

DIRK BARTZ PRIZE FOR VISUAL COMPUTING IN MEDICINE (EUROGRAPHICS MEDICAL PRIZE)

The Eurographics Association organizes a biannual competition to acknowledge the contribution that computer graphics and visualization are playing in the medical field, and to encourage further development. Until 2019, the prize was collocated with the Eurographics Conference. From 2021 on, it will be collocated with EG/VGTC EuroVis. Originally called "Eurographics Medical Prize", the competition was renamed to "Dirk Bartz Prize for Visual Computing in Medicine" in 2010 — in honor of Dirk Bartz who passed away far too early in March 2010.

Dirk Bartz was a highly recognized and enthusiastic scientist, teacher and promoter of Visual Computing in Medicine. Furthermore, he was an active member of the Eurographics Association and Chair of the EG Medical Prize 2007 and 2009.

HALL OF FAME

2019

EG 2019, Genova, Italy

Medical Prize Chairs: Stefan Bruckner, University of Bergen, Norway

Steffen Oeltze-Jafra, Otto von Guericke University Magdeburg, Germany

[Event Report: EG 2019 – Dirk Bartz Prize](#)

First Prize: Cytosplore: Interactive Visual Single-Cell Profiling of the Immune System

Thomas Höllt, Nicola Pezzotti, Vincent van Unen, Na Li, Frits Koning, Elmar Eisemann, Boudewijn P. F. Lelieveldt, Anna Vilanova

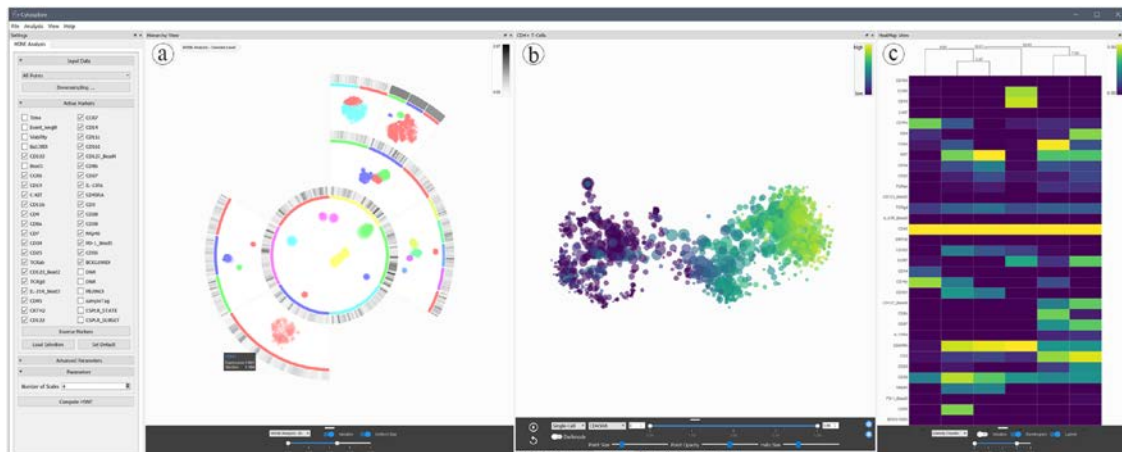
Leiden Computational Biology Center, Leiden University Medical Center, Leiden, The Netherlands

Computer Graphics and Visualization Department, TU Delft, Delft, The Netherlands

Leiden University Medical Center, Department of Immunohematology, Leiden, The Netherlands

Institute for Immunity, Transplantation, and Infection, Stanford University School of Medicine, CA, USA

Leiden University Medical Center, Department of Radiology, Leiden, The Netherlands



Abstract: Recent advances in single-cell acquisition technology have led to a shift towards single-cell analysis in many fields of biology. In immunology, detailed knowledge of the cellular composition is of interest, as it can be the cause of deregulated immune responses, which cause diseases. Similarly, vaccination is based on triggering proper immune responses; however, many vaccines are ineffective or only work properly in a subset of those who are vaccinated. Identifying differences in the cellular composition of the immune system in such cases can lead to more precise treatment. Cytosplore is an integrated, interactive visual analysis framework for the exploration of large single-cell datasets. We have developed Cytosplore in close collaboration with immunology researchers and several partners use the software in their daily workflow. Cytosplore enables efficient data analysis and has led to several discoveries alongside high-impact publications.

Second Prize: Model-based Visualization for Medical Education and Training

Noeska Smit, Kai Lawonn, Annelot Kraima, Marco deRuiter, Stefan Bruckner, Elmar Eisemann, Anna Vilanova

