

IOT DEVICE TO DETECT ANEMIA

19-129

Design Document

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13th of may 2019

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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 Kayanthan Navaratnarajah (IT16123014) hereby declare that this Design Document entitled IOT Device to detect Anemia submitted by me, under the supervision of Lecturer 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
IT16123014	N.Kayanthan		

Table of Contents

DECLARATION

ABBREVIATION

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

1.1 PURPOSE

1.2 SCOPE

1.3 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

1.4 REFERENCES

1.5 OVERVIEW

1.6 DOCUMENT ORGANIZATION

2. OVERALL DESCRIPTION

SANDBOX CONFIGURATION

CLUSTERING OF REPORTS

2.1 PRODUCT PERSPECTIVE

2.1.1 SYSTEM INTERFACES

2.1.2 USER INTERFACES

2.1.3 HARDWARE INTERFACES

2.1.4 SOFTWARE INTERFACES

2.1.5 COMMUNICATION INTERFACES

2.1.6 MEMORY CONSTRAINTS

2.1.7 OPERATIONS

2.1.8 SITE ADAPTATION REQUIREMENTS

2.2 PRODUCT FUNCTIONS

2.3 USER CHARACTERISTICS

2.4 CONSTRAINTS

2.5 ASSUMPTIONS AND DEPENDENCIES

2.6 APPORTIONING OF REQUIREMENTS

3 SPECIFIC REQUIREMENTS

3.1 EXTERNAL INTERFACE REQUIREMENTS

3.1.1 USER INTERFACES

3.1.2 HARDWARE INTERFACES

3.1.3 SOFTWARE INTERFACES

3.1.4 COMMUNICATION INTERFACES

3.2 ARCHITECTURAL DESIGN

3.2.1 HIGH LEVEL ARCHITECTURAL DESIGN

Introduction

1.1 Purpose

The Design Document (DD) is a document to provide documentation which will be used to aid in system development by providing the details for how the system should be built, tools and technologies, research study and development, functional and nonfunctional requirements of the system. Within the DD are narrative and graphical documentation of the system design for the project including use case models, collaboration models, object behavior models, and other supporting information.

This document will include most of the requirements in developing the proposed system,

Also a variety of interfaces such as user interfaces, software interfaces, hardware interfaces, communication interfaces and system interfaces, constraints and limitations under which the proposed system must be operated, functionality flow, performance related requirements and other system attributes involved in developing the system.

Interested set of audiences to this document are, supervisor, co-supervisor, project coordinators, developers, testers and end users.

1.2 Scope

This document contains high-level detailed description of the requirements gathered for implementing IOT Device to Detect Anemia, which will enable detection of Anemia. The scope of this DD document is bounded only to describe the functionalities embedded under detection procedure, tools and techniques to be used and relevant technologies referred for the implementation of the system. The overall system is developed that has a widespread of audience such as Medical analysts, Bio medical engineers and etc. The system is developed as a solution for find the Anemia that are existing in current Medical world. The main functionalities of the proposed system would contain are detecting Anemia, the system should be capture the picture of the color changing as red.

1.3 Definitions, Acronyms and Abbreviations

Terms	Definitions
DD	Design Document
ML	Machine Learning
OS	Operating System
IOT	Internet Of Things

Table 1

1.4 Overview

Global communication has become an important trend the current society and usage of internet has grown exponentially in the modern society. At the same time, disease are increases in our society. Our project mainly detects whether they are diagnosed with anemia or not. The patient is diagnosed with anemia may symptoms can be seen. That anemia patents have some specific amount of iron reduces of the oxygen in the blood cells. That blood looks pale than normal red. This devise to use for the capture a picture of the anemia patient fingertip. capture the picture by sending light under the finger. Then getting the picture and stored in SD card of the System Memory. that picture would be subjected to the image processing where the image would be compared with a effected patient's image sample. then after would be decided whether this person infect anemia or not. After that all the results are sent to the server for the app connectivity.

