Mobile Measurement Tool for Ophthalmology

Project Management and Software Development
for Medical Applications

General Info

Project Title: Mobile Measurement Tool for Ophthalmology

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Project Abstract

Development of an algorithm to calculate common ophthalmological metrics (white-to-white, pathological dimensions, pupil diameter) and freehand distances in the eye from a slit lamp picture.

Background and Motivation

At Custom Surgical [1], we develop smartphone-based software for ophthalmologists and other microsurgical specialties with the goal of turning smartphones into a cutting-edge Swiss knife for such doctors.

During the eye exam in a slit lamp [2], measuring the size of lesions or other findings is crucial for monitoring its progress over time or deciding on the most appropriate treatment.

The most common tools used for such purposes today are: handheld rulers (awkward), oculars with built-in rulers in the reticule, or through advanced handling of the slit beam [3].

The goal of this project is to develop a tool in a mobile app that can automatically measure the white-to-white corneal distance, and allow users to calculate custom distances in the eye from a picture.

Student's Tasks Description

The student should be capable of undergoing the following:

1. Exploratory literature review to understand relevant metrics used to assess quality of cataract surgery (e.g. (white-to-white, pathological dimensions, pupil diameter). The student will be put in touch with experts in the field to get first-hand input.
2. Implement an algorithm to calculate the white-to-white corneal diameter from an image (it could be possible to calculate other relevant distances instead, depending on the outcome of the review and the student's preference).
3. Define the user requirements to calculate distances with a free-hand approach.
4. Implement a free hand measurement tool in a mobile OS.

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

The student will learn about the following topics:

1. Diagnostic procedures in ophthalmology
2. Image processing with OpenCV
3. Microscopy
4. App development for Android/iOS

Technical Prerequisites

Previous knowledge in:

- Python
- OpenCV
- Ideal - Basic native mobile iOS or Android development experience
- Optional – Java or C++

References

Please send the completed proposal to javier.esteban@tum.de, ardit.ramadani@tum.de, mf.azampour@tum.de and zl.jiang@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.

1. Customsurgical.co. 2021. MicroREC kit - Custom Surgical. [online] Available at: https://customsurgical.co/ [Accessed 19 August 2021].

2. Eyewiki.aao.org. 2021. Slit Lamp Examination - EyeWiki. [online] Available at: https://eyewiki.aao.org/Slit_Lamp_Examination#Anatomy_of_the_Slit_Lamp [Accessed 10 September 2021].

3. Flanders, W., 2021. Measuring - Slit Lamp - Flanders Health Blog. [online] Flanders Health Blog. Available at: https://www.flandershealth.us/slit-lamp/measuring.html [Accessed 10 September 2021].