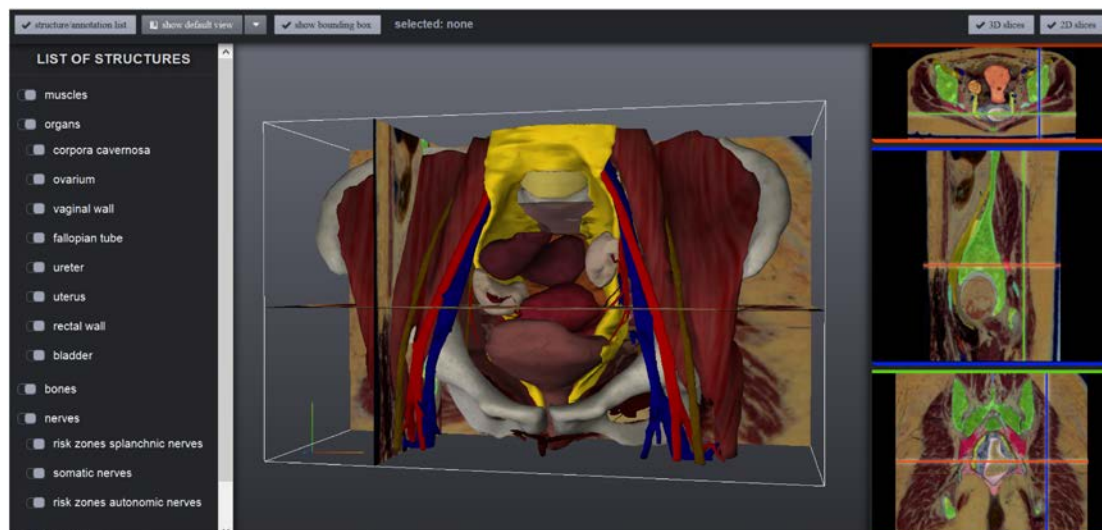
University of Bergen, Norway,

Mohn Medical Imaging and Visualization Centre, Norway

University of Koblenz, Landau, Germany,

Leiden University Medical Center, The Netherlands

Delft University of Technology, The Netherlands



Abstract: Anatomy, or the study of the structure of the human body, is an essential component of medical education. Certain parts of human anatomy are considered to be more complex to understand than others, due to a multitude of closely related structures. Furthermore, there are many potential variations in anatomy, e.g., different topologies of vessels, and knowledge of these variations is critical for many in medical practice. Some aspects of individual anatomy, such as the autonomic nerves, are not visible in individuals through medical imaging techniques or even during surgery, placing these nerves at risk for damage. 3D models and interactive visualization techniques can be used to improve understanding of this complex anatomy, in combination with traditional medical education paradigms. We present a framework incorporating several advanced medical visualization techniques and applications for teaching and training purposes, which is the result of an interdisciplinary project. In contrast to previous approaches which focus on general anatomy visualization or direct visualization of medical imaging data, we employ model-based techniques to represent variational anatomy, as well as anatomy not visible from imaging. Our framework covers the complete spectrum including general anatomy, anatomical variations, and anatomy in individual patients. Applications within our framework were evaluated positively with medical users, and our educational tool for general anatomy is in use in a Massive Open Online Course (MOOC) on anatomy, which had over 17000 participants worldwide in the first run.

Third Prize: Visual Analytics for Epidemiology

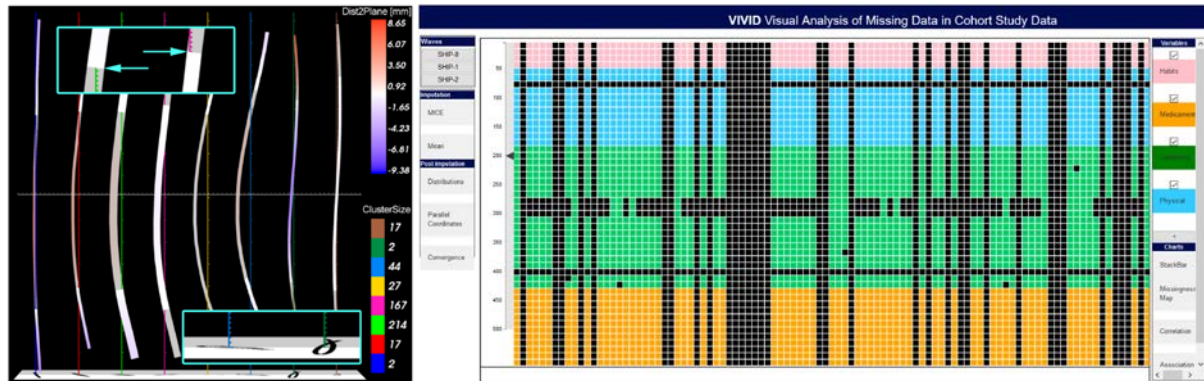
Bernhard Preim, Shiva Alemzadeh, Till Ittermann, Paul Klemm, Uli Niemann, Myra Spiliopoulou

Otto von Guericke University Magdeburg, Department of Simulation and Graphics, Germany

University of Greifswald, Department for Community Medicine, Germany

Otto von Guericke University Magdeburg, Institute of Technical and Business Information Systems, Germany

VR Vis, Center for Virtual Reality and Visualization, Vienna, Austria



Abstract: We present visual analytics methods to analyze epidemiologic cohort studies. We consider the automatic identification of strong correlations and of subgroups that deviate from the global mean with respect to their risk for health disorders. Moreover, we tackle missing value problems and discuss appropriate imputation strategies and visual analytics support.

2017

EG 2017, Lyon, France

Medical Prize Chairs: Stefan Bruckner, University of Bergen, Norway

Timo Ropinski, Ulm University, Germany

[Event Report: EG 2017 – Dirk Bartz Prize](#)

First Prize: Visual Analytics for Digital Radiotherapy: Towards a Comprehensible Pipeline

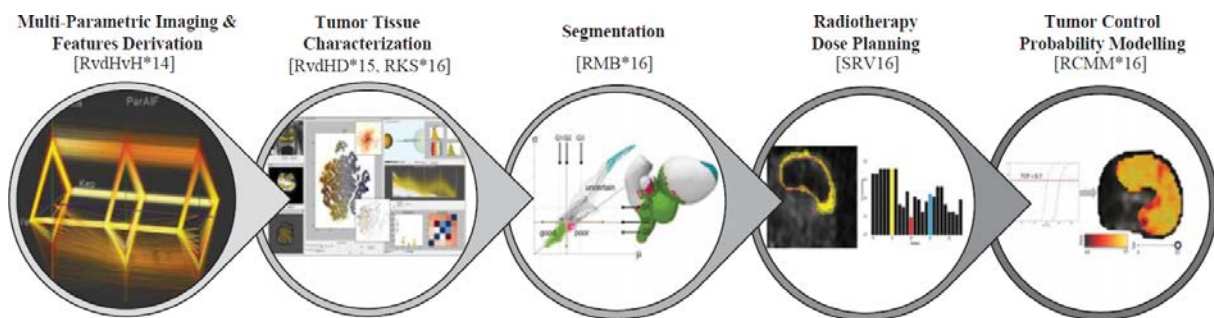
Renata G. Raidou, Marcel Breeuwer, Anna Vilanova

Delft University of Technology, The Netherlands

Philips Healthcare Best, The Netherlands

Vienna University of Technology, Austria

Eindhoven University of Technology, The Netherlands



Abstract: Prostate cancer is one of the most frequently occurring types of cancer in males. It is often treated with radiation therapy, which aims at irradiating tumors with a high dose, while sparing the surrounding healthy tissues. In the course of the years, radiotherapy technology has undergone great advancements. However, tumors are not only different from each other, they are also highly heterogeneous within, consisting of regions with distinct tissue characteristics, which should be treated with different radiation doses. Tailoring radiotherapy planning to the specific needs and intra-tumor tissue characteristics of each patient is expected to lead to more effective treatment strategies. Currently, clinical research is moving towards this direction, but an understanding of the specific tumor characteristics of each patient, and the integration of all available knowledge into a personalizable radiotherapy planning pipeline are still required. The present work describes solutions from the field of Visual Analytics, which aim at incorporating the information from the distinct steps of the personalizable radiotherapy planning pipeline, along with eventual sources of uncertainty, into comprehensible visualizations. All proposed solutions are meant to increase the - up to now, limited - understanding and exploratory capabilities of clinical researchers. These approaches contribute towards the interactive exploration, visual analysis and understanding of the involved data and processes at different steps of the radiotherapy planning pipeline, creating a fertile ground for future research in radiotherapy planning.

