

**DESIGN AND DEVELOPMENT OF A MOBILE APPLICATION: BLOOD
ANALYSIS**

BY

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181-15-11288

This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled “**Design and Development of a mobile application: Blood Analysis**”, submitted by **Asif Islam** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 16.05.2022.

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DECLARATION

I hereby declare that, this project has been done by me under the supervision of Touhid Bhuiyan, Professor & Head, Department of CSE Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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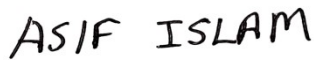
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Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

The rapid growth of smart phone technology with sensors has enabled physiological measurements, which can simplify self assessments, medical diagnosis and environmental monitoring etc. Smart phone today offers significant advantages over traditional platforms in terms of test speed, control, low cost, ease-of-operation, and data management, and requires minimal equipment and user involvement. This study investigates the feasibility of extracting heart rate, oxygen saturation, respiration rate, blood pressure using a cell phone camera in a non invasive way, without the need of external sensors which is independent of ambient lighting condition. The method works by placing people finger over the smart phone camera and computing the quantity of light absorbed by the finger tissue. The smart phone thus acquires the Photoplethysmographic (PPG) signal. From heart pulse, oxygen saturation, respiration rate, blood pressure are estimated by using a peak detection algorithm in order to find the local maxima of the PPG signal and computing the time difference between peaks. I have compared the accuracy of heart pulse, oxygen saturation, respiration rate, blood pressure estimated by our method with a camera sensor over three different controlled experimental conditions. The fast fourier transform (FFT) plots showed a clear frequency. This is a mobile application is being developed in order to measure and computed heart rate, blood pressure, all vital signs, respiration rate and oxygen saturation by doing image processing of blood cells.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In our society, People suffer from various kinds of health issues. We need to do our regular check up. Chronic diseases, like heart disease, stroke, diabetes, cancer and communicable diseases affect the health of millions of people and cost billions of dollars in medical expenses every year. These diseases often can be prevented by tracking risk factors, including high blood pressure, high cholesterol and elevated blood sugar levels under control. People also don't have easier access to medical care, so they have to run to the hospital any time they feel sick and take advice. So, if anyone becomes ill, they have two options: focus on the emergency care available to them, which may or may not be helpful, or go to a location where they may locate a trained medical assistant, which may be time-consuming as well as expensive. The purpose of this android project is to provide everyone a one-stop solution for checking heart rate, oxygen saturation, blood pressure respiration rate by image processing. They need to use their fingertips on the back camera for doing the test with “**Blood Analysis**” android application.

1.2 Objective

The main objective of this project is to help patient detect their heart rate, oxygen saturation, blood pressure respiration rate at home by their selves using an android application. Some more objectives are given below -

- Check heart pulse.
- Check blood pressure
- Check respiration rate
- Check oxygen saturation
- Tracking health problem
- Test by android application
- Less time consuming
- No cost

1.3 Motivation

In this modern era, technology has advanced to a level that is beyond our imagination. But still doing medical test at home is not so easier. Today most of us using online doctor portal to save our time. But we need to go to the nearest clinic or hospital to do certain test, So I want to solve this problem by using an android application.

With this application patient can check heart rate, oxygen saturation, respiration rate, blood pressure from anywhere.

1.4 Expected Outcomes

- Get heart pulse test report.
- Get blood pressure test report.
- Check respiration rate test report.
- Check oxygen saturation test report.
- Test can be conduct by an android application.
- Doctor can see report digitally without any extra tool.

1.5 Project Management and Finance

Project financial management goes to simply managing costs and planning, capturing, and managing costs on any projects. If the user needs to maintain a balance between the project investment and the expected benefits or returns associated with that project. My project is Blood Analysis. So, I think my project is a portfolio project. This project should maintain a balance between the project investment and the expected benefits. I think the overall impact on my business results. Blood Analysis project discusses approaches to project financial management that benefit the user by providing them with meaningful, powerful financial information that can be used to manage my business. So, I think the overall context and criteria of my Blood Analysis project provides powerful project finances and is followed by specific approaches for managing and reporting , planning on project and portfolio performance of my Blood Analysis project. Projects are correlated to the budgets that I have to fund it.

- Varieties calculations, budget and need to spend are unfailing across the portfolio.
- Financial performance for components within a portion of a project.
- Financial performance can be aggregated to continue the project and across. So, it is helpful for me.
- Project financial information is relevant to the Sponsor.
- I have to store the data on the server. So, I need funds to store the data to the server.

Table 1.5: Project Management and Finance

No	Task Name	Start Date (m/d/y)	Finish Date(m/d/y)	Duration(m/d/y)
1	Planning	6/12/2021	9/9/2021	89
2	Design	9/9/2021	11/3/2021	55
3	Coding	11/4/2021	2/18/2022	106
4	Delivery and Testing	2/19/2022	4/13/2022	53

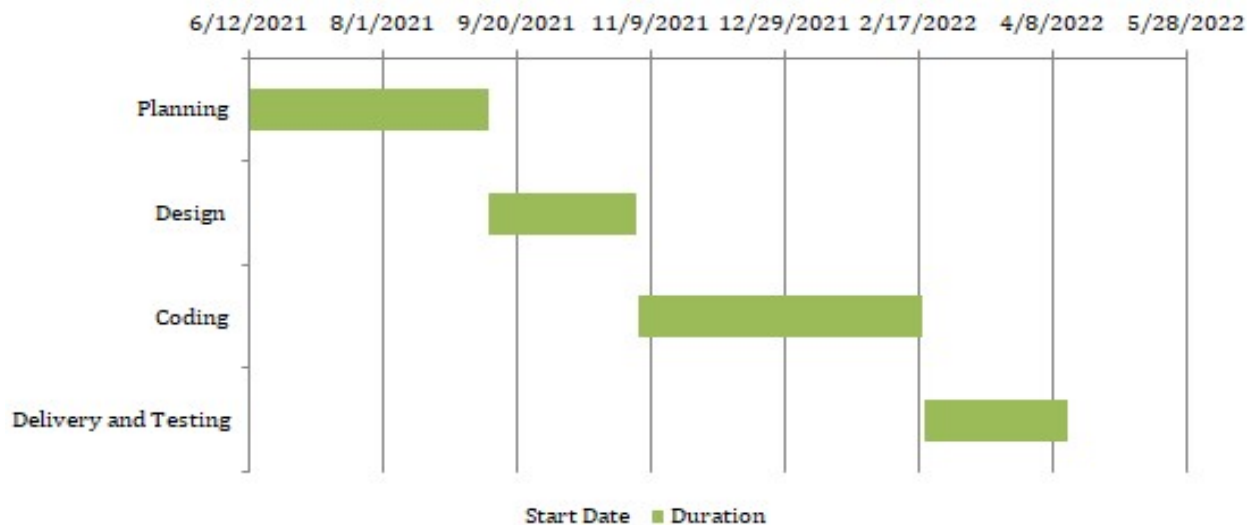


Figure 1.5: Gantt Chart

1.6 Report Layout

- In this chapter 1, there is a Introduction, here discusses about introduction, objectives, motivation and the expected outcome. Project Management and Finance of my project.
- In this chapter 2, there is a Background, here discusses about the background of Preliminaries/Terminologies, related work such as comparison with other app projects and website projects and check the problem to my project, the challenges is which are facing when the project do.
- In this chapter 3, there is a Requirement Specification, here give whose kind of requirements and work to the project such as business process modeling, requirement collection and analysis, use case modeling and description, Logical data model and design requirement
- In this chapter 4, there is a Design Specification, here The purpose of the design of the project. In this purpose there have two types of the design first is Front-end Design and other is Back-end, Interaction Design and User Experience (UX), Implementation Requirements The proper work in this project of the design is show with in detail.
- In this chapter 5, there are an Implementation and Testing, here Implementation of Database, Implementation of Front-end Design, Testing Implementation and Testing system of the project by the project, Test Results and Reports in this project.
- In this chapter 6, there are Impact on Society, Environment and Sustainability, here discuss about impact on society, impact on environment, ethical aspects, sustainability plan in my project.
- In this chapter 7, there are a Conclusion and Future Scope, here discussion about in this project and Conclusion of this project, here also discussed about which kind of thing I will add in future implementation scope in this project.

CHAPTER 2

BACKGROUND

2.1 Preliminaries/Terminologies

In today's world smart phone capabilities are increasing day by day. We can now analysis different kind of things with help of sensors. "**Blood analysis**" is an android application which takes user figure as input on the back camera with flash light turned on.

Camera takes multiple snaps and do image processing to calculate heart pulse, oxygen saturation, blood pressure, respiration rate. Patient can test these things at home and send data to doctor via online platform. No need to buy extra device, their smart phone will do all the jobs.

