

IOT DEVICE TO DETECT ANEMIA

19-129

Project Progress Report

Supervisor: Ms.Shahika Lokuliyana

Author: 19-129 group

Bachelor of Science (Honors) in Information Technology Specialized in
Computer System and Network Engineering

Department of Information System Engineering

Sri Lanka Institute of Information Technology

Sri Lanka

May 2019

IOT DEVICE TO DETECT ANEMIA

19-129

Project Progress Report

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

Bachelor of Science (Honors) in Information Technology Specialized in
Computer System and Network Engineering

Department of Information System Engineering

Sri Lanka Institute of Information Technology

Sri Lanka

May 2019

Declaration

We team 19-129 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
IT16134072	M.H.M.Akmal		
IT16048324	M. Pravienth		
IT16123014	N. Kayanthan		
IT16136120	H.S.M.H. Fernando		

Table of Contents

1. Introduction	
1.1 Purpose	01
1.2 Scope	01
1.3 Overview	01
2. Statement of Work	
2.1 Background information and overview of previous work based on literature.....	02
2.2 Identification and significance of the problem	03
2.3 Technical Objectives	03
3. Research Methodology.....	04
4. Test data and analysis.....	04
5. Anticipated benefits.....	05
6. Project Plan and Schedule	06
References	08

1. Introduction

1.1 Purpose

The main purpose of this document is to provide a clear understanding on the progression of this project and the methodology that has been taken detect anemia using a non-invasive method.

1.2 Scope

Using a Raspberry Pi we shall be connecting it to the camera and get the pictures and that would be transferred to into a logic where we would be connecting it to the the image processing algorithm and the output is then sent to the server. Then it would get the details from the app and in the server the machine learning algorithm would be taking place making the the output appear in the app. The input which is taken from the finger tip, which is an image is then transferred to the server and then is processed to generate a proper output. The scope of this document is to provide a clear understanding on the progression of this project.

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. After the output from image processing is received then the input from the app is taken and an then machine learning algorithm in the server would decide whether the user is diagnosed with anemia or not.

2. Statement of Work

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

Existing solutions

Due to the increment in different types of diseases we need better technologies for the identification of these diseases which the patient is diagnosed from. There was a research conducted by Jamie Punter and five other members. In this research they obtain 50 μ L whole blood sample to test for anaemia. The main aim of the project is to get a portable device so that it can be used for instantaneous detection of anaemia. The developed device contains electronic instrumentalization, post processing software and plug and play disposable sensor. The disposable sensor is based on a three-gold electrode commercial sensor which is of low cost and 50 μ L of blood is required for the device to use in this test. In order to achieve a success with this device they had used 48 blood samples for testing of this device. These samples were collected from different clinics and hospitals for the task. Blood samples were distributed in two main groups as one for system calibration and the other 38 samples for system validation. The calibration of the device was done using a complete EIS experiment in this project to get accuracy in the detection of anaemia, defining the working range of haematocrit detection. So, in this project the specialty they had used an instant impedance detection in order to make sure they achieve accuracy, sensitivity and co-efficient of variation in this project. After the proper testing has been carried out only 2% accuracy error had been seen [1]. Therefore, this is a more successful device that is portable.

But the main difference between the project that we are developing, and this project is that we will be also developing a portable device, but our project is non-invasive where we will not be getting any blood samples to carry on any tests but rather make sure that the required input is taken from the symptoms. For this we shall be building a device with the necessary features with image processing integrated into it.

2.2 Identification and significance of the problem

This condition can be caused by an iron lacking diet, medical condition such as cancer, AIDS or women who are pregnant also would be also anemic due lower production of red blood cells, children also can be anemic due to genetic disorders of not producing enough red blood cells. The last cause of anaemia is the increased amount of red blood cells destruction by the spleen. This can be caused due to certain diseases that would cause our own body to destroy more red blood cells from our body. The second reason for this to happen would be an enlarged spleen that is causing the destruction of red blood cells that would cause anemic conditions in the patients [2].

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. We shall be sending the output from image processing to the server where the required details about symptoms can be taken from apps and processed in server and the output is generated back to the app. 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

The main methodology that is involved in the designing of this project is to build a simple device that has accuracy and give the user the ability to trust the results of the device. In order to achieve the objectives, the team have designed the project on 5 major steps.

- Building the hardware device
- Configuring Image processing
- Configuring connection between server and device
- Configuring the server and creating necessary channels to intake data from app
- Building the app
- Designing an algorithm in the server to process the data using machine learning algorithms

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. The data would be sent to the server will also be analyzed based on input from app.

