2D guidance information

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

In this project, the integration of different 2D visualizations as additional guidance during surgery is explored. This constitutes an experimental step improved navigation information.

Background and Motivation

Tracking of medical instruments is an essential part in modern interventions. However, the complexity of application, the interruption of the surgical workflow are predominant factors for the continuously conservative percentage of navigated surgeries. In addition, the surgeon has to split his attention between the navigation information displayed on the external screen and the situs, which further increases the complexity of usage.

Drawing the surgeons' attention from an external screen back to the patient is a well-researched topic. With the advent of AR, MR as well as mobile device solutions, further methods to overlay additional information onto the situs has been investigated. Several research showed that the use of these systems can result in less procedure time and less attention shifts for the surgeon.

This project leverages these observations and aims to explore different visualization techniques that can be used as additional information during spinal surgeries.

Student's Tasks Description

- Starting with familiarizing with Android Studio and app development.
- Implementation of different pre-designed visualizations in Android Studio as graphical interface.
- Implementation of UDP-Communication in C
- Sending and testing experimental data via UDP on wearable smartwatch device

Technical Prerequisites

- Experience with Android and app development
- Skills in C programming

References

Brendle, C., Schuetz, L., Esteban, J., Krieg, S., & Navab, N. (2020, October 2020). Can a hand-held navigation device reduce cognitive load? A user-centered approach evaluated by 18 surgeons. Proceedings of the 23rd International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI), Lima.

Liebmann, F., Roner, S., von Atzigen, M., Scaramuzza, D., Sutter, R., Snedeker, J., Farshad, M., & Fürnstahl, P. (2019). Pedicle screw navigation using surface digitization on the Microsoft HoloLens. International journal of computer assisted radiology and surgery, 14(7), 1157-1165.

Carmigniani, J., Furht, B., Anisetti, M., Ceravolo, P., Damiani, E., & Ivkovic, M. (2011). Augmented reality technologies, systems and applications. Multimedia tools and applications, 51(1), 341-377.

Herrlich, M., Tavakol, P., Black, D., Wenig, D., Rieder, C., Malaka, R., & Kikinis, R. (2017). Instrument-mounted displays for reducing cognitive load during surgical navigation. International journal of computer assisted radiology and surgery, 12(9), 1599-1605. 20

Please send the completed proposal to javier.esteban@tum.de, ardit.ramadani@tum.de, mf.azampour@tum.de and zl.jiang@tum.de. The proposal will be evaluated by the BMC coordinators and assigned to a student only in case of acceptance.