TU Clausthal

Bachelor-, Master- und Doktorandenseminar
des Instituts für Informatik

Novel Point Cloud Processing Pipeline for Autonomous Surgical Lamps

Jörn Teuber, B.Sc., TU Clausthal

In the last decades, the operating room (OR) has been a place of constant research and innovation. Today, there is almost no aspect of the OR that is not in some way affected by technology, from ultrasonic surgical scissors that automatically atrophy the cut tissue to intra-operative magnetic resonance imaging (MRI) to find previously undiscovered tumors. One exception to this is the surgical lighting system (SLS). While the surgical lamps experienced a lot of progress by using LEDs, making the lamps bigger, lighter and emit less heat, the mounting and manipulation of those lamps has not changed significantly. They still rely on manual manipulation by the surgeon or surgical staff and are mounted to a ceiling-mounted pendant system. In long open abdominal surgeries this can be a problem with disruption of the surgical work-flow and communication problems.

In this thesis we present a system and pipeline that autonomously moves the lamps where the surgeon needs them and removes the need for manual adjustments altogether. This system works by mounting the lamps to robotic arms or similar system that can move the lamps on a two dimensional lamp workspace above the patient and orientate them towards the operation situs. The robotic system is controlled by a pipeline that processes the images of a depth camera that is mounted above the operating table in the middle of the lamps workspace. With the depth image, we build a model of the environment around the operating table and create an occlusion map, showing where the lamp workspace is occluded when looking from the situs. Further analysis of this occlusion map results in a set of optimal positions, to which the lamps are then moved. All this is done in real time in our pipeline, utilizing the whole 30 Hz of the used depth camera.

Donnerstag, den 24.09.2015, 17:30 Uhr,
im Besprechungsraum 106, IfI, Julius-Albert-Straße 4

Technische Universität Clausthal • Institut für Informatik • Julius-Albert-Straße 4 • 38678 Clausthal-Zellerfeld
Tel +49.(0)5323.72.7100 • Fax +49.(0)5323.72.7139 • http://www.in.tu-clausthal.de • info@in.tu-clausthal.de