

# Advanced Algorithms in Medical Computer Graphics

Jan Klein <sup>1</sup>, Dirk Bartz <sup>2</sup>, Ola Friman <sup>1</sup>, Markus Hadwiger <sup>3</sup>, Bernhard Preim <sup>4</sup>, Felix Ritter <sup>1</sup>, Anna Vilanova <sup>5</sup>, Gabriel Zachmann <sup>6</sup>

(1) MeVis Research, Germany

(2) University of Leipzig, Visual Computing (ICCAS), Germany

(3) VRVis Research Center, Vienna, Austria

(4) Otto-von-Guericke-University, Institute for Simulation and Graphics, Germany

(5) Eindhoven University of Technology, Department of Biomedical Engineering, Netherlands

(6) TU Clausthal, Department of Informatics, Germany

Advanced algorithms and efficient visualization techniques are of major importance in intra-operative imaging and image-guided surgery. The surgical environment is characterized by a high information flow and fast decisions, requiring efficient and intuitive presentation of complex medical data and preciseness in the visualization results. Regions or organs that are classified as risk structures are in this context of particular interest. This state of art report summarizes advanced algorithms for medical visualization with special focus on risk structures such as tumors, vascular systems and white matter fiber tracts. Algorithms and techniques for visualization in intra-operative situations or virtual and mixed reality simulations are discussed. Finally, the prototyping and software development process of medical visualization algorithms is addressed.