2.2 Related Works

There are some related works is available right now but no one is similar. Many of the systems have some limitations. Many of the systems are based on the Web or have only a one feature. From the study of this similar project, I got interested to develop this system where four features are combined in one app and give more accurate measurement. These are some related application in the play store – "Heart Rate pulse", "Pulse Oximeter Tracker".

2.3 Comparative Analysis

This "**Blood Analysis**" app is different from any other app in the market. There are some apps and websites, where they offer only one feature at a time. But I have combine four feature in one app using image processing. Patient can check or test heart rate, oxygen saturation, all vital signs, blood pressure and respiration rate easily from one app.

2.4 Scope of the Problem

Doing medical test from home still not very easy in the modern era. There are some problem scope given below -

- Need to visit to clinic for test
- Need to use extra device for test
- Need to wait for a long time to get test report
- Extra device is costly
- Operating via smart phone is not available
- One device cannot give all the faculties what an smart phone application can give
- Patience can't sent test result to the doctor via online medium so easily if needed

According to these problems, my mobile application makes solutions that will help patients to recover their problem. The patients can easily access the mobile application anytime and anywhere. This application is user friendly and very easy to use. This application has most importantly there is no privacy issue.

For Patients helps,

- Time saving
- The smart way of measuring
- Easily finds result
- Reduce cost
- Send their result to the doctor
- Reduce the test delay

For Doctors helps,

- Easily check patient Result
- No need for any extra test device
- Can know patient present health conditions

2.5 Challenges

No task is without challenges. Additionally, we encountered some challenges while completing my project.

Here are a few of the main issues that I have face:

- **Software Development Stage:** While developing “**Blood Analysis**”, I have to consider multiple Android versions.
- **Image Processing:** Capturing the fingertip and doing image processing to extract data.
- **Custom UI design:** As the standard UI cannot meet all of an application's requirements, I had to redesign the UI by customizing the options.
- **Camera Sensor:** Camera was sometime crashing while taking the finger measurement.
- **Security issues:** It is challenging to make the application and user data secure.
- **Power Management:** While doing the heavy image processing the battery was draining fast. I had to use android “**wakelock**” feature.
- **Testing State:** I needed to follow different testing strategies.
- **Java Programming Language:** I have to implement image processing and blood measurement logic in this mobile application through this language. It was very challenging.
- **Scalability:** I need to build my mobile application that is marketable to accept the latest technologies.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

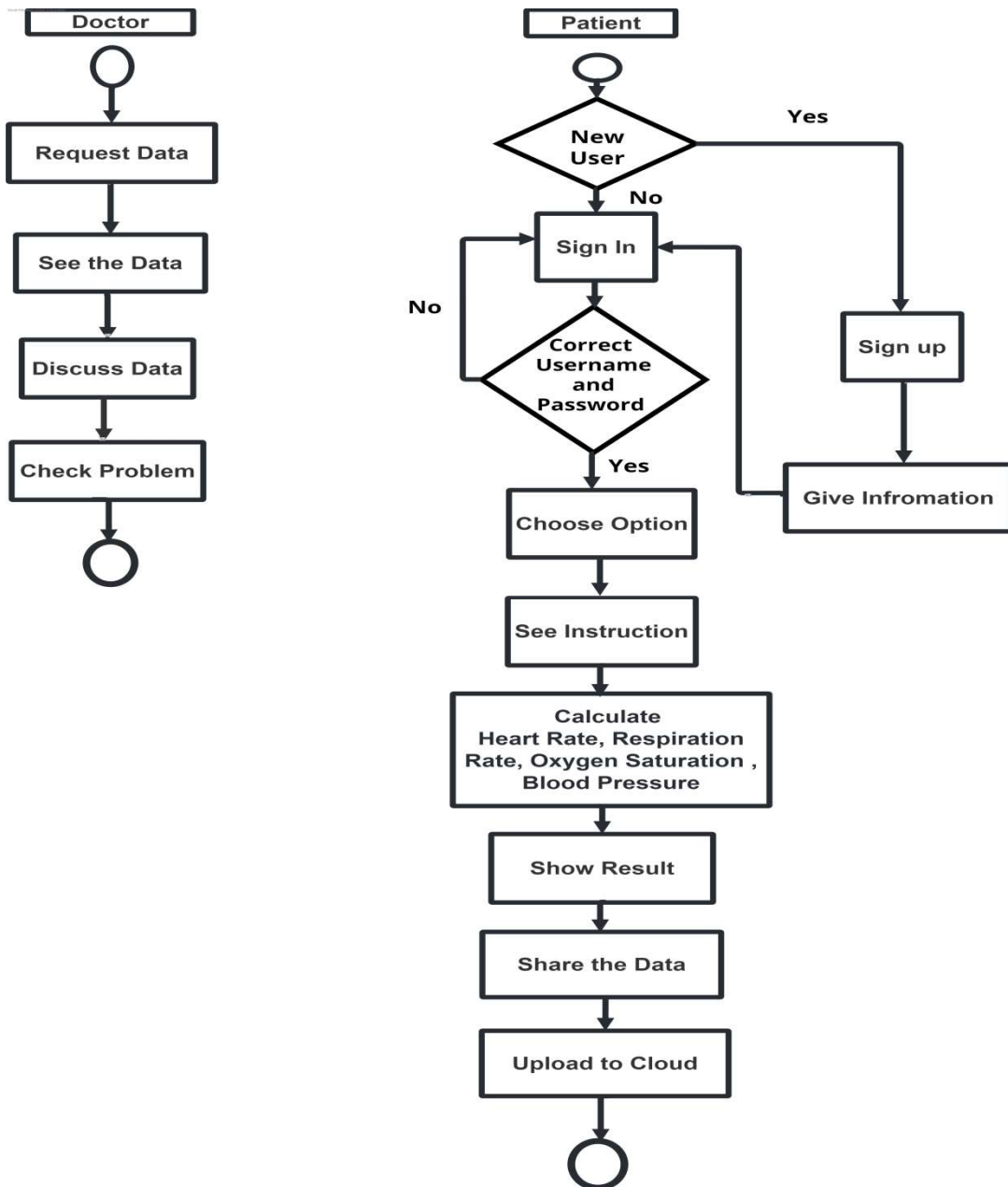


Figure3.1.1: Business Process Modeling

In this is Figure 3.1.1 is a Business Process Modeling. Here:

- Patient's can first Sign Up.
- Then the patient can Sign In the app.
- Then the patient takes a choose option from dashboard.
- Then the patient presses any button from dashboard.
- Then the patient put his finger on the camera sensor.
- The patient calculate the beats per minute from this app
- The patient sees the result and sends the data by share data button.
- The patient can upload data to cloud.
- The doctor can see patients test result.
- Then the doctor can discuss the data and check the problem.
- Then the doctor gives medicine to his patients.

This Business Process Modeling will show how to patient's send the beats per minute data and the doctor can see the result.

3.2 Requirement Collection and Analysis

This app should Requirement have:

- User Interface
- Scope
- Verification
- Limitation

User Interface: User Interface is very needed for an application. It helps to give results for design.

Scope: This app calculate BPM and show their result by using camera sensor.

Verification: My app will work excellently. User can verify this app very easily.

Limitation:

- Need to put finger on camera properly.
- Sometime may not give 100% accurate result.
- We will provide high security in future.
- Need to have smart phone with camera and flashlight

3.2.1 Methodology:

The method started with a human placing his finger over the phone camera without pressing down any additional force and the smart phone camera's flash turned on. User need to keep his finger for 26 sec on the camera to give finger tips measurement. RGB components were extracted from every frame by image processing. The red and green values were used to compute the average of light absorbed by the finger tissue in every frame. Thus, the PPG signal is acquired and used to extract data. The red and green intensity average in the PPG signal formed peaks that correspond to cardiac pulse. A peak detection algorithm was used to find all the cardiac peaks in the signal. Once a peak was found, the time difference between consecutive peaks was calculated. After this, the Fast Fourier Transform (FFT) of the heart rate was computed. I observed that the FFT plots showed a clear harmonic peak at the frequencies, which corresponded to the respective respiration rate.

The R-R interval is used for measurement heart rate using the formula is given below:

$$\text{Heart Rate} = 26 / \text{RR}$$

YUV data to convert RGB. Here Cr is a U and Cb is a V:

$$\text{Cr} = \text{Cr} - 128;$$

$Cb = Cb - 128;$

$R = Y + Cr + (Cr \gg 2) + (Cr \gg 3) + (Cr \gg 5);$

$G = Y - ((Cb \gg 2) + (Cb \gg 4) + (Cb \gg 5)) - ((Cr \gg 1) + (Cr \gg 3) + (Cr \gg 4) + (Cr \gg 5));$

$B = Y + Cb + (Cb \gg 1) + (Cb \gg 2) + (Cb \gg 6);$

In this app I used Fast Fourier Transform to store in an array to Red and Green intensities. The formula is given below:

$$F(\omega) = \int_{-\infty}^{\infty} f(t) e^{-i\omega t} dt$$

$$f(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(\omega) e^{i\omega t} d\omega$$

Figure 3.2.1: Fast Fourier Transform formula

The Respiration Rate I used Fft2. The Fft2 is a bandpass filter should be 0.1 Hz to 0.4Hz with 0.2Hz.