Second Prize: Sketching and Annotating Vascular Structures to Support Medical Teaching, Treatment Planning and Patient Education

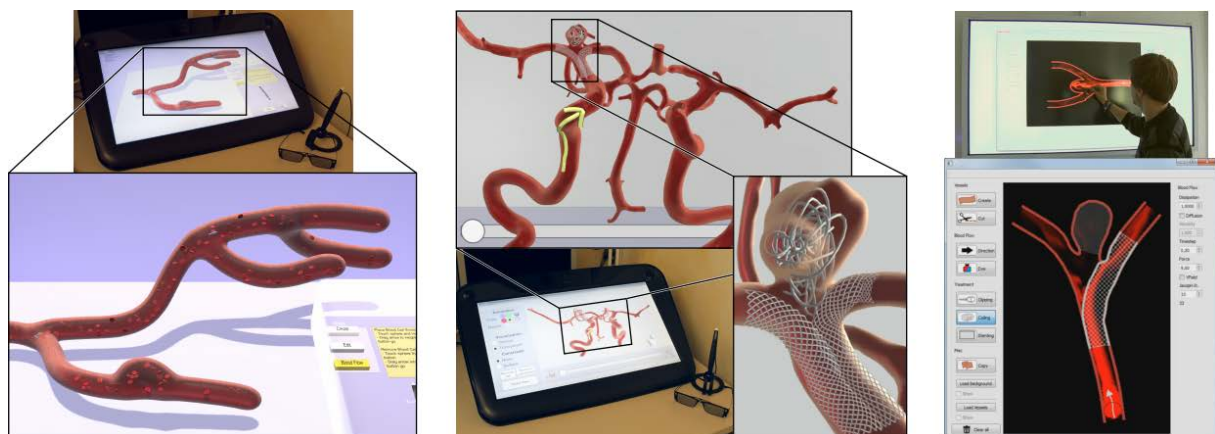
Patrick Saalfeld, Steffen Oeltze-Jafra, Sylvia Saalfeld, Uta Preim, Oliver Beuing, and Bernhard Preim

University of Magdeburg, Germany

University of Leipzig, Germany

Municipal Hospital Magdeburg, Germany

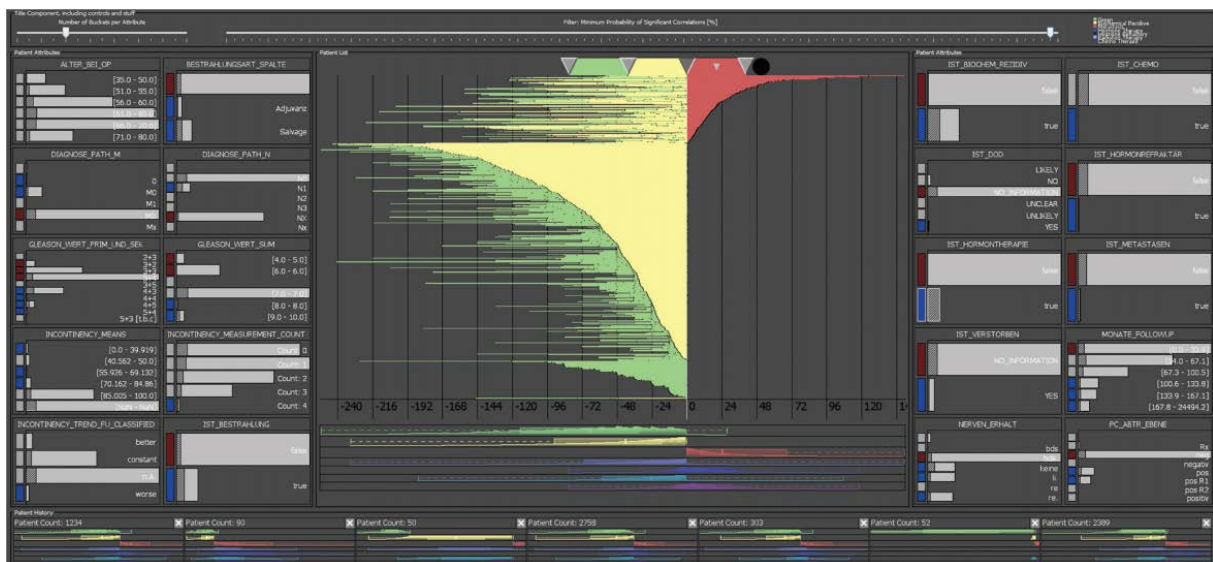
University Hospital Magdeburg, Germany



Abstract: In clinical practice, hand drawn sketches are employed to express concepts and are an efficient method for the discussion of complex issues. We present computer graphic methods to improve and support the creation and annotation of complex sketches, resulting in a more clear, expressive and

Third Prize: Visual Computing for Big Data Analysis in Prostate Cancer Research

University Medical Center Hamburg Eppendorf, Germany



2015

Event Report: EG 2015 – Dirk Bartz Prize

First Prize: Surgery Training, Planning and Guidance Using the SOFA Framework

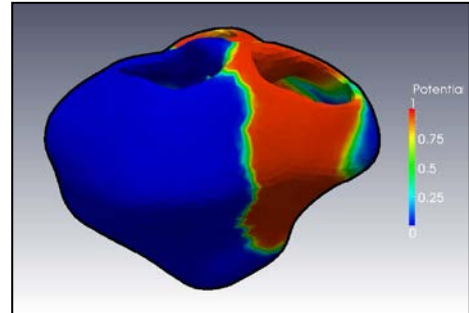
**Hugo Talbot, Nazim Haouchine, Igor Peterlik, Jeremie Dequidt,
Christian Duriez, Herve Delingette, Stéphane Cotin**

Inria, Lille , France

Inria, Sophia-Antipolis, France

Masaryk University, Czech Republic

Abstract: In recent years, an active development of novel technologies dealing with medical training, planning and guidance has become an increasingly important area of interest in both research and health-care manufacturing. A combination of advanced physical models, realistic human-computer interaction and growing computational power is bringing new solutions in order to help both medical students and experts to achieve a higher degree of accuracy and reliability in surgical interventions. In this paper, we present three different examples of medical physically-based simulations implemented in a common software platform called SOFA. Each example represents a different application: training for cardiac electrophysiology, pre-operative planning of cryosurgery and per-operative guidance for laparoscopy. The goal of this presentation is to evaluate the realism, accuracy and efficiency of the simulations, as well as to demonstrate the potential and flexibility of the SOFA platform.



