



Towards fully automatic Robotic-US scan for Thyroid

Project Management and Software Development
for Medical Applications

General Info

Project Title: Towards fully automatic Robotic-US scan for Thyroid

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Project Abstract

Thyroid nodules are a common disease on Germany, where a large part of the population is diagnosed every year. The assessment of the nodule is done with MR images, and posterior biopsy if necessary. Ultrasound images can be used; however, this operator dependent modality offer some challenges that need to be solved.

Background and Motivation

Robotic Ultrasound systems have been shown to perform better than hand-held 3D US compounding. The ability of the robot to keep the force that is been applied, offers an advantage on the recording of the images and the posterior compounding. Furthermore, the full automatization of the process decreases the price of the procedure.

Student's Tasks Description

- Get familiar with all the existing software for controlling the robot and recording the US images.
- Build a realistic head-neck phantom.
- Implement a sweep protocol based on manual selection of points on the CT of the phantom.

- Implement a registration algorithm between RGBD images and the phantom's CT/MR.
- Test the aforementioned solution with real people.
- Implement a detection algorithm for automatic sweep protocols.

Technical Prerequisites

- Linux
- C++
- CAD modelling / 3D printing (optional)
- Cmake (optional)

Non-Technical Prerequisites

- Motivation!
- Interest on working on a lab space with hands-on tasks (i.e. phantom building, experiments with volunteers etc.)
- Availability for working at the IFL at least 2-3 days weekly.

References

1. Robotic Ultrasound-Guided Facet Joint Insertion
International Journal of Computer Assisted Radiology and Surgery / 9th International Conference on Information Processing in Computer-Assisted Interventions (IPCAI), Berlin, Germany, June 2018.
J. Esteban, W. Simson, S. Requena, A. Rienmüller, S. Virga, O. Zettinig, B. Frisch, S. Drazen, Y.-M. Ryang, N. Navab, C. Hennersperger
<https://www.youtube.com/watch?v=t4lh8QivLyM&t=14s>
2. Robotic Ultrasound for Catheter Navigation in Endovascular Procedures
F. Langsch*, S. Virga*, J. Esteban, R. Gööbl, N. Navab
IEEE/RSJ International Conference on Intelligent Robots and Systems 2019

Please send the completed proposal to beatrice.demiray@tum.de, javier.esteban@tum.de and hendrik.burwinkel@tum.de.
Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.