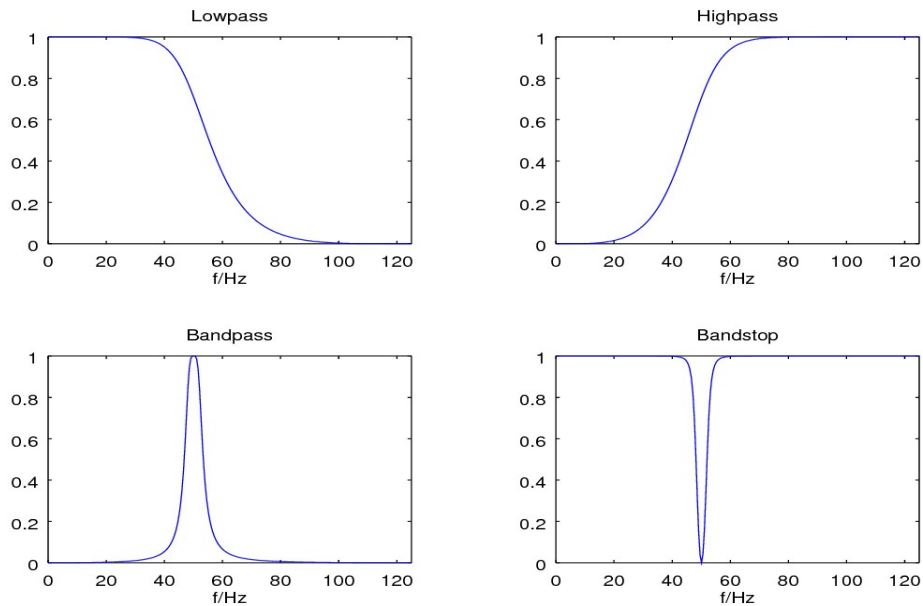


Figure 3.2.2: Fast Fourier Transform frequency

In this project I use the waterfall model. This model is commonly used to create the development life cycle. Why I use this model it is given below:

- It presents clear projects.
- It is easy to use.
- It is easy to test and debug.
- It can be easily understand and managed.

Waterfall Model

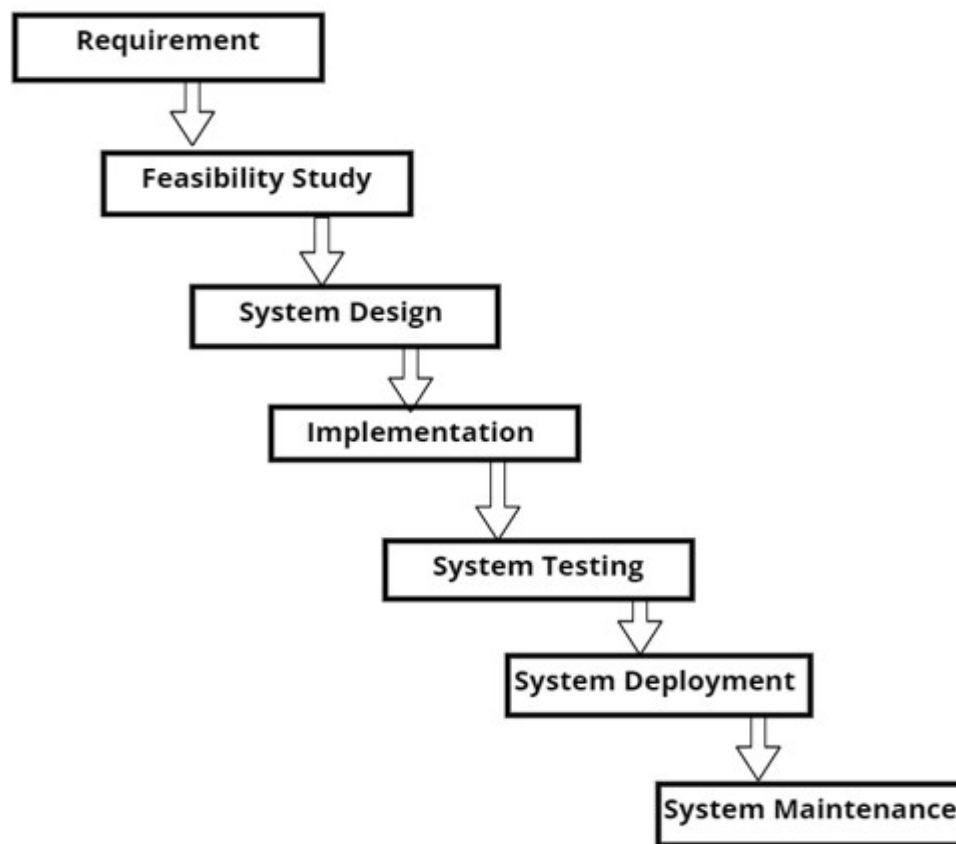


Figure 3.2.3: Waterfall Model

Project Management Life Cycle:

It is a framework via which to translate knowledge into reality in an exactly.

This is a higher process for a successful to my project. Through this, the life cycle of each project is described. The following picture shows the steps of its life cycle:

- Starting
- Planning
- Executing
- Handling
- Ending

Life Cycle

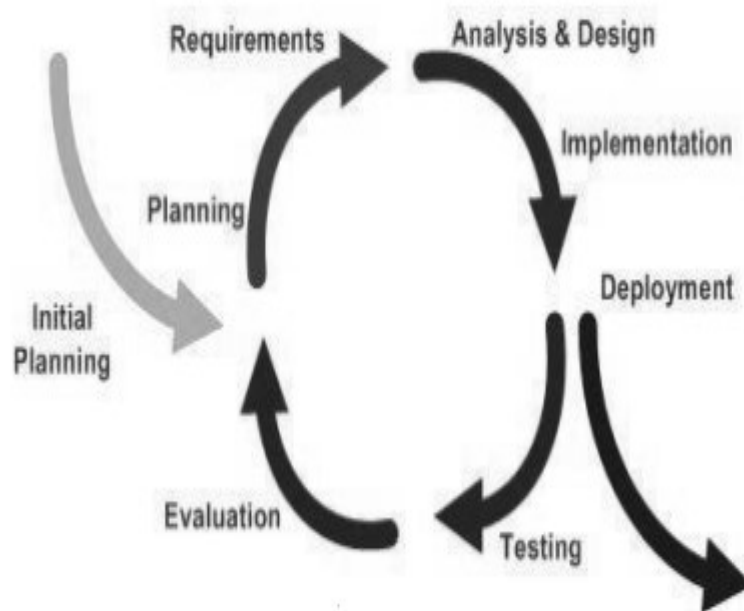


Figure 3.2.4: Iterative and Incremental Life Cycle

3.3 Use Case Modeling and Description

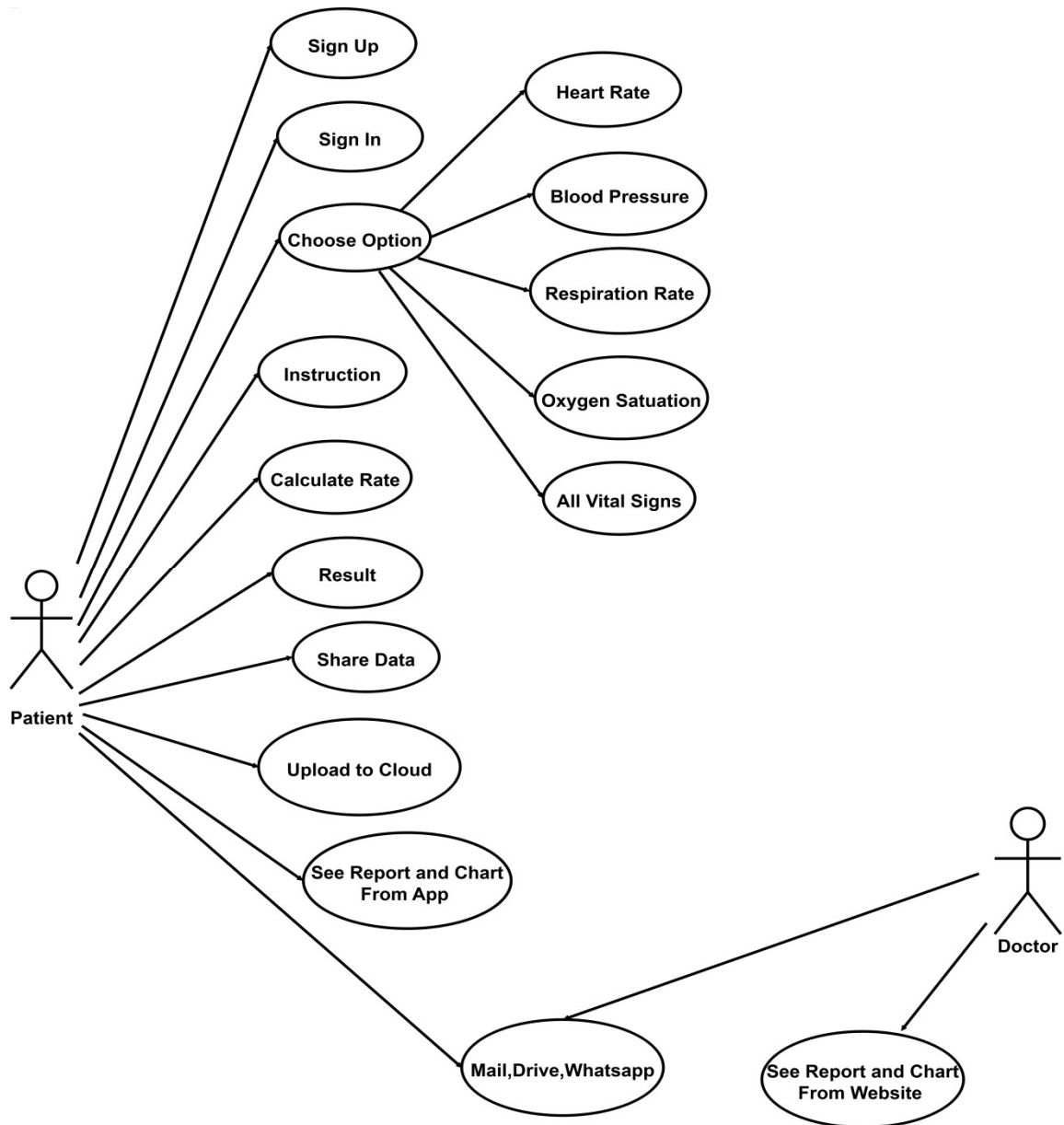


Figure 3.3.1: Use case model

In this is Figure 3.3.1 is a Use Case Modeling. Here:

Use case 1: Sign Up

Actor: Patient

Precondition: No precondition is required

Success Scenario:

1. Actor enters the Username.
2. Actor enters the Password.
3. Actor enters the Conform Password.
4. Actor enters the Age.
5. Actor enters the Mail.
6. Actor enters the Height.
7. Actor enters the Weight.

Exception Scenario:

1. Correct Password, Conform Password, Age, Mail, Height, Weight.

Use case 2: Sign In

Actor: Patient

Precondition: No precondition is required

Success Scenario:

1. Actor enters Username in the Username box.
2. Actor enters Password in the password box.
3. Actor enters his or her credentials by pressing the login button.

Exception Scenario:

1. The password is incorrect.
2. There is no password.

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Use case 3: Choose Option

Actor: Patient

Precondition: No precondition is required

Success Scenario:

1. Actor pressing the Heart Rate button.
2. Actor pressing the Respiration Rate button.
3. Actor pressing the Blood Pressure button.
4. Actor pressing the Oxygen Saturation button.
5. Actor pressing the All Vital Signs button.

Exception Scenario:

1. Have no any.

Use case 4: Instruction

Actor: Patient

Precondition: Select Heart Rate, Respiration Rate, Blood Pressure, Oxygen Saturation or All Vital Signs button

Success Scenario:

1. Actor Know about measuring their BPM.

Exception Scenario:

1. Choose any Heart Rate, Respiration Rate, Blood Pressure, Oxygen Saturation or All Vital Signs button it is not work.

Use case 5: Calculate BPM

Actor: Patient

Precondition: Select Heart Rate, Respiration Rate, Blood Pressure, Oxygen Saturation or All Vital Signs measurement button.

Success Scenario:

1. Actor put his finger on the sensor.

Exception Scenario:

1. If move his finger on the sensor it do not measurement.

Use case 6: Result

Actor: Patient

Precondition: Select Heart Rate, Respiration Rate, Blood Pressure, Oxygen Saturation or All Vital Signs measurement button then measuring their BPM.

Success Scenario:

1. Actor sees their result.
2. Send their result to Mail, Drive, Whatsapp.

Exception Scenario:

1. If move his finger on the sensor it do not measurement.

This Use Case Modeling will show how to patient's send the beats per minute data and the doctor can see the result.

3.4 Logical Data Model

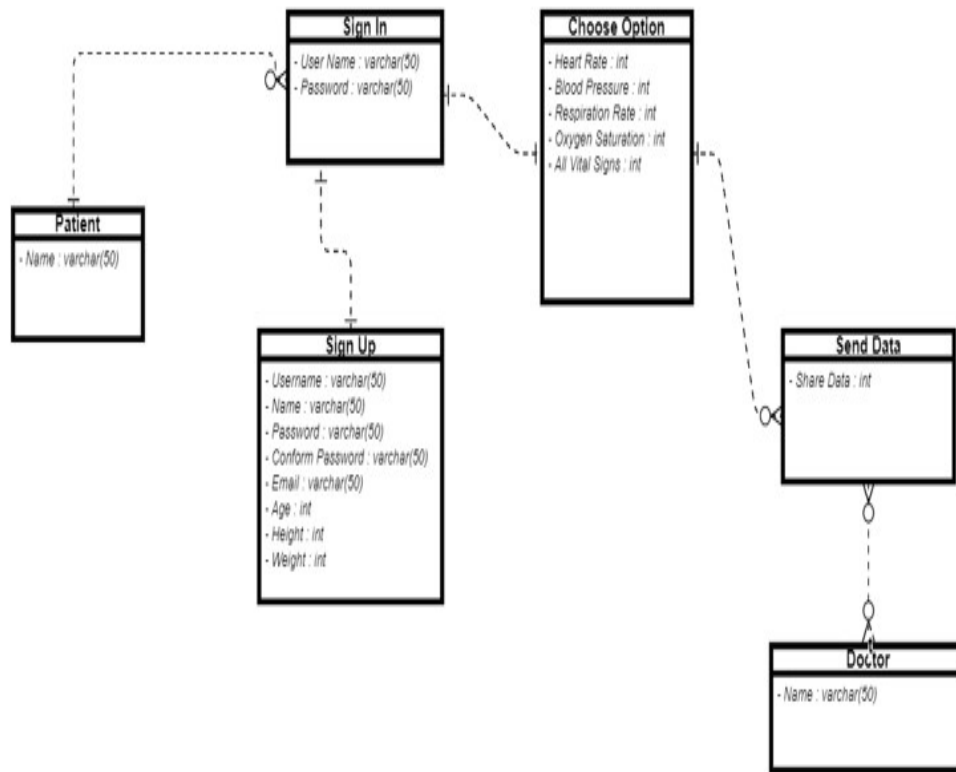


Figure3.4.1: Logical Data Model

In this Figure 3.4.1 is a Logical Data Model. Here have two people. Such as:

- Patient and
- Doctor

Patients has:

- Patient name

- Sign Up the app
- Sign In the app
- Measurement BPM and shared result

Doctor has:

- Doctor name
- See result

3.5 Design Requirement

I am designing my project by XML to design the app by layout, In JAVA I calculate the BPM and calculate result and In website design by using HTML, CSS, BOOSTRAP.

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end Design

The front-end is everything the patients can see on a mobile app. In this project I have used XML in the Front-end Design in the android application. In the website I have used HTML, CSS, JAVASCRIPT

Sign In

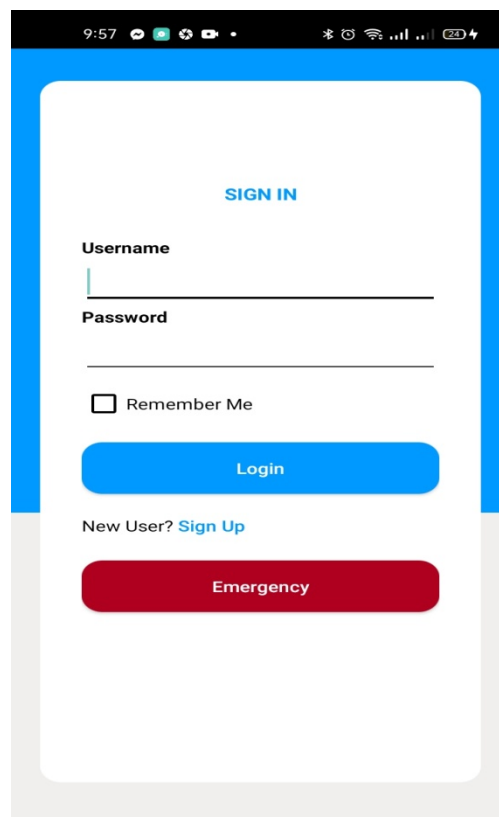


Figure 4.1.1:Sign In

This is a Sign in for Design and Development of a mobile application: Blood Analysis. Patient can see a login button. This activity will show Username and Password for login this app and they can show a button for going to another activity. If the patient forgets their password then they can sign up from Create New Account.