Second Prize: Guided Analysis of Cardiac 4D PC-MRI Blood Flow Data

**Benjamin Köhler, Uta Preim, Matthias Grothoff,
Matthias Gutberlet, Katharina Fischbach, Bernhard Preim**

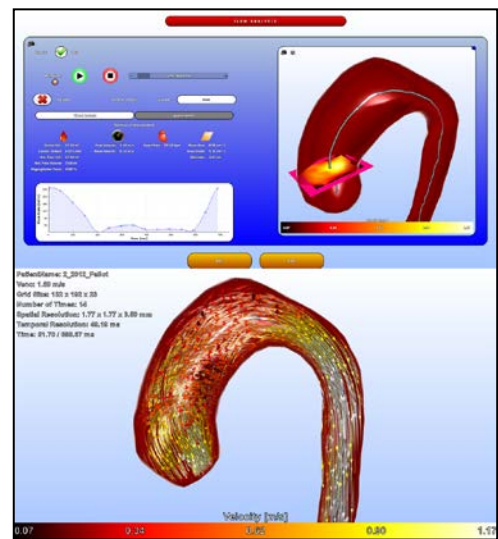
University of Magdeburg, Germany

Hospital Olvenstedt, Germany

Heart Center Leipzig, Germany

University Hospital Magdeburg, Germany

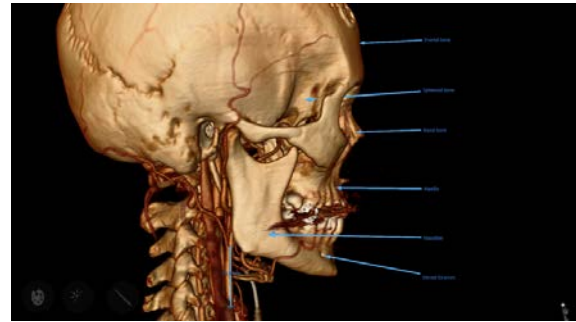
Abstract: Cerebral aneurysms are pathological vessel dilatations that bear a high risk of rupture. For the understanding of this risk, the analysis of hemodynamic information plays an important role in clinical research. These information are obtained by computational fluid dynamics (CFD) simulations. Thus, an effective visual exploration of patient-specific blood flow behavior in cerebral aneurysms was developed to support the domain experts in their investigation process. We present advanced visualization and interaction techniques, which provide an overview, focus-and-context views as well as multi-level explorations. Moreover, an automatic extraction process of qualitative flow characteristics, which are correlated with the risk of rupture is introduced. Although not established in clinical routine yet, interviews and informal user studies confirm the usefulness of these methods.



Third Prize: Multi-Touch Table System for Medical Visualization

**Anders Ynnerman, Thomas Rydell, Anders Persson,
Aron Ernvik, Camilla Forsell, Patric Ljung,
Claes Lundström**

Linköping University, Sweden
Swedish ICT Interactive Institute, Sweden
Center for Medical Image Science and Visualization,
Linköping, Sweden
Sectra AB, Sweden



Abstract: Medical imaging plays a central role in a vast range of healthcare practices. While the usefulness of 3D visualizations is well known, the adoption of such technology has previously been limited in many medical areas. This paper, awarded the Dirk Bartz Prize for Visual Computing in Medicine 2015, describes the development of a medical multi-touch visualization table that successfully has reached its aim to bring 3D visualization to a wider clinical audience. The descriptions summarize the targeted clinical scenarios, the key characteristics of the system, and the user feedback obtained.

2013

EG 2013, Girona, Spain

Medical Prize Chairs: Hans-Christian Hege, Zuse Institute Berlin, Germany

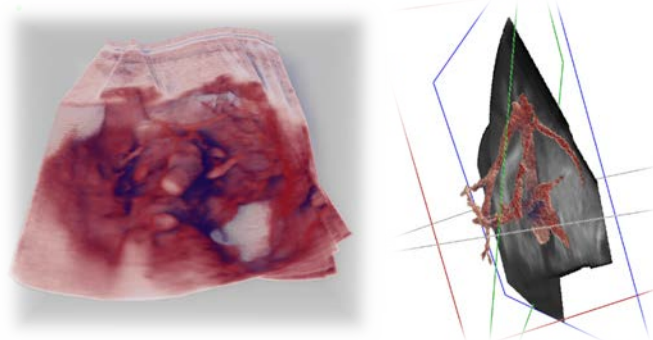
Anna Vilanova, Eindhoven University of Technology, Netherlands

[Event Report: EG 2013 – Dirk Bartz Prize](#)

First Prize: High-Quality 3D Visualization of In-Situ Ultrasonography

**Ivan Viola, Åsmund Birkeland
Veronika Solteszova, Linn Helljesen,
Helwig Hauser, Spiros Kotopoulos,
Kim Nylund, Dag M. Ulvang, Ola K. Øye,
Trygve Hausken, Odd H. Gilja**

University of Bergen, Norway
Christian Michelsen Research, Bergen, Norway
Haukeland University Hospital, Bergen Norway



Abstract: In recent years medical ultrasound has experienced a rapid development in the quality of real-time 3D ultrasound (US) imaging. The image quality of the 3D volume that was previously possible to achieve within the range of a few seconds, is now possible in a fraction of a second. This technological advance offers entirely new opportunities for the use of US in the clinic. In our project, we investigate how real-time 3D US can be combined with high-performance processing of today's graphics hardware to allow for high-quality 3D visualization and precise navigation during the examination.

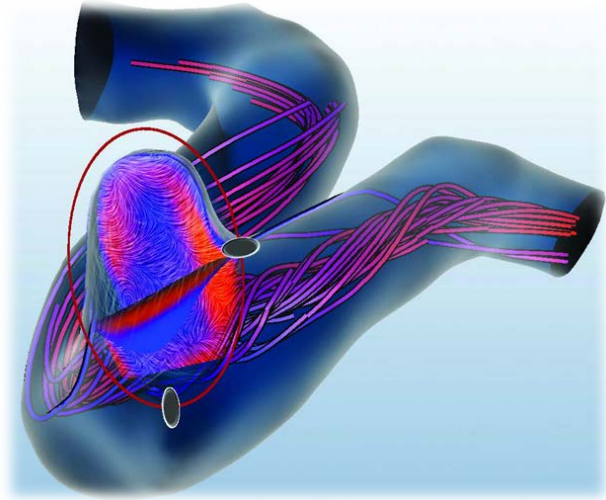
Second Prize: Effective Visual Exploration of Hemodynamics in Cerebral Aneurysms

**Mathias Neugebauer, Rocco Gasteiger,
Gábor Janiga, Oliver Beuing, Bernhard Preim**

University of Magdeburg
University Hospital Magdeburg

Abstract: Cerebral aneurysms are pathological vessel dilatations that bear a high risk of rupture. For the understanding of this risk, the analysis of hemodynamic information plays an important role in clinical research. These information are obtained by computational fluid dynamics (CFD) simulations. Thus, an effective visual exploration of patient-specific blood flow behavior in cerebral aneurysms was developed to support the domain experts in their investigation process. We present advanced visualization and interaction techniques, which provide an overview, focus-and-context views as well as multi-level explorations.

