Design and Implementation of a web-based dashboard for evaluation of user studies in a surgical simulation environment

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

We aim to implement a web-based portal, which the users of a surgical simulation setup can monitor their 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 our case, an ophthalmic surgical simulator has been developed, and to understand the effectiveness of the trainings, the outcomes should be analyzed and visualized so the users can keep track of their previous trainings and be aware of their progress with the setup.

Student's Tasks Description

1. Understanding and designing the necessary entities for such platform
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 possible]

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 ardit.ramadani@tum.de, tianyu.song@tum.de, vanessag.duque@tum.de and shervin.dehghani@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.