IOT DEVICE TO DETECT ANEMIA

19-129

Project Progress Report

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(Design document submitted in partial fulfilment of the requirement for the Degree of Bachelor of Science Special (honors) in information Technology)

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Declaration

I M.H.M.Akmal (IT16134072) hereby declare that this Project progress report entitled by IOT Device to detect Anemia submitted by me, under the supervision of Ms.Shahika Lokuliyana of Sri Lanka Institute of Information Technology is my own work and has not been submitted to any other University or Institute or published earlier.

Student ID	Name	Signature	Date
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1. Introduction

1.1 Purpose

The main purpose of this document is to provide a clear understanding how image processing would be applied in this project in detecting Anemia.

1.2 Scope

In image processing a Raspberry Pi is connected to the camera where it shall be taking the snapshots, and each will be sent to a location to be stored. These will be fetched, and the image processing would be done. The main scope of this is the technologies that will be used and the methodology to achieve the objectives.

1.3 Overview

The main goal of this project is to design a device so that the user is able detect whether they are diagnosed with Anemia or not. In this stage the detection of the symptoms of the disease is important. When a patient is diagnosed with Anemia many symptoms can be seen. But one of the key symptoms that can be seen in an anemia infected patient is that the amount of iron reduces which leads to the reduction of oxygen in the blood, makes the blood look pale than red. This is a key factor which we can detect without injecting and extracting blood. Therefore, we are designing a device where the picture of the fingertip, where plenty of blood capillaries are available by sending light and getting the image, then the image would be subjected to image processing where the image would be compared with a patient's image sample and a healthy person. Then would be decided whether infected or not and sent to the server.

2. Statement of Work

2.1 Background information and overview of previous work based on literature survey

Existing solutions

There have been many solutions using image processing for detecting anemia but by obtaining blood sample. For example, the project done by Siti Madihah Mazalan [1] they use red blood cells to detect anemia. In order to achieve that they are using blood samples and crops a red blood cell out and then detect the maximum radius of the cell using image processing and detect whether the patient is suffering from Anemia or not. Similarly, many projects have been done by extracting blood.

But the uniqueness of this project is that, we will not be taking blood out and do image processing rather send a beam of light through the finger tip and obtain the image and detect for anemia.

2.2 Identification and significance of the problem

The main unique part of this solution is that we have a image detection implemented on a finger tip rather than using an invasive method and detecting anemia. In image processing we shall be using implementing it from the raspberry pi rather than from a complex device. We shall be using Linux in the raspberry pi for this task and this is also a unique part of the project. In the samples that are collected from the patients are in a pale color rather than in the normal reddish color that can be seen in finger tips of healthy patients. So, getting a well-focused image at that proximity is also a challenge that would be faced by the team.

As we shall are using the non-invasive method to detect anemia it is less painful for the patient and specially anemia patients should not loose blood because the amount of oxygen carried is less and more blood loss could cause the patient fatigue more and lower the oxygen level, thus this method is adapted.

2.3 Technical objectives

The main technical objectives of this project is to make sure that we have proper focused images that can be run in the image processing algorithm that is being designed to check for the patient whether they are suffering from Anemia or not. The image should be sharp and clear so that the exact process to detect can be run.

For this purpose, we shall be using OpenCV as the tool to run the image processing. Matlab normally takes a lot of RAM as well as memory which we are unable to provide in the raspberry pie. The camera used should be of good quality. Therefore, we shall be using a camera with 4MP and we need a raspberry pie where we shall be installing Linux in order to install OpenCV and run the required steps in achieving the desired objectives. These are the most important software as well as hardware requirements that are needed for the development of the proposed device.

3. Research Methodology

In order to detect the change in the image that is taken from the developed device we shall be have a few prerequisites to be done. We should have OpenCV installed and configured so that the image can be fetched from the stored location for processing. Initially we should be able to get a well-focused and clear image of the finger tip so that it can be used in the Image processing process. In order to achieve this, we shall be following the below steps;

- Image Acquisition – We shall be retrieving the image from the used camera and it would be directed to a place of storage and we shall be fetching the image for processing from the stored location. In this stage no processing is possible as it will be acquiring the image in proper manner so that it can be used for image processing

- Image Pre-processing – when this step takes place, the noise that is there in the image is removed using different image pre-processing techniques like image clipping and etc. In this step we need mainly 5 sub-steps to be completed. They are;

    1. Read image – we store image path to a variable
    2. Resize image – all images inserted into an algorithm should be in same size therefore we have used two functions
    3. Remove noise – in this step we smooth our image
    4. Segmentation – We separate background from foreground
    5. Smoothing edges – we remove further noise [2].