Moreover, an automatic extraction process of qualitative flow characteristics, which are correlated with the risk of rupture is introduced. Although not established in clinical routine yet, interviews and informal user studies confirm the usefulness of these methods.



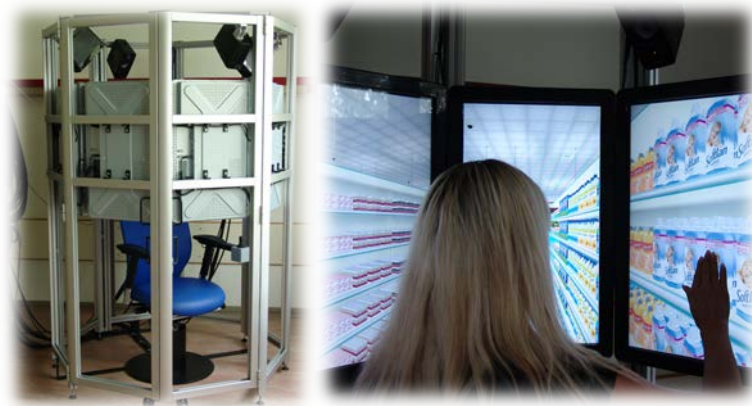
Third Prize: OCTAVIS: A Virtual Reality System for Clinical Studies and Rehabilitation

**Eduard Zell, Eugen Dyck,
Agnes Kohsik, Philip Grewe,
David Flentge, York Winter,
Martina Piefke, Mario Botsch**

Bielefeld University, Germany
Humboldt University Berlin, Germany
Witten Herdecke University, Germany

Abstract: Brain function disorders, resulting for instance from stroke, epilepsy, or other incidents can be partially recovered by rehabilitation training.

Performing neuro-rehabilitation in virtual reality systems allows for training scenarios close to daily tasks, is easily adaptable to the patients' needs, is fully controllable by clinical staff, and guarantees patient safety at all times. In this paper, we describe the OCTAVIS system, a novel virtual reality platform developed primary for clinical studies with and rehabilitation training of patients with brain function disorders. To meet the special requirements for clinical use, our system has been designed with ease of use, ease of maintenance, patient safety, space and cost efficiency in mind. Our system has been successfully deployed to four hospitals, where it is used for rehabilitation training and clinical studies. We report first results of these studies, demonstrating that our system is immersive, easy to use, and supportive for rehabilitation purposes.



EG 2011, Llandudno, UK

Medical Prize Chairs: Anna Vilanova, Eindhoven University of Technology, Netherlands

Katja Bühler, VRVis Center for Virtual Reality and Visualization Research, Austria

[Event Report: EG 2011 – Dirk Bartz Prize](#)

Shared First Prize: A Virtual Environment for Radiotherapy Training and Education VERT

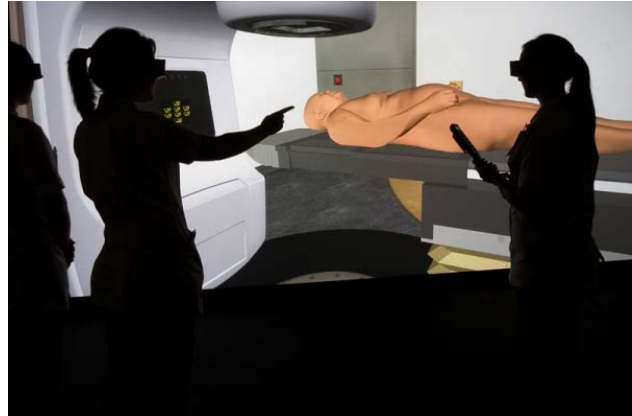
**James W. Ward, Roger Phillips,
Annette Boejen, Cai Grau,
Deepak Jois, Andy W. Beavis**

University of Hull, UK

Hull and East Yorkshire (NHS) Hospitals Trust, UK

Vertual Ltd, Hull, UK

Aarhus University Hospital, Denmark



Abstract: A report in 2007 to the UK Government identified a crisis in England for training staff and students for the radiotherapy treatment of cancer. The Hull authors have developed an immersive life size virtual environment of a radiotherapy treatment room, known as VERT, to address this problem. VERT provides the trainee with models, simulation, enhanced visualization and training aids for treatment of virtual patients in a virtual treatment room. In 2007 VERT systems for radiotherapy training were established for training purposes at the University Aarhus Hospital (Denmark), Birmingham City University (UK) and the University of Ulster (UK). There are now some 68 VERT systems around the world. This paper reports on the simulation and visualization capabilities and reports on the use of VERT from the Aarhus University hospital and on the national evaluation of VERT in the UK [AC10]. These reports clearly indicate the clinical benefit of using a virtual environment approach, such as VERT, for training and education in radiotherapy.

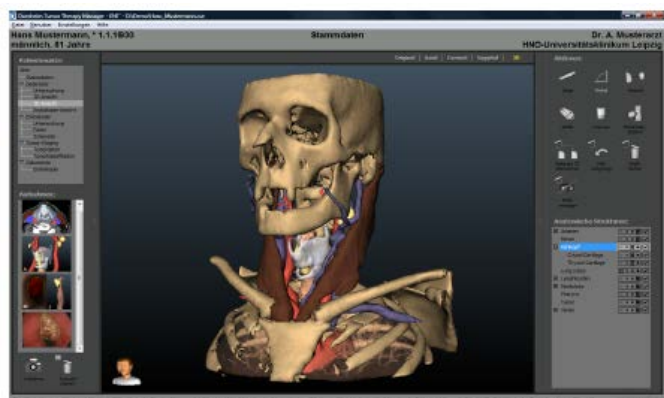
Shared First Prize: The Tumor Therapy Manager and its Clinical Impact

