

## OR ILLUMINATION SYSTEM USING ROBOTIC LAMPS AND MICROSOFT KINECT

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**Introduction:** Surgical Illumination Systems (SISs) currently available in Operating Rooms (ORs) show ergonomic problems [1]. Maneuverability and collision problems are especially relevant in complex surgical scenarios like new hybrid ORs. In this work, we present a SIS that tries to address the maneuverability and collision problems providing a better illumination environment in terms of illumination level and appearance of shadows.

**Methods:** The SIS comprises seven robotic lamps strategically attached to the OR ceiling around the operating table. These lamps have two degrees of freedom (pan and tilt movements) that allow focusing the light beams to any position in the operating table [2].

This system is controlled by a distributed software platform. A workstation hosts a controller software capable of setting the light position, intensity and set of active lamps. The controller allows receiving instructions from external client platforms and perform actions on the SIS accordingly. Currently, two clients are connected to the controller: 1) A Tablet PC providing interaction from the OR control room, as depicted in [2]; and 2) Direct light positioning using Microsoft® Kinect® from the operating table.

For the latter interaction, a Microsoft® Kinect® device has been attached to the OR ceiling right above the operating table. The device is controlled by a software capable of detecting and tracking hand positions. The detection stage is triggered by a foot-switch pedal and a waving hand gesture. This double check avoids false positive detection.

**Results:** So far, a prototype is being evaluated and used during regular surgical procedures carried out at The Intervention Centre (Oslo University Hospital). Preliminary results from clinical users show, in most of the cases, a good detection and tracking performance as well as a convenient illumination environment. Shortcomings detected during this evaluation are the inadequate

light angle for some deep wounds and the scope of Microsoft® Kinect® that makes detection and tracking difficult for some operating table positions.

1.       **References:**

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2. Palomar, R., Samset, E., Elle, O.J.: Computer-assisted fixed ceiling illumination system in the OR. *CARS 2011. Proceedings (2010)*. S153-154.