Sign up

SIGN UP

Username

Name

Password

Confirm Password

Email

Age

Height

Weight

Gender

Male

Back to [Log In](#)

Sign Up

Figure 4.1.2: Sign up

This is a Sign up for Design and Development of a mobile application: Blood Analysis. Patient can see a Create New Account button. This activity will show Username, Name, Password, Confirm Password, Email, Age, Height, Weight, Gender for Create New Account this app and they can show a button for going to another activity.

Home

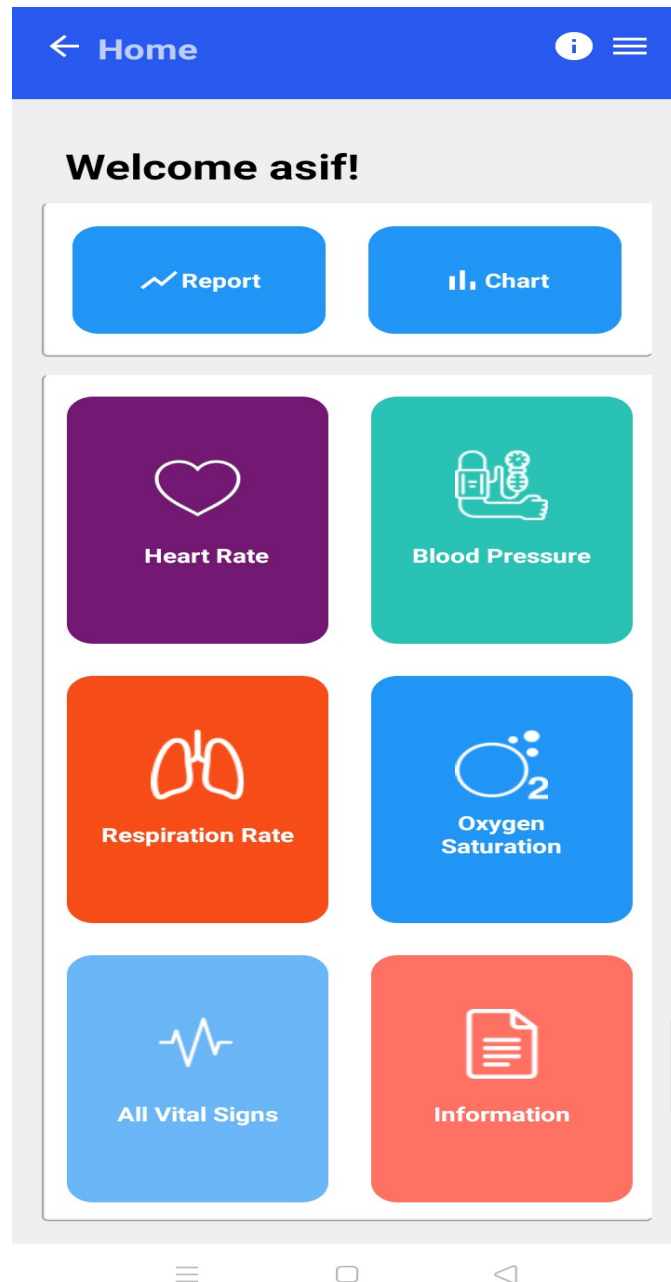


Figure 4.1.3: Home

This is a I give 6 Choose type of Heart Rate, Respiration Rate, Blood Pressure, Oxygen Saturation, and All Vital Signs and I also give back, about, navigation bar button. Patient can see in this page.

Heart Rate Instruction

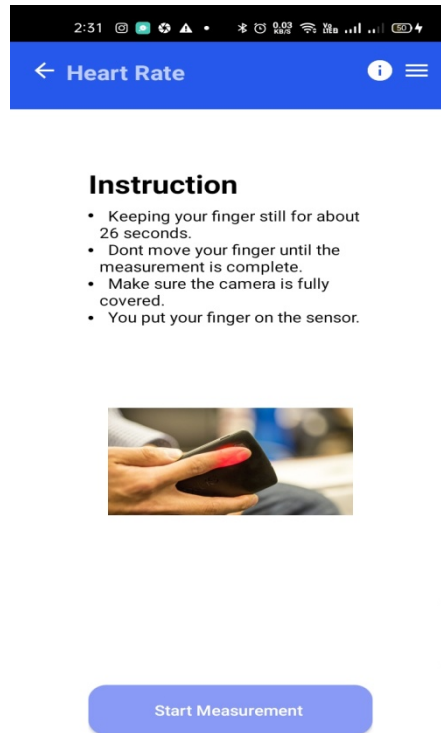


Figure 4.1.4: Heart Rate Instruction

This is a Instruction for measurement of Heart Rate. Patients can see Instruction how to measurement of Heart Rate from the Instruction and click the Start Measurement button. After pressing Start Measurement button, then it go to the Heart Rate process.

Calculate Heart Rate

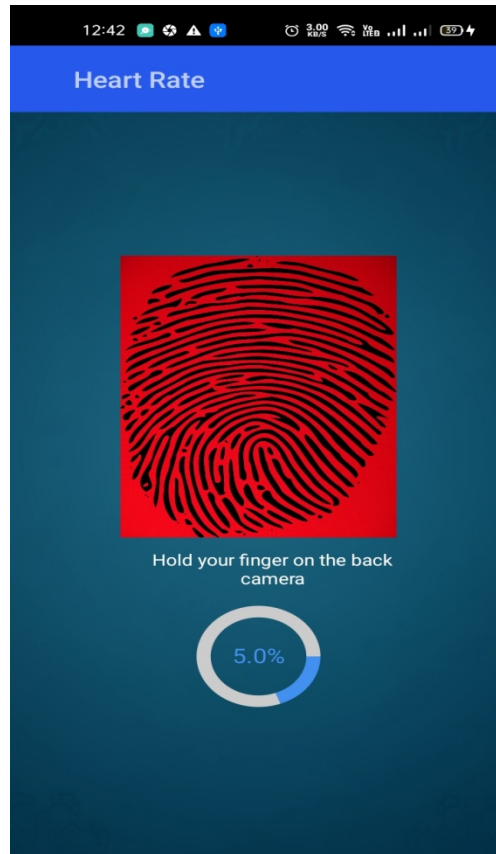


Figure 4.1.5: Calculate Heart Rate

This is a calculate heart rate for measurement of heart rate activity. Here a camera is call SurfaceView and a progressbar. Patient have to put their finger on the camera sensor then it calculates the bpm and show result in next activity.

Heart Rate Result

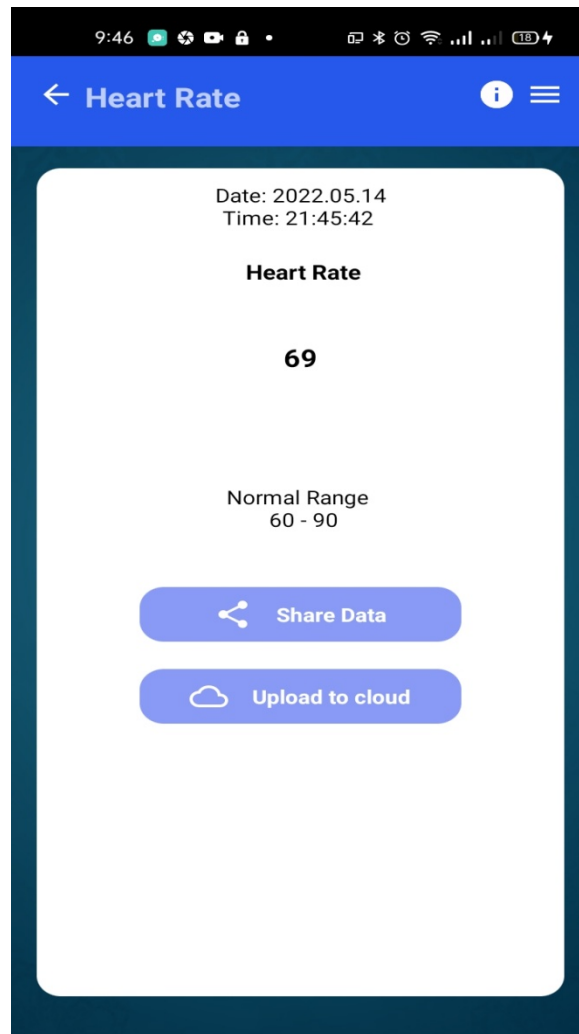


Figure 4.1.6: Heart Rate Result

This is a heart rate result. In this activity have date and time, two button. One button is a Share data and another is a upload to cloud button. Patient can see their heart rate result in this activity and share the data via mail, drive, whatapps and website and the doctor can see this data from the website.