**Ivo Rössling, Jana Dornheim, Lars Dornheim,
Andreas Boehm, and Bernhard Preim**

University of Magdeburg, Germany

University Leipzig, Germany

Dornheim Medical Images, Germany



Abstract: Visual exploration of CT and MRI datasets in clinical practice is still dominated by slice-based viewing. Volume rendering is now widely available but seen primarily as a tool for a fast overview, and only rarely as a visualization to directly support clinical decisions. Research projects aiming at advanced 3D visualizations, such as smart visibility and illustrative renderings, usually fail to meet clinical demands, since the visualizations are not dedicated to specific diagnostic or treatment planning questions. Moreover, they are unfamiliar to users who need reliable and familiar visualizations as a basis for their crucial decisions. Discussions with clinical practitioners reveal that parameterization of visual effects is too cumbersome and resulting visualizations are often too complex. We describe and discuss long-term experiences on developing, testing, and refining image analysis and visualization techniques for ENT surgery planning

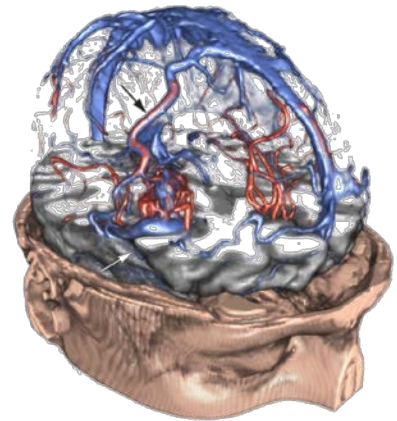
based on CT data. While visual quality and a faithful rendition of spatial relations indeed are essential, it turned out to be superior to generate sequences of rather simple 3D visualizations directly supporting specific treatment questions instead of presenting many anatomic structures simultaneously. We report on the actual clinical use of the system and discuss how it changed the surgical planning workflow.

Third Prize: AVM-Explorer: Multi-Volume Visualization of Vascular Structures for Planning of Cerebral AVM Surgery

**Florian Weiler, Christian Rieder, Carlos A. David,
Christoph Wald, Horst K. Hahn**

Fraunhofer MEVIS, Bremen, Germany
Lahey Clinic Medical Center, Burlington, MA, USA

Abstract: Arteriovenous malformations (AVMs) of the brain are rare vascular disorders characterized by the presence of direct connections between cerebral arteries and veins. Preoperative planning of AVM surgery is a challenging task. The neurosurgeon needs to gain a detailed understanding of both the pathoanatomy of the lesion as well as its location and spatial relation to critical functional areas and white matter fiber bundles at risk. A crucial element during this planning phase is the precise identification of feeding arteries, draining veins, and arteries “en passage”. To this end, a variety of imaging modalities for displaying neurovascular structures exists, both tomographic as well as projection based. However, the conventional 2D slice based review of such data is not well suited to help understanding the complex angioarchitecture of an AVM. In this paper, we demonstrate how state-of-the-art techniques from the fields of computer graphics and image processing can support neurosurgeons with the challenge of creating a mental 3D model of the lesion and understanding its internal structure. To evaluate the clinical value of our method, we present results from three case studies along with the medical assessment of an experienced neurosurgeon.

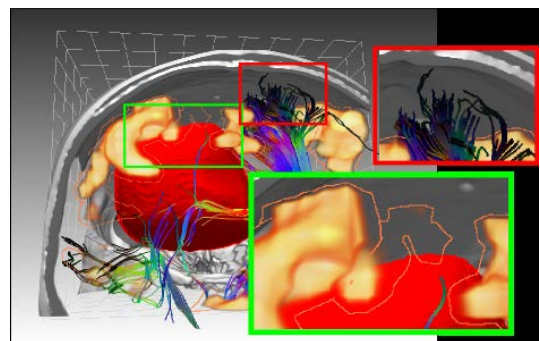


Honorable Mention: Interactive Visualization Techniques for Neurosurgery Planning

**Stefan Diepenbrock, Jörg-Stefan Praßni,
Florian Lindemann, Hans-Werner Bothe, Timo Ropinski**

University of Münster, Germany

Abstract: We present concepts for pre-operative planning of brain tumor resections. The proposed system uses a combination of traditional and novel visualization techniques rendered in real-time on modern GPUs in order to support neurosurgeons during intervention planning. A set of multimodal 2D and 3D renderings conveys the relation between the lesion and the various structures at risk and also depicts data uncertainty. To facilitate efficient interactions while providing a comprehensible visualization, all employed views are linked. Furthermore, the system allows the surgeon to interactively define the access path by clicking in the 3D views as well as to perform distance measurements in 2D and 3D.



Honorable Mention: FEMONUM: A Framework for Whole Body Pregnant Woman Modeling from Ante-Natal Imaging

**Juan Pablo de la Plata Alcalde, Jérémie Anquez,
Lazar Bibin, Tamy Boubekeur, Elsa Angelini, Isabelle Bloch**

Institut Télécom ParisTech, Paris, France

Abstract: Anatomical models of pregnant women can be used in several applications such as numerical dosimetry to assess the potential effects of electromagnetic fields on biological tissues, or medical simulations for delivery planning. Recent advances in medical imaging have enabled the generation of realistic and detailed models of human beings. This paper describes FEMONUM, a complete methodological framework for the construction of pregnant woman models based on medical images and their segmentation. FEMONUM combines several computer graphics methods, such as surface reconstruction and physics-based computer animation to model and deform pregnant women abdomens, to simulate different fetal positions and sizes and also different morphologies of the mother, represented with a synthetic woman body envelope. A set of 16 models, anatomically validated by clinical experts, is presented and is made available online to the scientific community. These models include detailed information on the utero-fetal units and cover different gestational stages with various fetal positions.



2009

EG 2009, Munich, Germany

Medical Prize Chairs: Katja Bühler, VRVis Center for Virtual Reality and Visualization Research, Austria

Dirk Bartz, Leipzig University, Germany

[Event Report: EG2009 – Medical Prize Competition](#)

First Prize: Virtual Hip Joint: from Computer-Graphics to Computer-Assisted Diagnosis

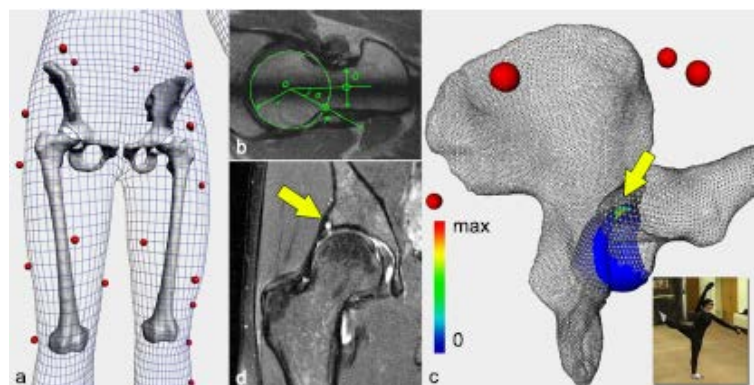
**Caecilia Charbonnier, Jerome Schmid, Frank Kolo-Christophe,
Nadia Magnenat-Thalmann, Christoph Becker, Pierre Hoffmeyer**

MIRALab – University of Geneva, Switzerland

University Hospital of Geneva, Radiology
Department, Switzerland

University Hospital of Geneva, Orthopedic
Department, Switzerland

The entry was awarded the 1st place for its innovative use of computer graphics for anatomical and patient specific modeling.