- Image Segmentation – here we shall be diving the image into groups of pixels based on certain criteria's or features.
- Feature Detection – Here we can detect whether it's an image of the fingertip where the patient is diagnosed with anemia or whether the patient is heathy.

- Detection and classification – here we would be able to check whether the fingertip image taken from the user is diagnosed with anemia or not and classify whether the user is diagnosed or not and send the results to the server.

The below flow chart shows the steps that would be followed in the image processing steps;

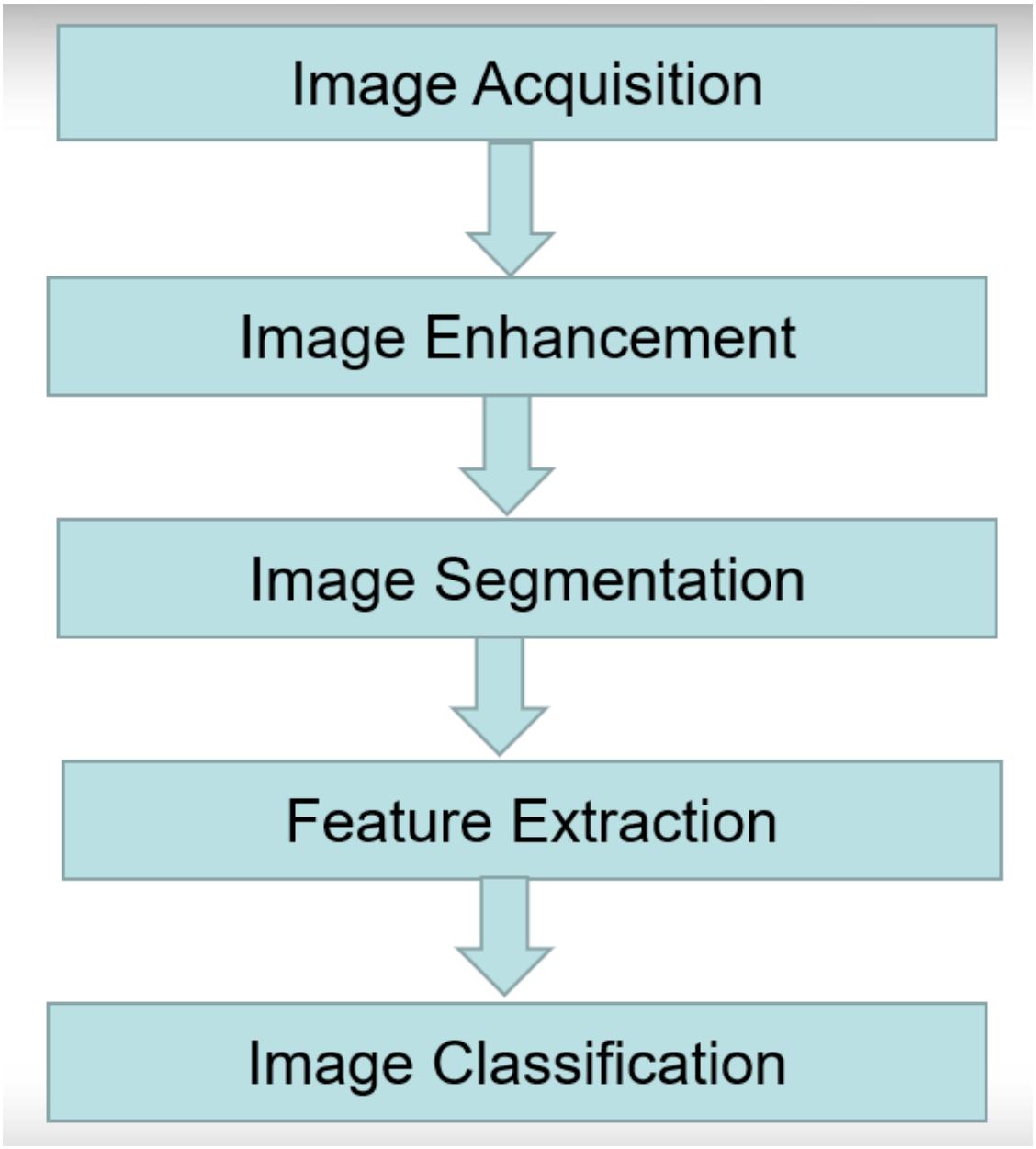

Figure 3.1: Steps in image processing

4. Test data & analysis

In this we are collecting sample from healthy as well as anemia diagnosed patients. We then take the picture of the finger tips and send the data to the raspberry pie where it would be stored in the database. Then when the users use the device the taken image after image processing would be compared with the diagnosed patients sample as well as healthy persons sample and would check whether the patient is diagnosed with anemia or not. For this we can collect a sample of 50 healthy as well as anemia diagnosed patient's sample.

It would be analyzed by the image processing algorithm. And then detected whether the patient is diagnosed with anemia or not. During the data analysis we shall be using Numpy where we would be analyzing the amount of Red, Green and blue in the image as well. Then we could also detect the amount of changes in the image.

5. Anticipated Benefits