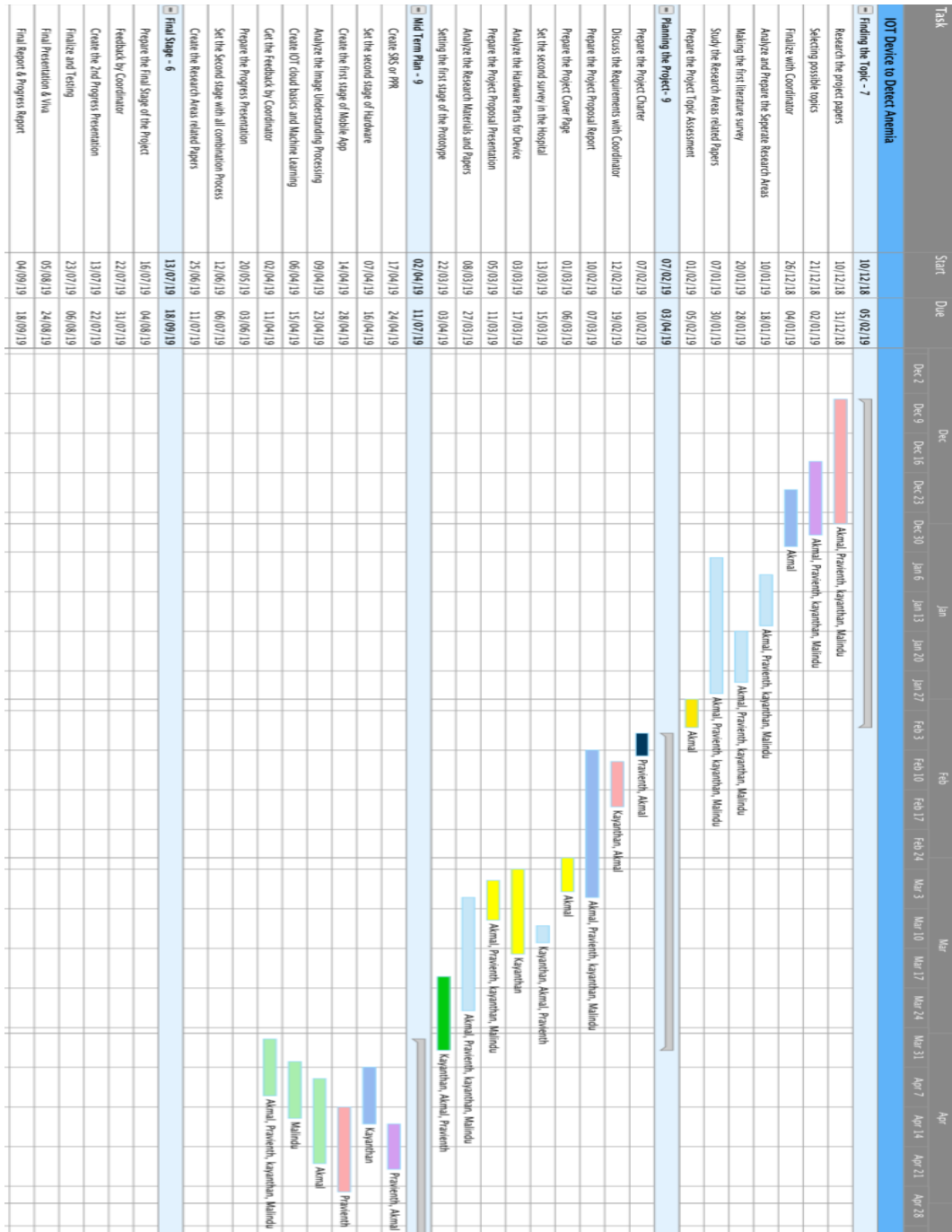
5. Anticipated Benefits

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 body 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 be taking 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