Abstract: Osteoarthritis (OA) is a major musculoskeletal disorder which causes are not always fully understood. Femoroacetabular impingements such as cam/ pincer cannot always explain observed OA in hips with normal morphology. This paper investigates the hypothesis of extreme repetitive movements as a source of cartilage degeneration. We present a clinical study conducted with professional ballet dancers and a methodology to perform functional simulations of the hip joint in extreme postures. Throughout the process, various computer graphics techniques are used, like motion capture, 3D body scanning and physically-based models. In addition to

accelerate and strengthen some tasks, these techniques strongly participate in the clinical understanding of OA related to motion. Preliminary results have indeed shown a significant correlation between the location of impingements and radiologically observed damage zones in the labrum cartilage.

Second Prize: ImaGIne-S: Imaging Guided Interventional Needle Simulation

Fernando Bello, Andrew Bulpitt, Derek A. Gould, Richard Holbrey, Carrie Hunt, Thien How, Nigel W. John, Sheena Johnson, Roger Phillips, Amrita Sinha, Franck P. Vidal, Pierre-Frédéric Villard, Helen, Woolnough, and Yan Zhang

School of Computer Science, Bangor University, UK
Biosurgery and Surgical Technology Department, Imperial College, London, UK
School of Computing, University of Leeds, UK
Royal Liverpool University Hospital, UK
Manchester Business School, Manchester University, UK
Department Computer Science, University of Hull, UK

The entry was awarded the 2nd place for its innovative use of computer graphics in a complex system that is already far advanced towards clinical use.

Abstract: We present an integrated system for training visceral needle puncture procedures. Our aim is to provide a cost effective and validated training tool that uses actual patient data to enable interventional radiology trainees to learn how to carry out image-guided needle puncture. The input data required is a computed tomography scan of the patient that is used to create the patient specific models. Force measurements have been made on real tissue and the resulting data is incorporated into the simulator. Respiration and soft tissue deformations are also carried out to further improve the fidelity of the simulator.



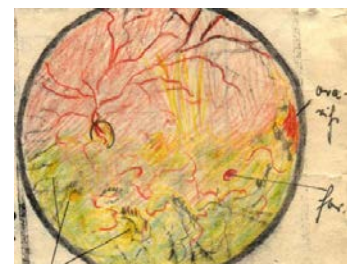
Third Prize 1: GREiF – Graphical Documentation of Retinal Findings Using a standardized Digital Symbol Library

Clemens Jürgens, Rico Großjohann, Frank Tost

Tdi – Teleaugendienst GmbH
University Eye Hospital, Greifswald, Germany

The entry was awarded the 3rd place for its innovative and well-structured use of interaction technique with high clinical value.

Abstract: Aim: To develop a software package that improves standardized clinical documentation of retinal findings. In clinical routine retinal findings are usually documented with sketchy free-hand drawings and supplementary hand-written remarks. Documentation features of common ophthalmologic software products include only simple sketching functions, which are limited to change location, size or colour of graphical primitives (e. g. ovals, rectangles, lines, text-boxes . . .). As a result a feasible creation of standardized graphical documentations in retinal imaging is almost impossible. **Methods:** We developed a java-based software tool that features quick and intuitive generation of fundus schemes, which can be printed as findings sheet or digitally archived. Particularly for clinical ophthalmologists we created a set of standardized symbols, which can be digitally rendered for graphical documentation. All symbols were integrated into a graphics library and separated in specific categories: “Preoperative”, “Postoperative”, “Angiomas and tumours”, “Retinopathy of the premature”. The required symbol can be chosen from the library and is simply 12odeled on



the retina scheme by placing anchor points with mouse clicks. **Results:** Practicability of existing features for graphical documentation of retinal findings is not sufficient, because free-hand drawings are too time-consuming and besides share the risk of false interpretation due to individual handwritings. In contrast to free-hand sketching our software tool not only applies a faster way of graphical creation but additionally improves medical documentation using a standardized symbol library, which also is specifically categorized. **Conclusions:** Graphical symbols for retinal documentation have found universal acceptance in ophthalmologists for a long time but still the practical use is not efficient in clinical routine. This report shows how the adequate use of software technology can contribute to documentation quality and clinical practice.

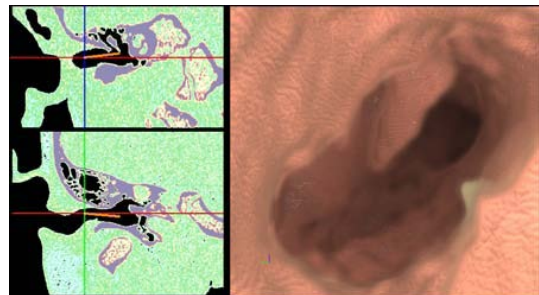
Third Prize 2: Advanced GPU Volume Rendering for Virtual Endoscopy

Arno Krüger, Christoph Kubisch, Gero Strauß, Bernhard Preim

Otto-von-Guericke-University of Magdeburg, Germany
ENT Department, University Hospital of Leipzig, Germany

The entry was awarded the 3rd place together with the previous entry for its innovative use of computer graphics to provide a high visual quality for patient information.

Abstract: For difficult cases in endoscopic sinus surgery, a careful planning of the intervention is necessary. Virtual endoscopy enables the visualization of the operating field and additional information, such as risk structures and target structures to be removed. The Sinus Endoscopy system provides the functional range of a virtual endoscopic system with special focus on a realistic representation. Furthermore, by using direct volume rendering, we avoid time-consuming segmentation steps for the use of individual patient datasets. However, the image quality of the endoscopic view can be adjusted in a way that a standard computer with a modern standard graphics card achieves interactive frame rates with low CPU utilization. Thereby, characteristics of the endoscopic view are systematically used for the optimization of the volume rendering speed. As a small standalone application it can be instantly used for surgical planning and patient education. The system was used for preoperative planning in 102 cases, provides useful information for intervention planning (e.g., anatomic variations of the Rec. Frontalis), and closely resembles the intra-operative situation.