2 Overall Descriptions

The device typically developed to find an anemia. This device access to the IOT base. Now a day Most of the people are having an anemia. This device to use full for all kind of persons can be use easily. All the systems should be connecting to the cloud.

One of the main function of this system is to capture the image color of fingertip by using a camera module. The camera module is specially bold for the Raspberry Pi. This module had a Sony Exmore IMX219 sensor Capable of 4k30, 1080P60,720P1080 and 8MP still can be capture.

The main system is running by Raspberry Pi 3 model B. it have a more capable than Arduino. capture a fingertip color as red taken by under the LED white light. After that color changed will be captured by using camera module. Then after that image has been saved in to the Raspberry Pi Memory card. after That picture has to be ready for the image processing.

2.1 Product Perspective

The device is to be used for detecting anemia, the patent should check the anemia to using this device easily than other way to check. that means the patent can check the whether anemia or not without needle.

The device is capture the image from the fingertip under the white led light. This picture will be automatically taken by camera module. After that image will be stored in order to the Raspberry Pi Memory Card. After that picture ready to image process by using specific algorithm. After that result will be sent to the cloud server via Wi-Fi connection without any wires.

2.1.1 System Interfaces

The function mainly covers the back end of the system. This section mentions the system interfaces that system going to be used.

Linux Environment with Ubuntu OS for the Raspberry Pi 3.

2.1.2 User Interfaces

The function mentioned in the DD is an internal processing, so this function will not be going to have any user interfaces.

2.1.3 Hardware Interfaces

Raspberry Pi 3 Model B – Raspberry with Linux environment will be the main hardware Interface. Ubuntu is used as the operating System

Camera Module - Sony Exmore IMX219 sensor Capable of 4k30, 1080P60, 720P1080 and 8MP Camera module will be the main hardware for capture the image.

LED white light – LED light will be used for capture the red color density of the fingertip.

Wi-Fi Router – Wi-Fi router to provide an internet facility to the system.

2.1.4 Software Interfaces

C, C++ language: those language is used to configure the System settings and storage configuration.

Ubuntu OS: Entire project development will be done in Ubuntu OS based Raspberry Pi System..

Documentation related work: Microsoft Office 2013 will be used for creating of project documents. Diagramming tool Draw.io software for creating diagrams.

2.1.5 Communication Interfaces

Wi-Fi or access to internet connection: Provides internet facility to the application. With this switches, hubs and Ethernet cables are used for the network connectivity.

Switches, Hubs and Ethernet cables are used to build an internet connection to the system.

2.1.6 Memory Constraints

32GB micro SD card is a primary memory of the system.

2.1.7 Operations

All the systems are worked by the automatically, If any further modification is required, All those modifications will be done by the Mobile app.

2.1.8 Site Adaptation Requirements

- A Raspberry Pi with Ubuntu OS
- Recommended Memory 32GB micro SD card
- Internet access

2.2 Product Functions

Main function of the device is take fingertip image under the light and store the image to the system memory to the specific folder, and connect the system via using Wi-Fi connection. This system was align to take a specific color change of the fingertip as red. After that picture will be aniline with an anemia patent sample under using image processing method. When the person will be scanning they are finger under the LED light. All the images are will be take system itself .

2.3 User Characteristics

User of the system will be use medical engineers or security analysts who have the full knowledge about the cyber security.

2.4 Constraints

- Testing the system
 - Power one the system, after that scanning a figure tip whether photos will be captured or not.

2.5 Assumptions and dependencies

- If a result is to be identified minimum 80% should be matched with its behaviors that are fed into the system.
- There is no delay in getting the detailed reports after the anemia analysis.

2.6 Apportioning of requirements

Our system is aa well- planned product which is developed by analyzing the current problem faced in the medical world. The product is not customized based on any user requirements. The methodology of implementing the system may slightly different from the content described in this document. During system designing, requirements specified will not be changed and the system released will totally contains its purposes and objectives.

3 Specific requirements

3.1 External Interface Requirements

3.1.1 User Interfaces

The function mentioned in the DD is an internal processing, so this function will not be going to have any user interfaces.

