



Thesis Project Form

Title (tentative): Preoperative planning in urology surgery with 3D solutions

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Description

Motivation and application domain

Preoperative surgical planning optimizes the patient outcome, the efficiency of the surgeon, and the educational experience of healthcare providers involved. With the rise of digital technologies, surgeons have now access to patient-specific 3D models of the organs which simplify preoperative planning. Currently, 3D models can be imported in preoperative planning software or printed to have a physical replica of the organs. As in the literature, there is no information regarding the "optimal" modality, each hospital uses a different approach.

General objectives and main activities

The goal of the thesis is to assess whether VR and 3D printing are equally efficient for pre-operative planning, or if one technology would be better in the specific case of urologic surgery. To respond to this research question, the student would realize a 3D model of part of the urinary tract (e.g., Kidney, Bladder or Prostate), starting from CT/MRI images. After the segmentation, the model will be used in two ways:

- To print a physical model of the organ
- To realize a VR application using a Graphic Engine or a physic simulation software

The two models (i.e., 3D printed and Virtual) should be as similar as possible, given that they will be compared. After the design and development phase, a group of surgeons will use both systems. After each session, their knowledge about the organ will be evaluated (e.g., presence of pathological signs, ideas on the surgery to perform, size of the stent to use).

Training Objectives (technical/analytical tools, experimental methodologies)

- Diagnostic images segmentation
- 3D modelling
- 3D printing
- Programming VR applications
- Run Experiments involving clinicians
- Analyze data
- Work in an international and multidisciplinary team of clinicians and engineers

Place(s) where the thesis work will be carried out: Joint lab For Emerging Technologies in Simulation @SimAv

Via Pastore 3

Additional information

Maximum number of students: 1