Blood Pressure Instruction



Figure 4.1.7: Blood Pressure Information

This is a Instruction for measurement of Blood Pressure. Patients can see Instruction how to measurement of Blood Pressure from the Instruction and click the Start Measurement button. After pressing Start Measurement button, then it go to the Blood Pressure process.

Calculate Blood Pressure

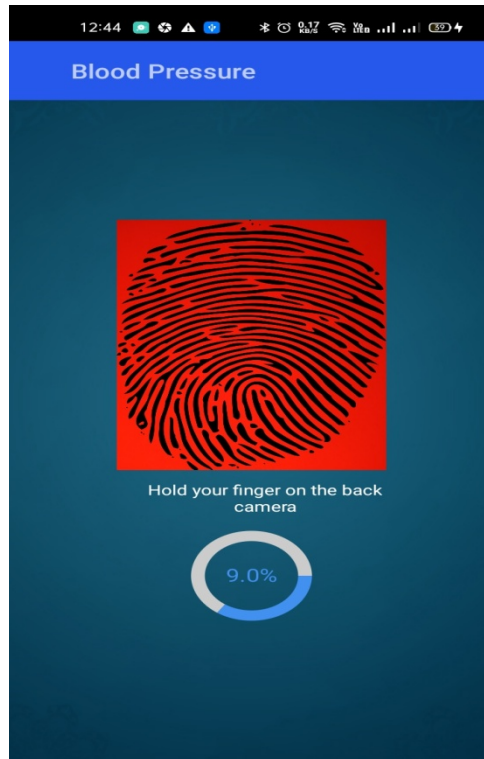


Figure 4.1.8: Calculate Blood Pressure

This is a calculate blood pressure for measurement of blood pressure activity. Here a camera is call SurfaceView and a progressbar. Patient have to put their finger on the camera sensor then it calculates the blood pressure and show result in next activity.

Blood Pressure Result



Figure 4.1.9: Blood Pressure

This is a Blood Pressure result activity. In this activity have date and time, two button. One button is a share data and another is a upload to cloud button. Patient can see their blood pressure result in this activity and share the data via mail, drive, whatapps and blood analysis website and the doctor can see this data from the blood analysis website.

Respiration Rate Instruction

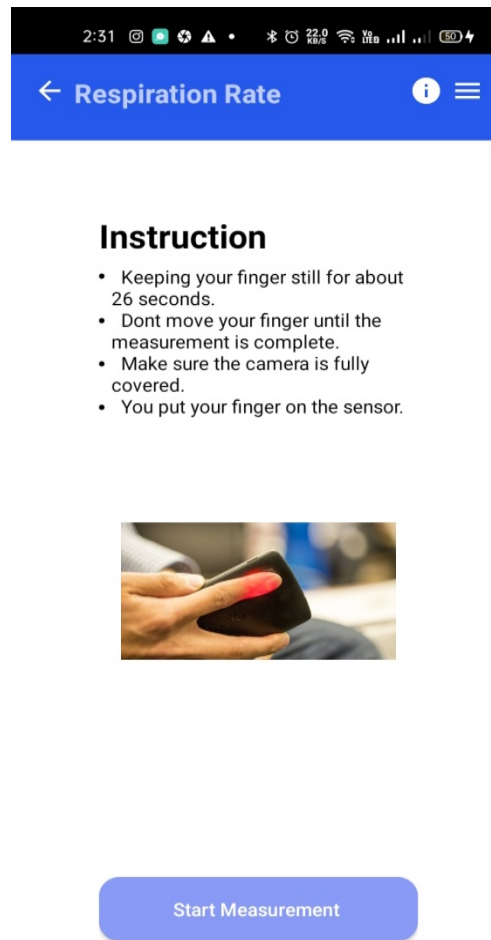


Figure 4.1.10: Respiration Rate Instruction

This is a Instruction for measurement of Respiration Rate. Patients can see Instruction how to measurement of Respiration Rate from the Instruction and click the Start Measurement button. After pressing Start Measurement button, then it go to the Respiration Rate process.

Calculate Respiration Rate

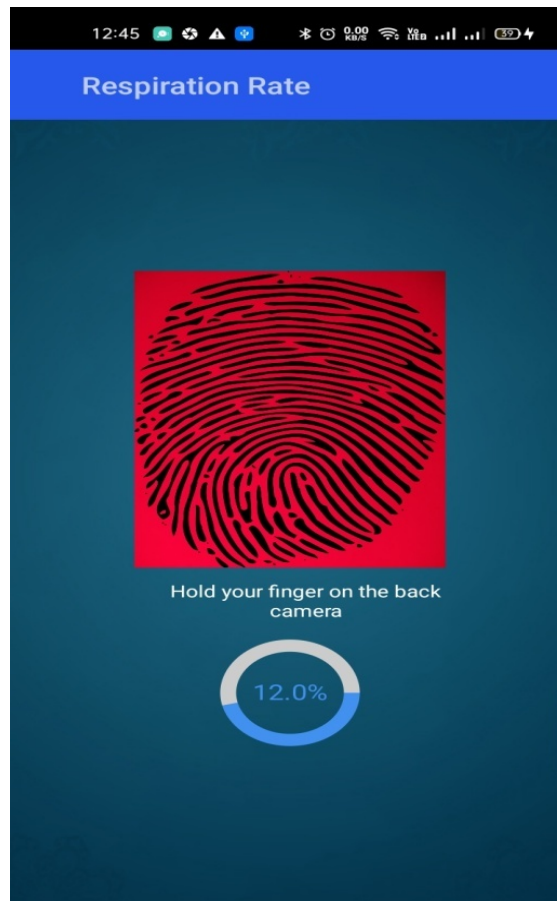


Figure 4.1.11: Calculate Respiration Rate

This is a calculate respiration rate for measurement of respiration rate activity. Here a camera is call SurfaceView and a progressbar. Patient have to put their finger on the camera sensor then it calculates the respiration rate and show result in next activity. If respiration rate is 12-20 then it is normal.

Respiration Rate Result

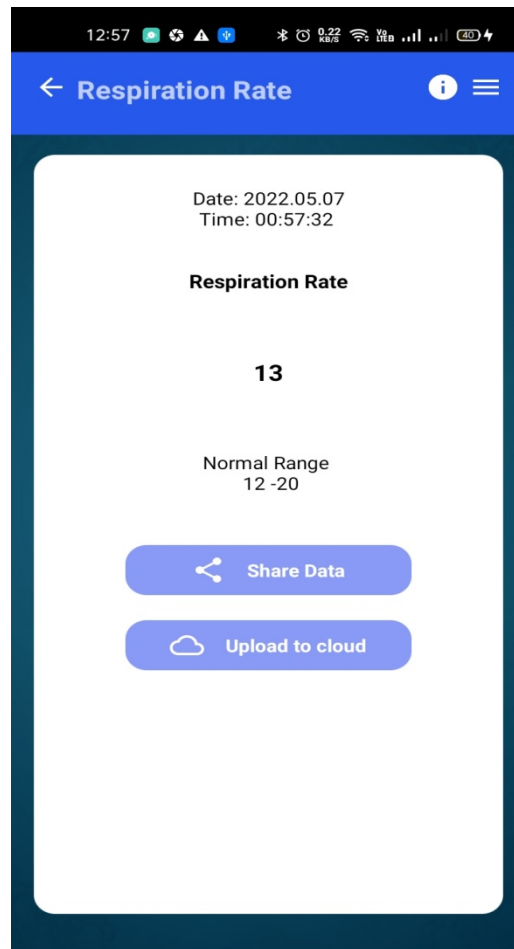


Figure 4.1.12: Respiration Rate Result

This is a respiration rate result activity. In this activity have date and time, two button. One button is a share data and another is a upload to cloud button. Patient can see their a respiration rate result in this activity and share the data via mail, drive, whatapps and blood analysis website and the doctor can see this data from the blood analysis website.