3.1.2 Hardware Interfaces

Raspberry Pi 3 Model B – Raspberry with Linux environment will be the main hardware Interface. Ubuntu is used as the operating System

Camera Module - Sony Exmore IMX219 sensor Capable of 4k30, 1080P60, 720P1080 and 8MP Camera module will be the main hardware for capture the image.

220° wide Angle Fisheye lens

LED white light – LED light will be used for capture the red color density of the fingertip.

Wi-Fi Router – Wi-Fi router to provide an internet facility to the system.

- A Raspberry Pi with Ubuntu OS
- Recommended Memory 32GB micro SD card
- Internet access

3.1.3 Software Interfaces

C, C++ language: those language is used to configure the System settings and storage configuration.

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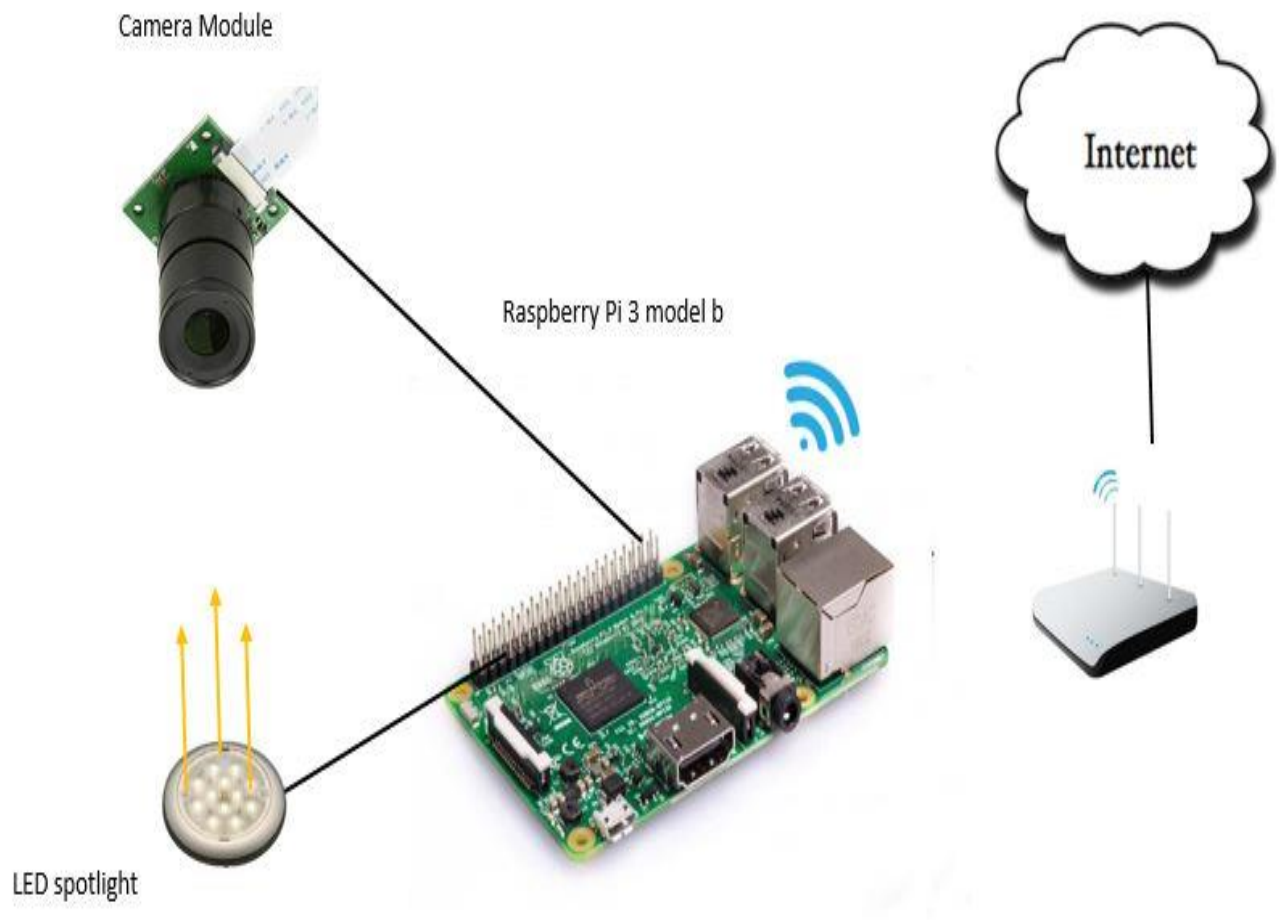
3.1.4 Communication Interfaces

