



Project Proposal Template

Project Management and Software Development
for Medical Applications

General Info

Project Title: Visualization Framework for Intra-operative Nuclear Imaging

Contact Person: Dzhoshkun Shakir

Contact Email: shakir@in.tum.de

Project Abstract

The aim of this project is to develop a GUI for augmented reality visualization in intra-operative imaging with navigated beta and high-energy probes.

Background and Motivation

Within the Navigated Nuclear Probes (NaNu) group of CAMP, we are developing intra-operative imaging modalities for providing guidance to the surgeon in the OR. Getting feedback from all involved parties (e.g. Nuclear Medicine experts, Surgeons) is a crucial part of the development cycle. For this reason, we have recently started working on a novel software framework (called Eos), that is envisioned to provide easy integration for new devices, and a small augmented-reality (AR) visualization framework to be used in conducting pre-clinical studies with surgeons and nuclear medicine doctors.

Student's Tasks Description

A GUI using VTK is to be developed for visualizing

1. data acquisition (scanning) with a navigated nuclear probe,
2. reconstructed images, both in real-time.

The GUI should be robust and easy to use. The student will have the opportunity to

concretely contribute to a novel medical software framework by developing a dedicated visualization widget. In addition, s/he will have ample opportunity to get familiar with novel GUI programming tools like Qt and VTK.

Technical Prerequisites

- C++
- CMake
- Qt
- VTK
- OpenGL knowledge (i.e. graphics programming) is beneficial, but not required

Administrative Info

Working Time: 1-2 days a week

Project Location: IFL

Required Equipments: Laptop, Intra-operative Imaging Cart, Nuclear Probes

Timeline and Milestones

See the course website.

References

[1] D. I. Shakir, J. Bieniarz, S. Pirsig, T. Wendler, N. Navab, and S. I. Ziegler, "A first study on biological feasibility of intraoperative control of tumor resection borders with navigated beta-probe



surface imaging,” in Proceedings of the annual meeting of SNM, Salt Lake City, UT, USA, 2010.

[2] Dzhoshkun I. Shakir, N. Navab, and S. I. Ziegler, “Acquisition Model for Iterative Reconstruction of Navigated Beta-Probe Surface Images,” in Proceedings of IEEE Nuclear Science Symposium and Medical Imaging Conference (IEEE NSS-MIC), Knoxville, TN, USA, 2010.

[3] T. Wendler, J. Traub, A. Hart, T. Lasser, M. Burian, A. Buck, F. Daghighian, M. Schwaiger, S. Ziegler, and N. Navab, “Adding navigation to radio-guided surgery: new possibilities, new problems, new solutions,” in Proceedings of RBC Biomed 2007, Erlangen, Germany, 2007, pp. 96–100.

[4] D. I. Shakir, A. Hartl, N. Navab, and S. I. Ziegler, “Evaluation of an ad hoc model of detection physics for navigated beta-probe surface imaging,” in SPIE 2011, 2011.

[5] D. I. Shakir, T. Lasser, A. Drzezga, S. I. Ziegler, and N. Navab, “Evaluation of Navigated Beta-Probe Surface Imaging on a Realistic 3D Phantom,” in IEEE MIC 2011, 2011.

[6] C. Oezguer, J. Bieniarz, T. Lasser, S. I. Ziegler, N. Navab, and T. Wendler, “Phenomenological Models for intraoperative Positron Emission Surface Imaging using Handheld Probes,” in Proceedings of WC 2009, Munich, Germany, 2009.

[7] T. Wendler, A. Hartl, T. Lasser, J. Traub, F. Daghighian, S. Ziegler, and N. Navab, “Towards intra-operative 3D nuclear imaging: reconstruction of 3D radioactive distributions using tracked gamma probes,” in International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), Brisbane, Australia, 2007, vol. 4792, pp. 909–917.