Oxygen Saturation Instruction

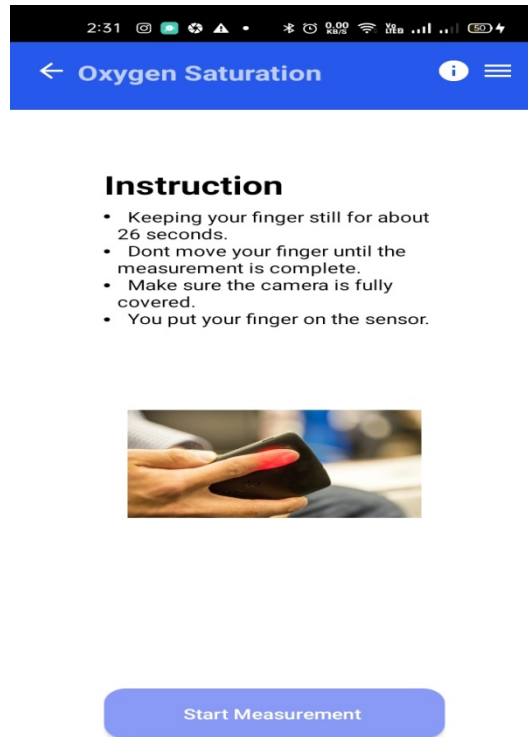


Figure 4.1.13: Oxygen Saturation Instruction

This is a Instruction for measurement of Oxygen Saturation. Patients can see Instruction how to measurement of Oxygen Saturation from the Instruction and click the Start Measurement button. After pressing Start Measurement button, then it go to the Oxygen Saturation process.

Calculate Oxygen Saturation

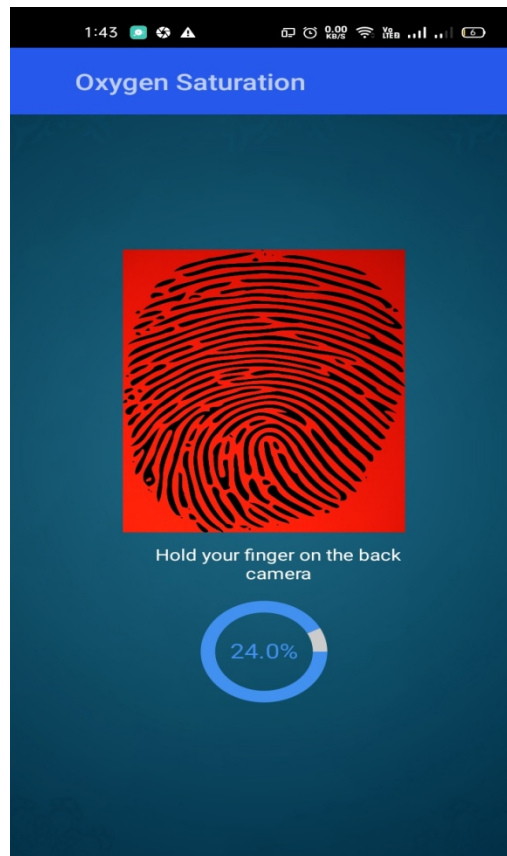


Figure 4.1.14: Calculate Oxygen Saturation

This is a calculate oxygen saturation for measurement of oxygen saturation activity. Here a camera is call SurfaceView and a progressbar. Patient have to put their finger on the camera sensor then it calculates the oxygen saturation and show result in next activity.

Oxygen Saturation Result

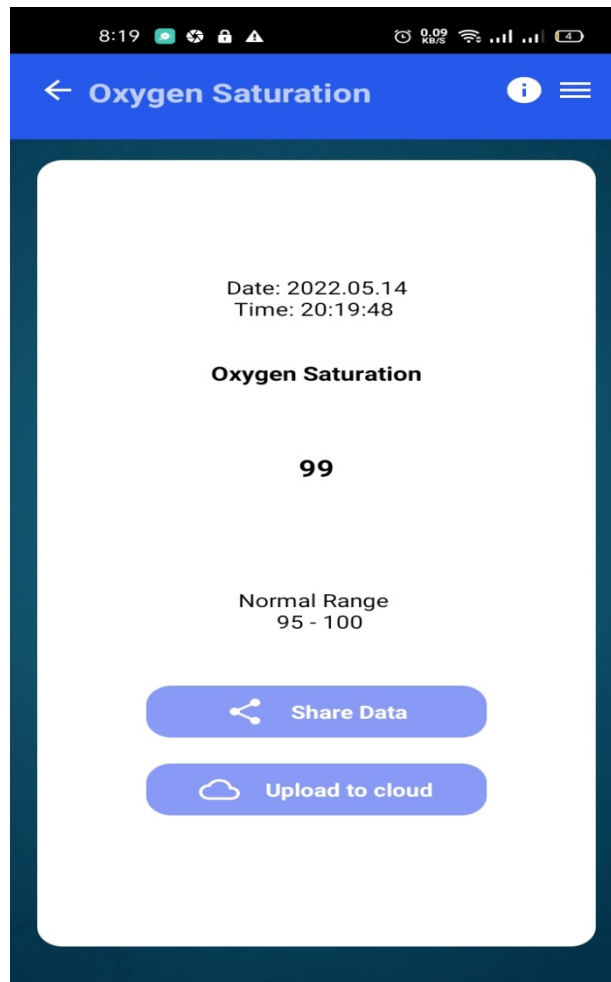


Figure 4.1.15: Oxygen Saturation

This is a oxygen saturation result activity. In this activity have date and time, two button. One button is a share data and another is a upload to cloud button. Patient can see their a oxygen saturation result in this activity and share the data via mail, drive, whatapps and blood analysis website and the doctor can see this data from the blood analysis website. If oxygen saturation between 95 to 100 then it is normal.

All Vital Signs Instruction



Figure 4.1.16: All Vital Signs Instruction

This is a All Vital Signs Instruction for measurement of All Vital Signs. Patients can see Instruction how to measurement of All Vital Signs from the Instruction and click the Start Measurement button. After pressing Start Measurement button, then it go to the All Vital Signs process.

Calculate All Vital Signs

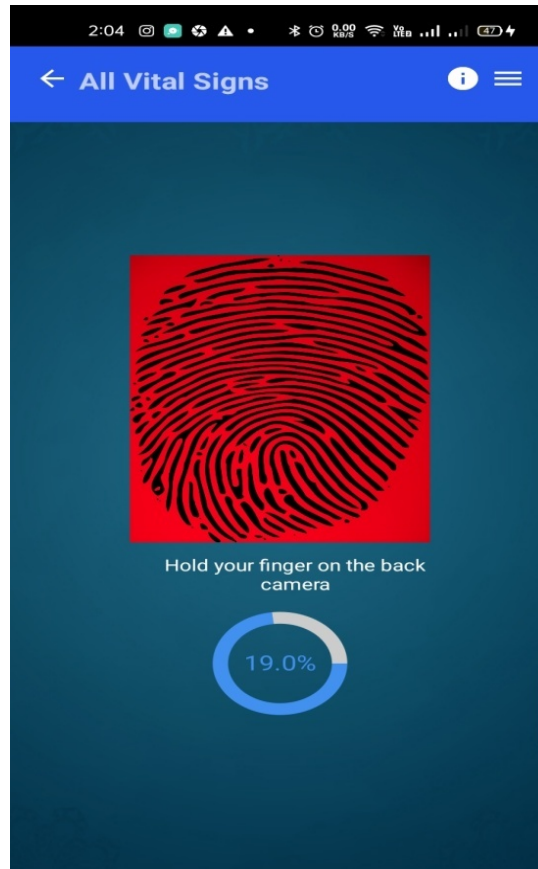


Figure 4.1.17: Calculate All Vital Signs

This is a calculate all vital signs for measurement of all vital signs activity. Here a camera is call SurfaceView and a prograssbar. Patient have to put their finger on the camera sensor then it calculates the all vital signs and show result in next activity.

All Vital Signs Result

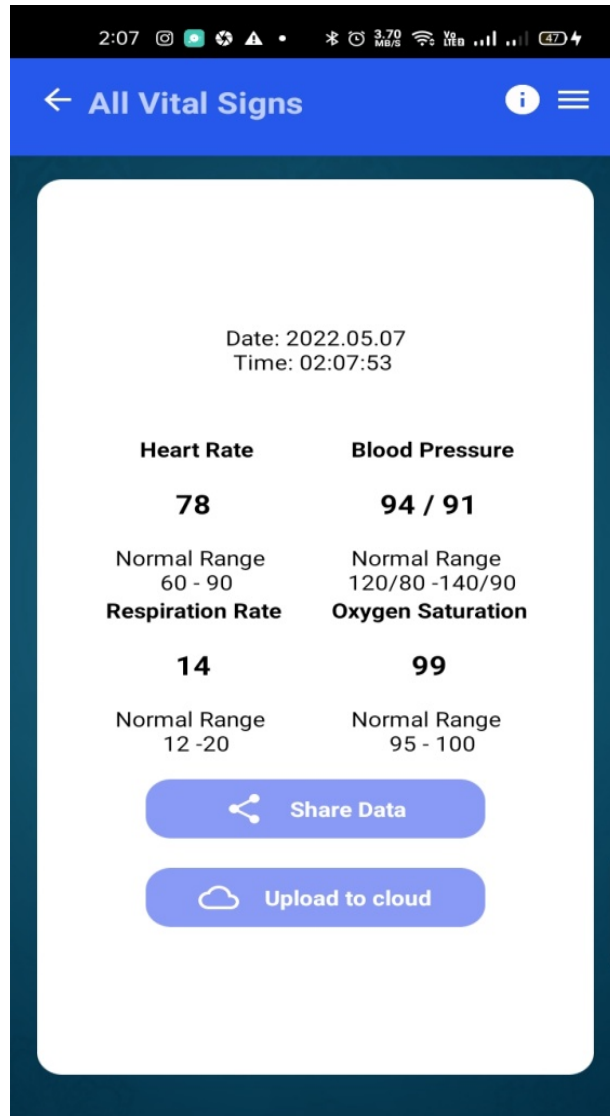


Figure 4.1.18: All Vital Signs Result

This is oxygen saturation , heart rate, blood pressure and respiration rate result activity. In this activity have date and time, two button. One button is a share data and another is a upload to cloud button. Patient can see their a oxygen saturation , heart rate, blood pressure and respiration rate result in this activity and share the data via mail, drive,

whatapps and blood analysis website and the doctor can see this data from the blood analysis website

