AR-Guided Cataract Surgery Training
Project Management and Software Development for Medical Applications

General Info
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Project Abstract
Cataract surgery is the most common type of surgery worldwide. This project aims to develop a mobile-based, Augmented Reality (AR) training tool to improve the training of cataract surgery.

Background and Motivation
This project is a continuation of a previous work done in the Medical Augmented Reality course at CAMP and will be run in collaboration with the startup Custom Surgical.

Cataracts are the leading cause of blindness worldwide, responsible for 65.2 million people with vision loss in 2019 [1]. Experimental evidence suggests that surgical simulation training reduces the learning curve and improves surgical performance. In previous works, virtual reality simulators like “VRmagic eyes”, “Immersive Touch Microvis-touch” and “Melerit medical Phacovision” were developed [2, 3]. These systems are costly and lack haptic feedbacks, limiting their use to well-funded hospitals and training institutions.

This project aims to create a mobile-based training application for cataract surgery in order to test its effect on the learning curve of surgeons.

Student’s Tasks Description
As part of this project, the student will:
1. Develop a robust algorithm for detection of major structures of the eye.
2. Create a training workflow and user interface to guide the doctor through the different phases of the surgery.
3. Implement different AR overlays on the phone screen to guide the doctor to properly perform the surgery (alignment of toric axis, incision and suture markers...).

During the entire process, the student is invited to the laboratory of Custom Surgical GmbH to test and discuss his/her findings with the engineers of the company and our clinical consultants.

1. The student will learn about the following topics:
2. Surgical procedures in ophthalmology
3. Augmented Reality
4. Image processing
5. Microscopy
6. App development

Technical Prerequisites
• Previous experience with mobile front-end development (e.g. React Native)
• Knowledge of some AR framework
• Knowledge of computer vision algorithms and libraries (e.g. OpenCV)

References