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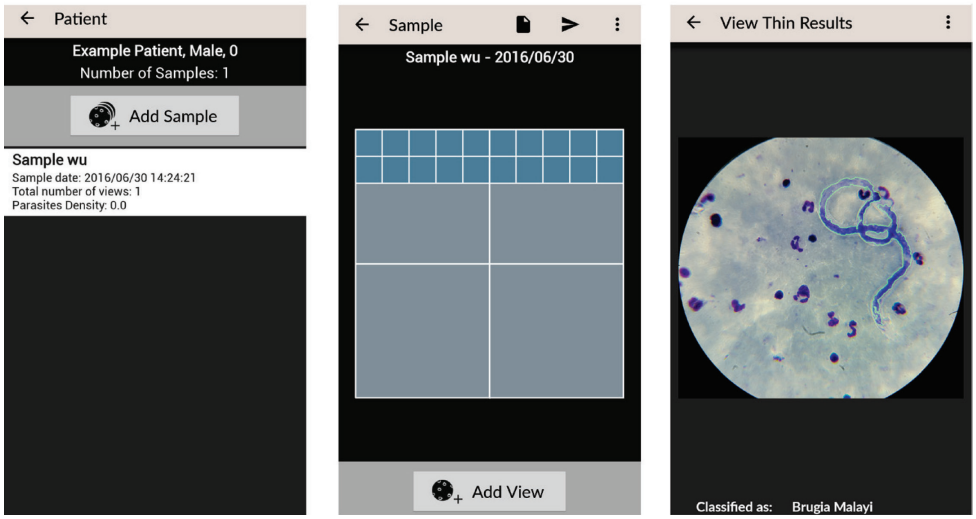

Fig1. Patient screen on the left. Samples view in the middle with an added image. Final result of a processed image on the right.

LFDETECTION

LYMPHATIC FILARIASIS DETECTION IN MICROSCOPIC IMAGES

Motivation

The Lymphatic Filariasis (LF) in humans, commonly known as elephantiasis, is one of the four most important tropical diseases identified by the World's Health Organization, along with onchocerciasis, chagas disease and leprosy. It is an infectious disease which causes changes in the lymphatic system and deformation of body parts, causing pain and incapacity and that is acquired, normally in childhood, when filarial parasites are transmitted from person to person through mosquito bites.

According to data from the World Health Organization it is estimated that approximately 120 million people are currently infected in 73 countries across the tropical and subtropical regions of Asia, Africa, Occidental Pacific and part of Caribbean and South America, where 40 million of those infected individuals are seriously incapacitated and disfigured by LF, and 1,23 billion live in areas where the Filariasis is capable of transmission, being therefore at risk. The access to medical equipment and health professionals is limited and the economic costs of this disease are huge, estimated over US$1 billion for year only for India, which makes it imperial for an agile and accessible detection method.

Objectives

The main goal for this project is to develop a robust automated image processing methodology capable of finding the parasites in low-quality smartphone-acquired thin blood smear

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Features

- Automated detection of Lymphatic Filariasis
- Take photos using Skylight or Fraunhofer AICOS' prototype
- Offline and Background Analysis
- Save the results grouped by patient
- No need for a professional

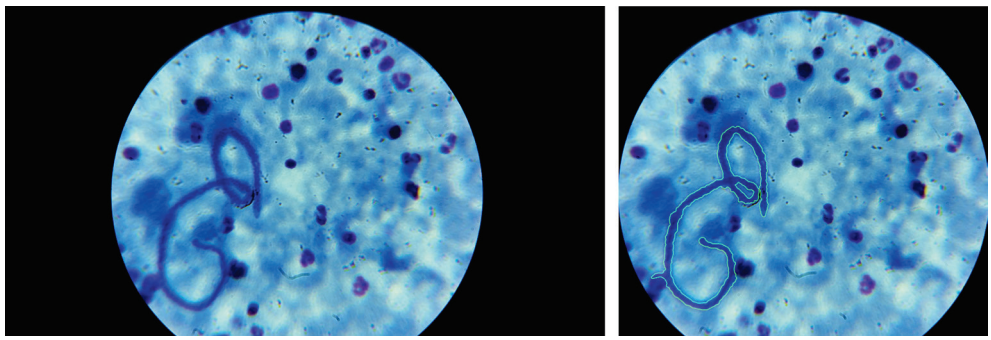

Fig2. Original image on the left. Processed image and result on the right.

images and differentiate the two most common types of microfilariae (*Wuchereria bancrofti* and *Brugia malayi*). Finally, an integration of the image processing methodology into mobile devices was the key element to be able to perform the analysis anywhere.

Image Analysis

The automated detection is only possible due to an image processing methodology.

This methodology comprises four stages: Pre-Processing, Segmentation, Feature Extraction and Classification.

In the Pre-Processing phase, a colour normalization is applied, in order to maintain images from both samples (*Wuchereria bancrofti* and *Brugia malayi*) in the same range of colours followed by a noise reduction to eliminate possible artefacts coming from the acquisition devices.

Afterwards, in the segmentation phase, the parasite (which is our region of interest) is isolated from the rest of the image through colour and size.

Finally, in the feature extraction phase, texture, colour and geometry characteristics are extracted from the parasite found in the segmentation phase and, with the use of machine learning algorithms, these are trained and used to classify the segmented regions into one of the two parasite types (*Wuchereria bancrofti* or *Brugia malayi*).

Android APP

The mobile application is the main focus of this project as it makes it possible to have a low cost detection device. The analysis is performed in the smartphone and it is possible to obtain images by using Fraunhofer Portugal AICOS' prototype from MalariaScope or a Skylight smartphone-microscope adapter along with a stained blood smear and a mobile device. The results are promising, as the classification shows an accuracy of 97, 43% in differentiating both types.

Fig3. Fraunhofer AICOS' prototype with mobile connected.