



SEMINAR

Implicit Neural Representations for Low-Latency Structural Understanding of Deformable Objects

Date: 27 March, 2026 (Friday)
Time: 17:00 - 18:00
Venue: Room 7-34 & 7-35
Haking Wong Building, HKU



Speaker: Mr. Pit Henrich
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Abstract:

For surgical scene understanding, we often rely on deformable registration, where preoperative templates are iteratively aligned to intraoperative data. In contrast, we present an approach that directly infers semantically labeled 3-D representations of known anatomical structures from partial observations in sensor coordinates. The talk introduces the concept of implicit neural representations and shows how they can be used to reason about many kinds of 3-D objects, including deformable, articulated, and rigid structures, as well as combinations of these. Applications are presented in which the method estimates the positions of anatomical structures inside the human body from a single depth image of the patient surface. Such estimates could, for example, be used to initialize the positioning of ultrasound devices. We further demonstrate that the approach enables low-latency inference suitable for robotic interaction, allowing tumors inside deforming organs to be tracked at over 60 Hz (on consumer hardware) given only a single-view surface observation. The talk then discusses how uncertainty estimates can indicate whether the available observations are sufficient to infer deformation reliably. This capability is important for preventing robotic systems from acting on ambiguous or incomplete observations. The talk concludes with a brief look at recent work conducted in collaboration with Prof. Dr. Axel Krieger (IMERSE Lab, Johns Hopkins) on autonomous robotic surgery.

Biography:

Pit Henrich is a senior PhD candidate at the Surgical Planning and Robotic Cognition (SPARC) Lab at Friedrich-Alexander University Erlangen-Nuremberg (FAU), Germany. His research focuses on surgical robotics, with an emphasis on perception of deformable anatomy for tasks such as biopsy guidance and surgical resection. His work combines 3D computer vision and robotics, and has resulted in 9 journal articles (e.g., IEEE T-RO) and 4 conference papers (e.g., WACV, IROS).

ALL INTERESTED ARE WELCOME

For further information, please contact Professor Z.L. Jiang at 3910 2658.