A Web-Based Surgical Performance Analysis Tool

Project Management and Software Development
for Medical Applications

General Info

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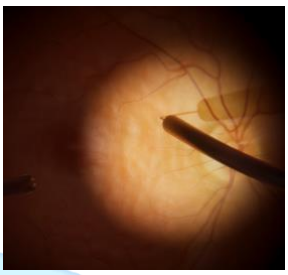
Project Abstract

We aim to implement a web-based framework that automictically assesses the surgical performance in a surgical simulation environment and allows to monitor the training schedule, progress, history, and receive feedbacks from their mentors.



Background and Motivation

Surgical simulation has been an interesting topic in the past years, and it has been proven that it would be an efficient, while effective [1], replacement for conventional surgical trainings. In ophthalmology, in specific, there has been works to create a simulation environment [2], and recently, with integration of advanced imaging systems [3], even more realistic training simulations has been made possible for surgeons. In this project we use an ophthalmic surgical simulator and, to understand the effectiveness of the trainings, analyze the behavior of the surgeon and visualize the outcome to keep track of previous trainings and monitor the progress with the setup.

Student's Tasks Description

1. Designing algorithms to extract and measure performance
2. Implementation of the platform, front-end and back-end
3. Visualization of the training evaluations in a user-friendly manner
4. Cloud hosting [if time allows]

Technical Prerequisites

1. **React/AngularJS** for front-end | NodeJS or any relevant alternative for back-end
2. **Auth0/*Firebase***(Google) for authentication
3. ***Plotly*** for graph visualizations
4. ***Numpy/Pandas***

References

1) https://www.escrs.org/eurotimes-articles/what-is-the-future-of-ophthalmology-training-in-europe/.

2) Huang, Y. H., Chang, H. Y., Yang, W. L., Chiu, Y. K., Yu, T. C., Tsai, P. H., & Ouhyoung, M. (2018, April). CatAR: a novel stereoscopic augmented reality cataract surgery training system with dexterous instruments tracking technology. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (pp. 1-12).

3) Sommersperger, M., Martin-Gomez, A., Mach, K., Gehlbach, P. L., Nasseri, M. A., Iordachita, I., & Navab, N. (2022). Surgical scene generation and adversarial networks for physics-based iOCT synthesis. *Biomedical Optics Express*, *13*(4), 2414-2430.

Please send the completed proposal to tianyu.song@tum.de, shervin.dehghani@tum.de and felix.tristram@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.