2007

EG 2007, Prague, Czech Republic

Medical Prize Chairs: Milos Sramek, Austrian Academy of Sciences, Vienna, Austria

Dirk Bartz, University of Leipzig, Germany

[Event Report: EG2007 – Short Papers and Medical Prize Awards](#)

First Prize: State-of-the-Art Computer Graphics in Neurosurgical Planning and Risk Assessment

**Alexander Köhn, Florian Weiler, Olaf Konrad,
Jan Klein, Horst Hahn, Heinz-Otto Peitgen**

MeVis Research GmbH, Bremen, Germany

Abstract: We present a novel software assistant that unlocks new potentials in neurosurgical planning and risk assessment. It allows surgeons to approach the task in an intuitive manner, by providing them with the possibility to simultaneously observe all relevant data of a case in synchronized 2D and 3D views. State-of-the-art technologies from the field of computer graphics are combined to allow simultaneous interactive rendering of anatomical and functional MR data in combination with manually segmented objects and slice-based overlays. This allows surgeons to perceive a clearer impression of the anatomical and functional structures affected by an intervention, and especially the way they are related to each other. Thus, it significantly facilitates the finding of an optimal intervention strategy.



Second Prize: A Pen-based Interface for Generating Graphical Reports of Findings in Cardiac Catheterization

**Yuki Mori, Takeo Igarashi,
Ryo Haraguchi, Kazuo Nakazawa**

The University of Tokyo, Japan
National Cardiovascular Center Research Institute, Japan

Abstract: This paper introduces a pen-based interface for the graphical reporting of findings in cardiac catheterization. The user can interactively draw, erase, move, and deform coronary arteries as well as record stenoses on them. The location and degree of each stenosis is represented visually and the doctor can record various treatments such as bypasses and stents on the diagram. In addition, the system automatically extracts semantic information from the graphical representation and stores it in XML format. The system can also generate a table in the format specified by the American Heart Association. This system is useful not only as a tool for efficiently generating reports of findings but also as an effective explanation tool for patients.

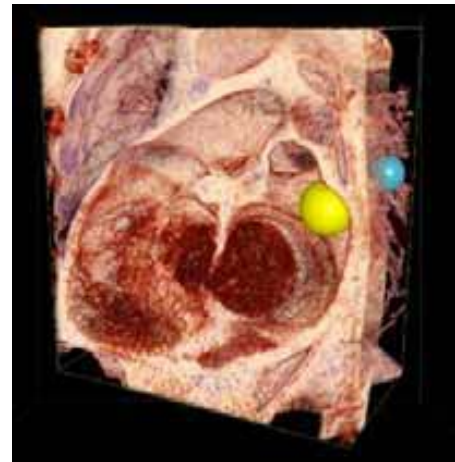


Third Prize: Analysis of the Pulmonary Vein Ostia using Cardiac 4DCT for Radiosurgical Ablation

Thilaka Sumanaweera, Francois Conti, Patrick Maguire

CyberHeart, Incorporated, Menlo Park, CA, USA
Force Dimension, Lausanne, Switzerland

Abstract: A software tool to analyze 4D cardiac CT data sets for planning radiosurgical ablations in the heart is presented. Volume rendering and data processing are performed using a GPU. The user visualizes the data from inside the left atrium and defines the target in 3D using an intuitive user interface. A haptic input device lets the user measure motion at the ostia of the pulmonary veins for radiosurgical treatment planning. This tool has been used effectively for generating radiation treatment plans for animal studies.



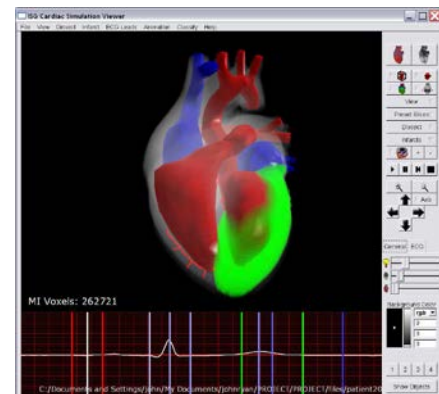
2005

EG 2005, Dublin, Ireland
Medical Prize Chair: Nigel W. John, University of Wales, Bangor

First Prize: A Virtual Reality Toolkit for the Diagnosis and Monitoring of Myocardial Infarctions

John Ryan, Carol O'Sullivan, Chris Bell, Niall Mulvihill

Image Synthesis Group, Trinity College, Dublin, Ireland
Department of Physiology, Trinity College, Dublin, Ireland
Department of Cardiology, St James' Hospital, Dublin, Ireland



Second Prize: MEDARPA - An Augmented Reality System for Supporting Minimally Invasive Interventions

**Stefan Wesarg, Bernd Schwald, Helmut Seibert,
Pawel Zogal, Michael Schnaider, Georgios Sakas**

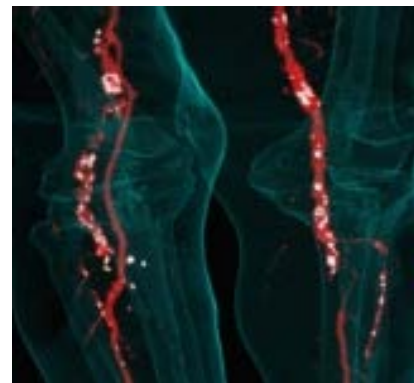
Fraunhofer IGD, Darmstadt, Germany
Computer Graphics Center (ZGDV), Darmstadt, Germany
MedCom GmbH, Darmstadt, Germany



Third Prize: The AngioVis ToolBox

**Matus Straka, Milos Sramek, Alexandra La Cruz,
Eduard Gröller, Arnold Köchl, Dominik Fleischmann**

Commission for Scientific Visualization, Austrian Academy of Sciences,
Austria
Institute of Computer Graphics and Algorithms, Vienna University of Tech-
nology, Austria
Department of Angiography and Interventional Radiology, Vienna Medi-
cal University, Austria
Department of Radiology, Stanford University Medical Center, CA, USA



2003

EG 2003, Granada, Spain
Medical Prize Chair: Nigel W. John, University of Wales, Bangor
[Event Report - EG2003 Medical Prize Competition](#)

Winner: Augmented Reality based Liver Surgery Planning.

**Alexander Bornik, Reinhard Beichel,
Bernhard Reitinger, Erich Sorantin,
Georg Werkgartner, Franz Leberl, Milan Sonka**

Institute for Computer Graphics and Vision, TU Graz, Austria
Department of Radiology, Graz University Hospital, Austria
Department of Surgery, University Hospital Graz, Austria
University of Iowa, Iowa City, IA, USA

