TAILORED LIGHT

Institute of Mechatronic Systems
imes Leibniz Universität Hannover

Hand-held projection and measurement system for surgical interventions

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Augmented reality is an emerging research domain that permeates our daily life. Virtual objects are fused with the real environment thus a mixed perception occurs. Prominent examples are overlaid lines in sports broadcast or the park assist feature visualized into rear view cameras of cars.

Tailored light by hand-held projector-based augmented reality enables new visualization concepts, e.g. to assist surgeons in future interventions. A small-sized video or laser projector will directly illuminate or shade important structures. First tests in laboratory environments and the operating room with projector-based reality have demonstrated promising results, but challenges with deformable organs, view-angle dependent visualization of sub-surface structures as well as powerful and spectral-optimized illumination remain unsolved. Furthermore, human-machine interaction in terms of gesture control, projected buttons or sliders as well as (self-) localization, real-time measurement and mapping for those new systems have not been solved ideally.

Actual prototype and projector-based visualization of vessels onto the human head and liver as an example of a deformable organ.

This PhD-project will address these challenges and advance the state of the art towards time-, spatial-, spectral-optimized hand-held projector-based augmented reality. The ideal candidate will have a very good master degree and strong background in one or more of these areas: Optical technologies, image processing, computer vision and graphics, human-machine interaction, real-time computing, mixed reality, computer- and robot-assisted surgery.

The members of the Institute of Mechatronic Systems have vast experience in augmented reality for surgical interventions and projector-based visualization. A prototype exists to advance the state of the art in a quick way. Clinical collaboration partners will allow testing of newly developed methods under realistic conditions.

This is a PhD-project of Tailored Light. Tailored Light is a coordinated PhD-programme of the Hanover Centre for Optical Technologies from the Leibniz Universität Hannover together with the Hochschule Hannover, the Laser Zentrum Hannover, the HAWK Hildesheim/ Holzminden/ Göttingen, the TU Braunschweig and the TU Clausthal.

Students interested in this or another project of Tailored Light can apply for fellowships. Have a look at www.tailored-light.uni-hannover.de for details.