

Oral Presentation
Track 8: Computer-Assisted Surgery
8.5. Clinical Evaluation

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A registration-free intraoperative procedure to optimally position the ports and the robots in mirs

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Purpose: State of the art planning procedures in minimally invasive robotic surgery (MIRS) are based on preoperative imaging data, hence requiring an accurate registration between the preoperative data and the intraoperative situation to transfer the results of the planning procedure into the operating room (OR). With registration usually a time consuming step and a potential source of inaccuracy (due to e.g. insufflation, soft tissue displacement or breathing), a fast procedure that uses intraoperative data to consider the actual OR situation is presented. Since planning takes place in the OR coordinate system, no registration is necessary.

Material and Methods: With the described procedure positions for the robot bases and the entry points into the human body are determined that guarantee the observance of certain criteria such as reachability of the whole workspace with sufficient accuracy and manipulability and the absence of collisions outside the patient. The optimization algorithm basically requires mathematic descriptions of the OR situation concerning a) the surface that contains possible entry points into the patient and b) the desired workspace.

An approximation for a) is obtained using an optically tracked pointer. To approximate b), the surgeon first chooses an entry point for the endoscope and he then explores the desired workspace with an optically tracked endoscope equipped with a calibrated probe to record sample points. The optimization algorithm then determines good robot base positions and entry points. After validation by the surgeon, the robot bases are positioned and the entry points are set due to the calculated positions, guided by an optically tracked pointer.

Results and Conclusion: Preoperative planning definitely is crucial for a successful intervention. However the presented approach suggests, that for the placement of the trokars and the robots itself intraoperatively easily obtainable data is sufficient and even more appropriate, mainly due to differences between the preoperative data and the situation in the OR. Since the presented procedure gets by without registration, it furthermore promises to be faster than conventional methods, both pre- and intraoperatively.

