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# Information Processing in Medical Imaging

22nd International Conference, IPMI 2011  
Kloster Irsee, Germany, July 3-8, 2011  
Proceedings

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Gábor Székely  
Swiss Federal Institute of Technology  
Computer Vision Laboratory  
Medical Image Analysis and Visualization Group  
ETH-Zentrum, Sternwartstr. 7, 8092 Zurich, Switzerland  
E-mail: [szekely@vision.ee.ethz.ch](mailto:szekely@vision.ee.ethz.ch)

Horst K. Hahn  
Fraunhofer MEVIS  
Universitätsallee 29, 28359 Bremen, Germany  
E-mail: [horst.hahn@mevis.fraunhofer.de](mailto:horst.hahn@mevis.fraunhofer.de)

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# Preface

It is a great pleasure and an honor for us to present the proceedings of the 2011 International Conference on Information Processing in Medical Imaging (IPMI), the 22nd in the series after the successful meetings held in Kerkrade, The Netherlands, in 2007 and in Williamsburg, VA, USA, in 2009. Biannually, IPMI brings together excellent young investigators, experienced researchers and some of the old stagers in medical image formation, analysis and interpretation. After the first meeting in 1969, IPMI has developed into a highly prestigious event and is said to be the longest-running international scientific workshop on medical image analysis. Many important developments in the field were first presented at IPMI and, with its unique format that allows for intensive and comprehensive discussion of new ideas and a variety of clinical applications, the series was always committed to a rigorous scientific approach to information processing in medical imaging.

IPMI 2011 was held during July 3–8, 2011 at the Irsee Monastery in Bavaria, Germany. Topics of the conference include image and signal processing, shape representation and analysis, image registration and fusion, functional and molecular imaging, computational physiology, statistical and mathematical models, computer-aided detection and image interpretation, image reconstruction, objective assessment of image quality, data visualization, and novel image acquisition methods. Most of these topics were covered by a relatively small number of talks within single-track sessions plus a number of poster presentations. We received 224 full-length submissions before the deadline in December 2010, from which we selected 24 for oral presentation and 39 as posters during the all-plenary five-day conference. This corresponds to an overall acceptance rate of 28%. All papers were carefully judged by at least three reviewers, each of whom performed at least nine reviews and also provided a relative ranking of the reviewed papers. On this basis, the paper selection committee assessed all papers in a two-stage process that focused on clarity of presentation, justification of the methodological approach, scientific rigor, quality and depth of evaluation, and novelty. The selection of the best papers was a difficult task, but based on the high-quality reviews, a unanimous decision could finally be made. The quality of the submissions was very high, such that due to size limitations of the conference, a number of valuable submissions could unfortunately not be accepted.

The number of active researchers permitted to attend was limited to just above 100, and like past meetings, the unique study group concept was implemented to foster deep scientific exchange. Each participant was member of one study group, which focused on reading and discussing two papers in advance. Within its respective session, the study group led the discussion after each author's presentation before it was opened to the plenum. As an important IPMI rule, in-depth discussions were allowed to stretch far beyond the allocated session

time to permit a detailed understanding of the presented paper, including its limitations and comparison to existing methodology. In addition, this year we introduced the special focus session as a new concept. Selected poster contributions on topics of great common interest were presented in a summary fashion by the members of the study group, while offering the authors the opportunity to reply, clarify raised issues, and comment on the assessment before the discussion was opened to the audience. This highly interactive mode greatly contributed to intensifying and broadening the discussion of high-interest papers. As an additional stimulus, the François Erbsmann Prize was awarded for the best contribution by a young scientist giving an IPMI talk for the first time. This year, over half the participants attended their first IPMI and among the 24 first authors of oral presentations, 20 were eligible for the Erbsmann Prize.

As a tradition of IPMI, a remote location was chosen in order to intensify the participants' interchange of ideas. In the middle of Bavaria and at the foot of the mighty Alps lies the former Benedictine monastery Irsee. The Irsee Monastery, whose current buildings were constructed in the Baroque era, was founded by hermits on the Irsee Castle Mountain in 1182 and remained active until the nineteenth century. In addition to prayer and spirituality, the main focuses of monastery life at Irsee were scientific knowledge and education. In the eighteenth century, members of Irsee included renowned thinkers in the natural sciences, philosophy, and music. The monastery hosted an acclaimed mathematical museum, and this old wisdom lingered and inspired the IPMI attendees when walking the same corridors as the old monks. In addition to visiting the monastery's brewery, one afternoon was devoted to refreshing our minds and interacting informally during a hike through the beautiful surroundings of the monastery, while some attendees visited the fairy-tale castle Neuschwanstein 50 kilometers south of Irsee. We also held the traditional "US versus the Rest of the World" soccer match on Wednesday evening.

In these proceedings, IPMI 2011 papers are published in the order of their presentation at the meeting and we hope that they will remain an invaluable source of information and reminder for the participants. For those who could not attend, they provide an excellent overview of some of the best current research available in information processing in medical imaging and an encouragement to participate in the next IPMI, which will be held in the USA in 2013. Please visit [www.ipmi-conference.org](http://www.ipmi-conference.org) for up-to-date information.