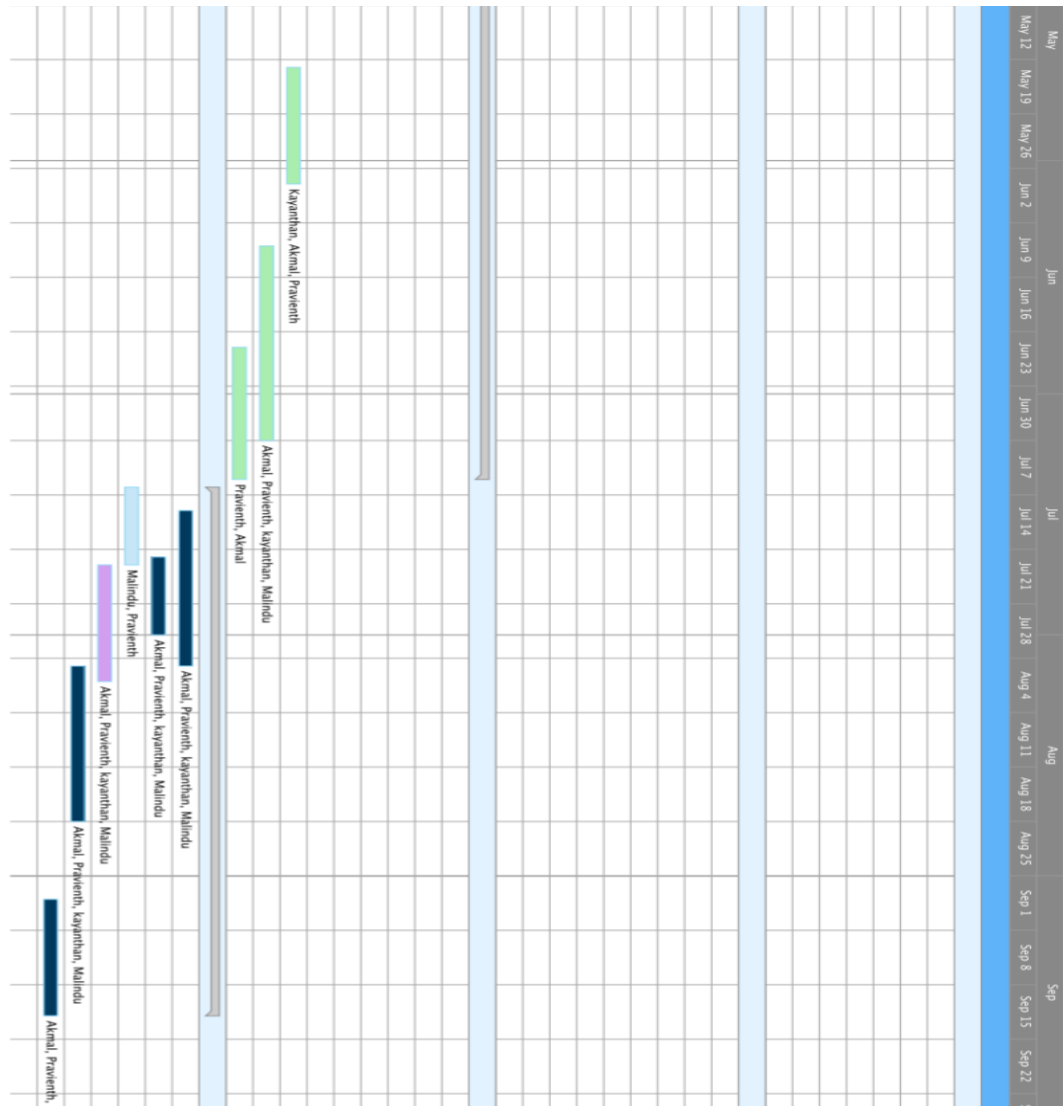


Figure 6.1: Gann Chart

The above figure demonstrates the rest of the Gannt chart that has been shown in the page above. This explains the work that would be done throughout the period of the project by the team members.

After the device has been built, the testing of the device should be done to know whether the device is functioning in accurate manner. In order to do that the team shall be testing the device on the patients whom we collected the data and come to a conclusion whether the device is generating accurate results or not.

References

- [1] J. Punter-Villagrasa, "Toward an Anemia Early Detection Device Based on 50- μ L Whole Blood Sample," Madrid, 2015.
- [2] J. C. a. R. Nall, "Iron Deficiency Anemia," Healthline, 17 July 2017. [Online]. Available: <https://www.healthline.com/health/iron-deficiency-anemia>. [Accessed 12 May 2019].
- [3] J. C. C.-F. R.-V. L. M.-C. Jaime Punter-Villagrasa, "Toward an Anemia Early Detection Device Based on 50- μ L Whole Blood Sample," IEEE, Madrid, 2015.
- [4] J. C. a. R. Nall, "Iron Deficiency Anemia," Healthline , 17 July 2017. [Online]. Available: <https://www.healthline.com/health/iron-deficiency-anemia>. [Accessed 13 February 2019].