Wi-Fi or access to internet connection: Provides internet facility to the application. With this switches, hubs and Ethernet cables are used for the network connectivity.

Switches, Hubs and Ethernet cables are used to build an internet connection to the system

3.2 Architectural Design

3.2.1 High level Architectural Design



Picture 1

3.2.2 Hardware and software requirements with justification

Hardware Requirements

Raspberry Pi 3 Model B – Raspberry with Linux environment will be the main hardware Interface. Ubuntu is used as the operating System. This model has a CSI (Camera Serial Int) for the special interface to connect the Camera module and this module faster than Arduino.

- CPU & Speed – Quad coretex A53@ 1.2Ghz
- RAM - 1GB
- GPU - Broadcom 400MHz Video Core IV
- USB Ports – 4USB 2.0 Ports
- Storage - Micro SD
- Wi Fi - 802.11n
- Bluetooth – 4.1

Camera Module - Sony Exmore IMX219 sensor Capable of 4k30, 1080P60,720P1080 and 8MP Camera module will be the main hardware for capture the image.

220° wide Angle Fisheye lens – this type of lens more capability to capture the wide angle images.

- Aperture F2.1
- Field of view 220°
- 6 element lens – 2 glass and 4 plastic
- Image circle – 2.80mm diameter
- Focal length 0.79mm
- Mount type M12
- Lens diameter 16mm
- IR Filter (RF- L220)

LED white light – LED light will be used for capture the red color density of the fingertip.

Wi-Fi Router – Wi-Fi router to provide an internet facility to the system.

- A Raspberry Pi with Ubuntu OS
- Recommended Memory 32GB micro SD card
- Internet access

Software Requirements

C, C++ language: those language is used to configure the System settings and storage configuration.

Ubuntu OS: Entire project development will be done in Ubuntu OS based Raspberry Pi System

Documentation related work: Microsoft Office 2013 will be used for creating of project documents. Diagramming tool Draw.io software for creating diagrams.

3.2.2 Risk Mitigation Plan with alternative solution identification

The photos will be capture itself, so we can't judge whether the image is good or not. So we put the display to this device.

3.2.3 Cost Benefit Analysis for the proposed solution

The development of this system was given by the medical company. During the completion of this system there can be some positives for the project group members.

3.3 Performance Requirements

- A Raspberry Pi with Ubuntu OS
- Recommended Memory up to 32GB micro SD card
- Fast Internet access

3.4 Design Constraints

Amid the outline arranges, the significant imperative to the advancement group was the impediment in time and accomplishing the turning points. In spite of the fact that the venture is relied upon to be finished inside a year, the time we get is not precisely a year. It's hard to make a system outline which matches industry gauges and comprises of legitimate plan designs. The procedure includes heaps of research on the related regions of improvement.

3.5 Software System Attributes

3.5.1 Reliability

Reliability plays a major role in this system. To have a system with high performance reliability is a must because it is a real-time application.

3.5.2 Availability

The device has a portable size and anyone can be use easily without any practice.

The device is working in a low voltage so nothing to worry use this device.

3.5.3 Security

The internal configuration can't be viewed by the user.

3.5.4 Maintainability

Keep it in silicone bag to product the device from the fungus infect.

3.6 Other Requirements

The system made is made so as to be very accurate in the task and perform in less amount of time. The exact expected outcome is given if the correct details are given to the system as input.

References

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- [2] D. Navani, *jaipur*, 2017.