeko-064.pdf](#)

Dynamic Measurement of Body Swing in Walking and Jogging by Wearable Sensing System 226

Shigeru Takayama, Yuuki Matsuda and Komyo Kariya

[ilm1-2011imeko-016.pdf](#)

Session for Young Scientists

Online Correction of Aberrations to Reduce the Measuring Uncertainty for the Optical High-Speed Measurement of High-Precision Cutting Tools Using Coordinate Measuring Machines 232

Marco Büchner, Silvio Holder, Frank Richter, Uwe Nehse

[ilm1-2011imeko-051.pdf](#)

An Approach for Efficient Implementation of Uncertainty Analysis in Production-Related Measurement Process 237

Martin Timmermann, Teresa Werner, Albert Weckenmann

[ilm1-2011imeko-071.pdf](#)

Internet Traffic Clustering Using Packet Header Information 241

Pekka Kumpulainen, Kimmo Hätönen, Olli Knuuti, Teemu Alapaholuoma

[ilm1-2011imeko-050.pdf](#)

Knowledge-Based Inspection Planning for Multiscaled Quality Testing 248

Karina Weißensee

[ilm1-2011imeko-067.pdf](#)

Poster Presentations

Applications for Intelligent Quality Measurements

Loudness Measurement by Robust Magnitude Estimation 252

Francesco Crenna, Giovanni B. Rossi, Luca Bovio

[ilm1-2011imeko-074.pdf](#)

Improvement of the Fast Impedance Spectroscopy Method Using Square Pulse Excitation 259

Grzegorz Lentka, Michael Kowaleski

[ilm1-2011imeko-077.pdf](#)

Analysis and Correction of Errors of Optical Measuring Systems Based on CCD-Sensors 263

Galina Polte, Alexey Saenko, Victor Musalimov, Gerhard Linß

[ilm1-2011imeko-079.pdf](#)

Quality Assurance for Measurements of the Radioactivity in the Area of the „Horia Hulubei“ National Institute for Physics and Nuclear Engineering, IFIN-HH "489

Ana Stochioiu, Aurelian Luca, Maria Sahagia, Romul Mircea Margineanu, Ion Tudor

[ilm1-2011imeko-080.pdf](#)

A Compact Smart Resistive Sensor Based on a Microcontroller 271

Zbigniew Czaja

[ilm1-2011imeko-075.pdf](#)

An Experimental Study of Motion Blur in Optical Coordinate Metrology for Dynamic Measurements of Geometrical Features 275

Ke Xie, Silvio Holder, André Göpfert, Matthias Rückwardt, Sebastian Krepler, Marco Büchner, Gerhard Linß

[ilm1-2011imeko-081.pdf](#)

The Assessment of the Measuring Performances of a Standard Instrument for Absorbed Doserate in the Medical Applications of the Ionizing Radiation 280

Sorin Bercea, Constantin Cenusă, Ioan Cenusă, Aurelia Celarel, Stela Patrascu

[ilm1-2011imeko-066.pdf](#)

Measurements in Medicine

A Clinical Scale for Measuring Functional Caregiving of Children Assisted with Medical Technologies 284

Nikolaus Bezruczko, Shu-Pi C. Chen, Connie Hill, Joyce M. Chesniak

[ilm1-2011imeko-032.pdf](#)

Information Function of the Heart. Biophysical Substantiation of Technical Requirements for Electrocardioblock Registration and Measurement of Electrocardiosignals' Parameters Acceptable for Information Analysis to Diagnose Internal Diseases 288

Viacheslav Uspenskiy

[ilm1-2011imeko-024.pdf](#)

Body, Mind, and Spirit are Instrumental to Functional Health: A Case Study 291

Carl V. Granger, Nikolaus Bezruczko

[ilm1-2011imeko-031.pdf](#)

The Fundamentals of the Measurement of the Dosimetric Quantities in Hadrontherapy 295

Sorin Bercea, Aleksandra Nikolic, Angelica Prioteasa, Aurelia Celarel, Constantin Cenusă

[ilm1-2011imeko-065.pdf](#)

Fundamentals of Measurement Science

Continuous Quantity and Unit; Their Centrality to Measurement 299

Gordon A Cooper, William P Fisher

[ilm1-2011imeko-019.pdf](#)

A Technology Roadmap for Intangible Assets Metrology 304

William P Fisher, A. Jackson Stenner

[ilm1-2011imeko-018.pdf](#)

..

.....**Metrological Properties of Classification** 315
.....