This method would reduce the amount of blood loss from the patient, as in an anemia diagnosed patient the amount of blood that is in the bloody is vitally important as a major symptom for a patient to be diagnosed with anemia is due to huge amount of blood loss from the body. Therefore, we would be able to diagnose the disease without using an invasive method.

This would also reduce the cost level incurred by the user because the amount of cost that is given after every blood sample provided certain materials needs to be disposed but in this scenario, there is some materials that has to be disposed and is cost effective for the user.

The accuracy is also a matter that has to be considered when developing the device. Thus, when we are using image processing we shall be ensuring that every possible combination to ensure the accuracy as well as we will betaking inputs from the app to further ensure the confirmation of the disease. This would make it possible to detect the disease much easily in a more accurate, cost effective manner.

6. Project plan and schedule

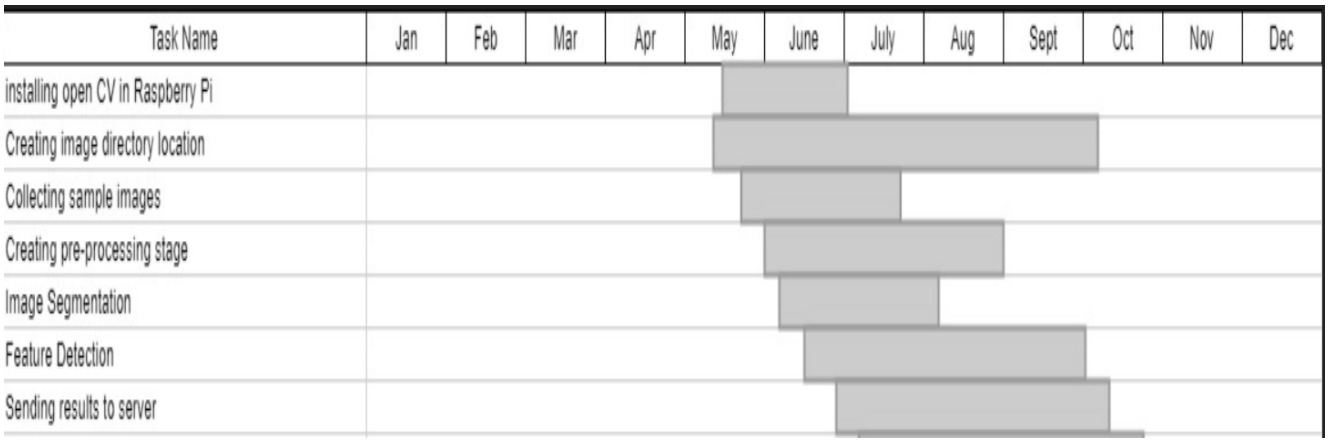

Figure 6.1: Gantt chart

This includes the Gantt chart for the image processing component

References

[1] N. H. M. Siti Madihah Mazalan, "Automated Red Blood Cells Counting in Peripheral Blood Smear Image Using Circular Hough Transform," IEEE, Johor, 2013.

[2] P. Canuma, "Image Pre-processing," Towards Data science , 10 October 2018. [Online]. Available: https://towardsdatascience.com/image-pre-processing-c1aec0be3edf. [Accessed 05 05 2019].