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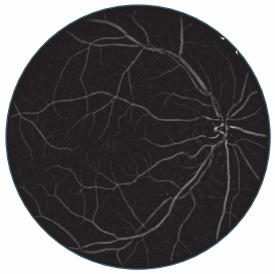
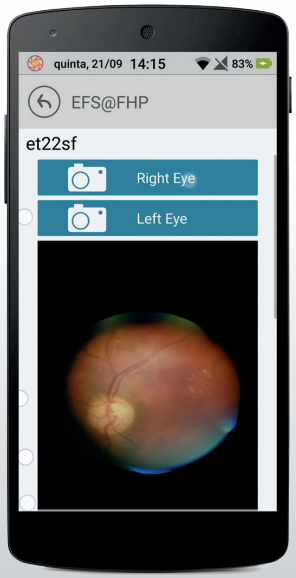
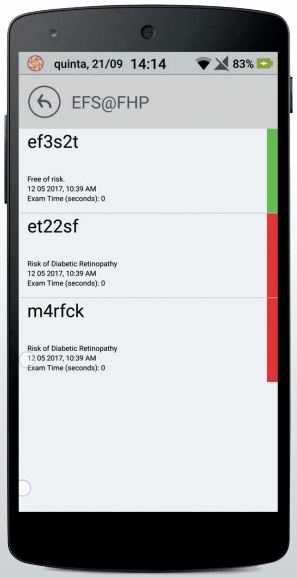
MOBILE-BASED RISK ASSESSMENT OF DIABETIC RETINOPATHY BY IMAGE PROCESSING

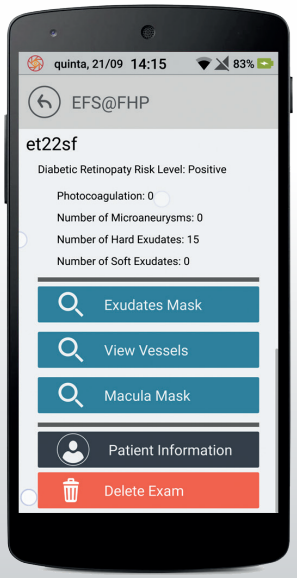
EYE FUNDUS SCOPE

THE AIM OF THIS PROJECT IS TO DEVELOP A SELF-CONTAINED MOBILE-BASED SYSTEM CAPABLE OF DETECTING EARLY SIGNS OF SIGHT THREATENING DIABETIC RETINOPATHY ON RETINAL IMAGES ACQUIRED THROUGH AN OPHTHALMOSCOPIC ADAPTER, ON A NON-EXPERT MONITORING CONTEXT.









Purpose

Diabetic Retinopathy (DR) is a pathology which ultimately may lead to complete vision loss, and is related to the systemic nature of diabetes, particularly the problematic glycemic control and hypertension. Current screening practices recommend a yearly retinal assessment of the diabetic population, but this recommendation is often not followed. Depending on the stage of the disease, cumulative changes are verified at the retina microvascularity, in chronological order:

- Microaneurysms formation;
- Excessive vessel permeability;
- Vessel occlusion;
- Neo vascularization;
- Formation of fibrous tissue;
- Contraction of fibrous tissue.

EyeFundusScope purpose is to allow a non-expert assessment of diabetic retinopathy by automatically detecting microaneurysms and exudates. These are the first visible signs of DR, which will be used as an indicator of the severity / risk of the pathology.

Software

The solution includes an Android application which will perform the acquisition, data management and determine the diabetic risk level, using as reference the presence of lesions in the retinal images. A decision-support system that combines the microaneurysms and exudates detection was developed, in order to rate the risk of diabetic retinopathy. The process follows three phases after the image acquisition:

- Image pre-processing;
- Classification / Validation;
- Decision-support system.

Hardware

A commercial ophthalmoscope was initially used for retinal image acquisition. Since then, a custom optical prototype was devised with the goal of acquiring retinal images with quality closer to commercial fundus cameras.

EyeFundusScope

Fraunhofer Portugal AICOS
Rua Alfredo Allen, 455/461
4200-135 Porto, PORTUGAL

Phone: (+351) 220 430 300
E-mail: info@fraunhofer.pt
www.fraunhofer.pt

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