July 2011

Gábor Székely  
Horst K. Hahn

# Acknowledgements

The organization of a meeting is always a large team effort and the Co-chairs of IPMI 2011 are grateful for the many individuals who enthusiastically supported the preparation of the meeting. First of all, we would like to thank the members of the Scientific Review Committee for the careful reviewing of a large number of manuscripts and their invaluable expert advice for the rather difficult task of identifying the best papers out of many excellent submissions. We are very grateful to the members of the Paper Selection Committee, Jerry Prince, Chris Taylor and Baba Vemuri, who spent enormous effort leading to an even-handed selection and the compilation of an outstanding final program. We also would like to thank many organizers of previous IPMI meetings, especially Jerry Prince, Chris Taylor, Nico Karssemeijer, Dzung Pham and Kyle Myers for their advice and support.

We greatly acknowledge Derek Jones taking all his time and effort to provide us with an outstanding keynote lecture on multi-spectral imaging of white matter and the challenges of quantifying connectivity.

The organization of this meeting would not have been possible without the support of many colleagues at the Computer Vision Laboratory of the ETH Zürich and Fraunhofer MEVIS. We would like to wholeheartedly thank Christoph Brachmann, Julien Egger, Ola Friman, Nils Papenberg, Bram Platel, Matthias Schneider and Christine Tanner for their enormous work and enthusiasm, spending countless hours on the numerous tasks related to all aspects of preparing IPMI 2011. We also thank our colleagues forming the IPMI Staff for spending a week at the conference venue helping to run the meeting in a smooth and effective fashion, as well as Iris Auer from the Irsee Monastery for hosting us so well.

Finally, we would like to acknowledge the following organizations for their generous financial support:

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# François Erbsmann Prizewinners

1987 (Utrecht, The Netherlands): **John M. Gauch**, University of North Carolina, Chapel Hill, NC, USA.

*J.M. Gauch, W.R. Oliver and S.M. Pizer: Multiresolution shape descriptions and their applications in medical imaging.*

1989 (Berkeley, CA, USA): **Arthur F. Gmitro**, University of Arizona, Tucson, AZ, USA.

*A.F. Gmitro, V. Tresp, V. Chen, Y. Snell and G.R. Gindi: Video-rate reconstruction of CT and MR images.*

1991 (Wye, Kent, UK): **H. Isil Bozma**, Yale University, New Haven, CT, USA.

*H.I. Bozma and J.S. Duncan: Model-based recognition of multiple deformable objects using a game-theoretic framework.*

1993 (Flagstaff, AZ, USA): **Jeffrey A. Fessler**, University of Michigan, Ann Arbor, MI, USA.

*J.A. Fessler: Tomographic reconstruction using information-weighted spline smoothing.*

1995 (Brest, France): **Maurits K. Konings**, University Hospital, Utrecht, The Netherlands.

*M.K. Konings, W.P.T.M. Mali and M.A. Viergever: Design of a robust strategy to measure intravascular electrical impedance.*

1997 (Poultney, VT, USA): **David Atkinson**, Guys Hospital, London, UK.

*D. Atkinson, D.L.G. Hill, P.N.R. Stoyke, P.E. Summers and S.F. Keevil: An autofocus algorithm for the automatic correction of motion artifacts in MR images.*

1999 (Visegrad, Hungary): **Liana M. Lorigo**, Massachusetts Institute of Technology, Cambridge, MA, USA.

*L.M. Lorigo, O. Faugeras, W.E.L. Grimson, R. Keriven, R. Kikinis and C.-F. Westin: Codimension 2 geodesic active contours for MRA segmentation.*

2001 (Davis, CA, USA): **Viktor K. Jirsa**, Florida Atlantic University, FL, USA.

*V.K. Jirsa, K.J. Jantzen, A. Fuchs and J.A. Scott Kelso: Neural field dynamics on the folded three-dimensional cortical sheet and its forward EEG and MEG.*

2003 (Ambleside, UK): **Guillaume Marrelec**, INSERM, France.

*G. Marrelec, P. Ciuciu, M. Pelegrini-Issac and H. Benali: Estimation of the hemodynamic response function in event-related functional MRI: directed acyclic graphs for a general Bayesian inference framework.*

2005 (Glenwood Springs, Colorado, USA): **Duygu Tosun**, Johns Hopkins University, Baltimore, USA.

*D. Tosun and J.L. Prince: Cortical surface alignment using geometry-driven multispectral optical flow.*

2007 (Kerkrade, The Netherlands): **Ben Glocker**, Technische Universität München, Garching, Germany.

*B. Glocker, N. Komodakis, N. Paragios, G. Tziritas and N. Navab: Inter-and intramodal deformable registration: continuous deformations meet efficient optimal linear programming.*

2009 (Williamsburg, Virginia, USA): **Maxime Descoteaux**, NeuroSpin, IFR 49 CEA Saclay, France.

*M. Descoteaux, R. Deriche, D. Le Bihan, J.-F. Mangin and C. Poupon: Diffusion propagator imaging: using Laplace's equation and multiple shell acquisitions to reconstruct the diffusion propagator.*



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