ST 2: DPG meets DGMP: Future Perspectives on Tomographic Imaging Techniques

Time: Tuesday 16:15–17:45 Location: ZHG003

Invited Talk ST 2.1 Tue 16:15 ZHG003

Photonenzählende Detektoren: Der nächste Schritt in der klinischen CT-Bildgebung — •Thomas Stein — Klinik für Diagnostische und Interventionelle Radiologie, Freiburg, Deutschland

Die Computertomographie hat sich als verlässliche Schlüsseltechnologie in Medizin und anderen Disziplinen etabliert. Nun halten Photonenzählende Detektoren (PCDs) verstärkt Einzug in die medizinische Bildgebung. PCDs erfassen einzelne Röntgenphotonen und ermitteln deren Energie, anstatt Signale, wie bisher, nur zu integrieren. Dadurch kann die räumliche Auflösung verbessert werden und unterschiedliche Gewebestrukturen sowie Materialien lassen sich präziser diskriminieren, was eine verfeinerte, spektrale CT-Bildgebung ermöglicht und damit die Patientenversorgung verbessert. Die Vorteile gehen über die bisherige Dual-Energy-CT hinaus: Spektrale Methoden erlauben, verschiedene Substanzen simultan zu analysieren und Artefakte zu reduzieren. Neue Kontrastmittel könnten damit besser identifiziert und die Diagnostik gesteigert werden. Darüber hinaus eröffnen Kooperationen mit der Grundlagenforschung ein erweitertes Spektrum an Untersuchungs- und Anwendungsmöglichkeiten, sodass neue Einsatzfelder erschlossen und wissenschaftliche Erkenntnisse gezielter vorangetrieben werden können. Fortschritte in der Signalverarbeitung, etwa durch iterative Rekonstruktionen und maschinelles Lernen, sorgen dafür, dass diese Weiterentwicklungen auch praktikabel werden. Die Photonenzähltechnologie stellt einen Quantensprung in der CT dar, erfordert jedoch weitere Forschung, um bestehende Herausforderungen zu meistern und ihr volles Potenzial auszuschöpfen.

Invited Talk ST 2.2 Tue 16:45 ZHG003

Life-view 3D endoscopy for colorectal cancer screening based on MHz optical coherence tomography — •Maik Rahlves[1], Awanish Singh[1], Madita Göb[1], Sazgar Burhan[1], Simon Lotz[1], Wolfgang Draxinger[1], Berenice Schulte[2], Marvin Heimke[3], Tillmann Heinze[3], Mario Pieper[4], Thilo Wedel[3], Mark Ellrichmann[2], and Robert Huber[1] — [1]Institute of Biomedical Optics, University of Lübeck, Lübeck, Germany — [2]Interdisciplinary Endoscopy, Medical Department 1, University Hospital Schleswig-Holstein, Campus Kiel, Kiel, Germany — [3]Center of Clinical Anatomy, Institute of Anatomy, Christian-Albrechts University Kiel, Kiel, Germany — [4]Institute of Anatomy, University of Luebeck, Luebeck, Germany

Colorectal cancer has one of the highest incidence rates among all types of cancer, which requires high resolution 3D imaging techniques for tissue layer differentiation for screening and tumor staging. We present our latest results on life-view 3D colorectal endoscopy based on Fourier-Domain Mode Locking Optical Coherence Tomography. The endoscope features a radially out-coupled rotating OCT-Laser beam. Our approach enables axial resolution of about 10 microns in tissue at A-scan rates of 3.4 MHz, which allows for screening large tissue areas as well as tissue layer differentiation. Solutions to common challenges such as Laser-triggering and non-uniform rotational scanning are presented. We present 3D images of human tissue obtained from ex-vivo body donor measurements. Furthermore, future prospects and preliminary results on novel OCT-imaging modalities are discussed.

Invited Talk ST 2.3 Tue 17:15 ZHG003

Engineering Precision Medicine with Magnetic Imaging Techniques — •Ioana Slabu — Institute of Medical Engineering, Helmut Schmidt University Hamburg — Institute of Applied Medical Engineering, Helmholtz Institute, Medical Faculty, RWTH Aachen University

Magnetic imaging techniques such as magnetic resonance imaging (MRI) and magnetic particle imaging (MPI) are of great interest in precision medicine. They have the potential to contribute to tremendous developments in two of the most challenging issues of today's healthcare: (i) early and precise detection of diseases with minimally invasive methods, and (ii) personalized therapy with high success rates and low side effects. This potential is largely driven by the development of image-guided therapies with magnetic nanomaterials, which are applied as contrast agents in MRI and as tracers MPI. Medical devices (e. g. stents, drug carriers) doped with magnetic nanomaterials are designed to respond to magnetic external stimuli, allowing them to sense, interact with, and adapt to their environment according to the therapeutical need. The talk focusses on the concept and realization of image-guided therapies based on such devices, highlighting the huge advantage of their *in vivo* monitoring in MRI and MPI.