Information

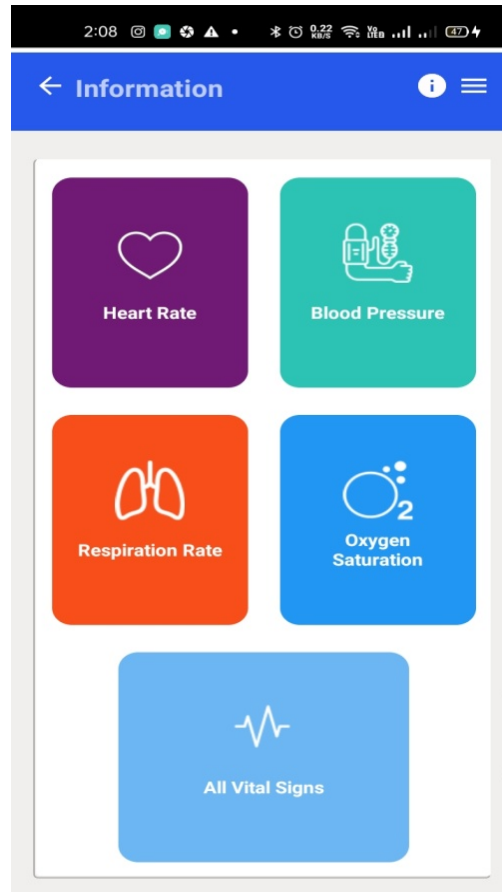
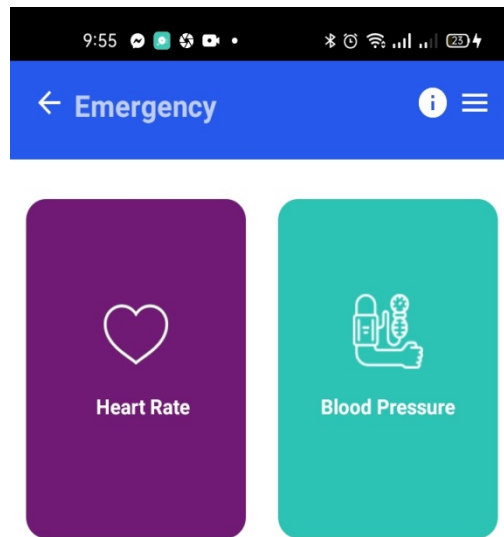


Figure 4.1.19: Information

This is a Information of Oxygen Saturation, Heart Rate, All Vital Signs, Blood Pressure and Respiration Rate button. Patient can see all information about Heart Rate, All Vital Signs, Respiration Rate, Blood Pressure and Oxygen Saturation when they click button.

Emergency

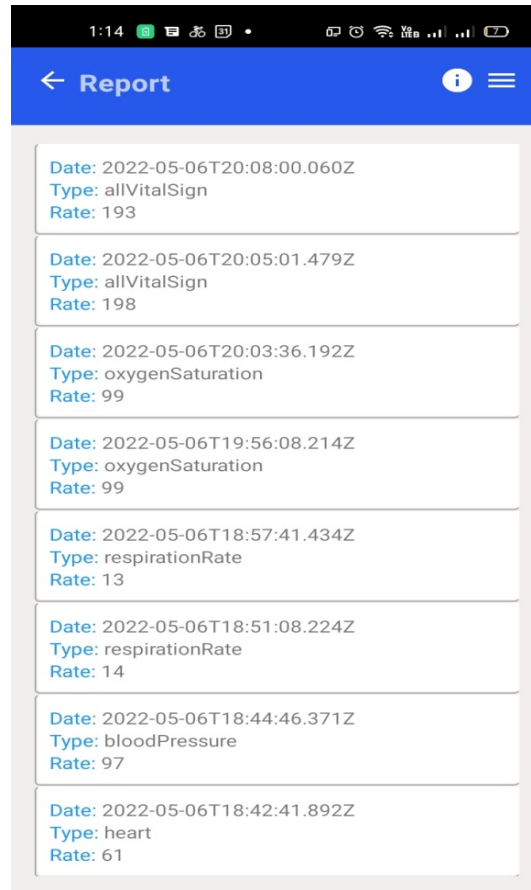


Please Log in the app. You can more option to calculate.

Figure 4.1.20: Emergency

This is a emergency activity of Heart Rate, Blood Pressure button. Patient can measurement Heart Rate and Blood Pressure when they click button.

Report



The screenshot shows a mobile application interface with a blue header bar containing a back arrow, the title 'Report', and an information icon. Below the header is a list of eight measurement entries, each in a white box with a light gray border. Each entry displays the date and time in blue text, the measurement type in gray text, and the rate value in blue text.

Date	Type	Rate
2022-05-06T20:08:00.060Z	allVitalSign	193
2022-05-06T20:05:01.479Z	allVitalSign	198
2022-05-06T20:03:36.192Z	oxygenSaturation	99
2022-05-06T19:56:08.214Z	oxygenSaturation	99
2022-05-06T18:57:41.434Z	respirationRate	13
2022-05-06T18:51:08.224Z	respirationRate	14
2022-05-06T18:44:46.371Z	bloodPressure	97
2022-05-06T18:42:41.892Z	heart	61

Figure 4.1.21: Report

This is a Report for the app. Patient can see their all the measurement types, rate, date and time from here.

Chart



Figure 4.1.22: Chart

This is a chart for the app. Patient can see their all the measurement rate, types in this chart easily.

About

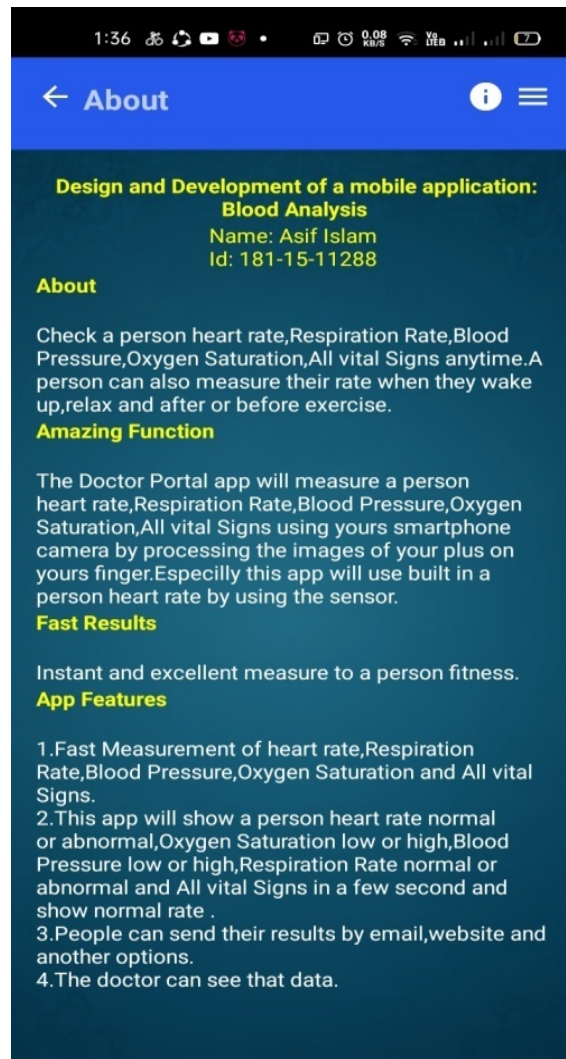


Figure 4.1.23: About

This is a about for Design and Development of a mobile application: Blood Analysis. Patient can see details about it.

Web Home Page

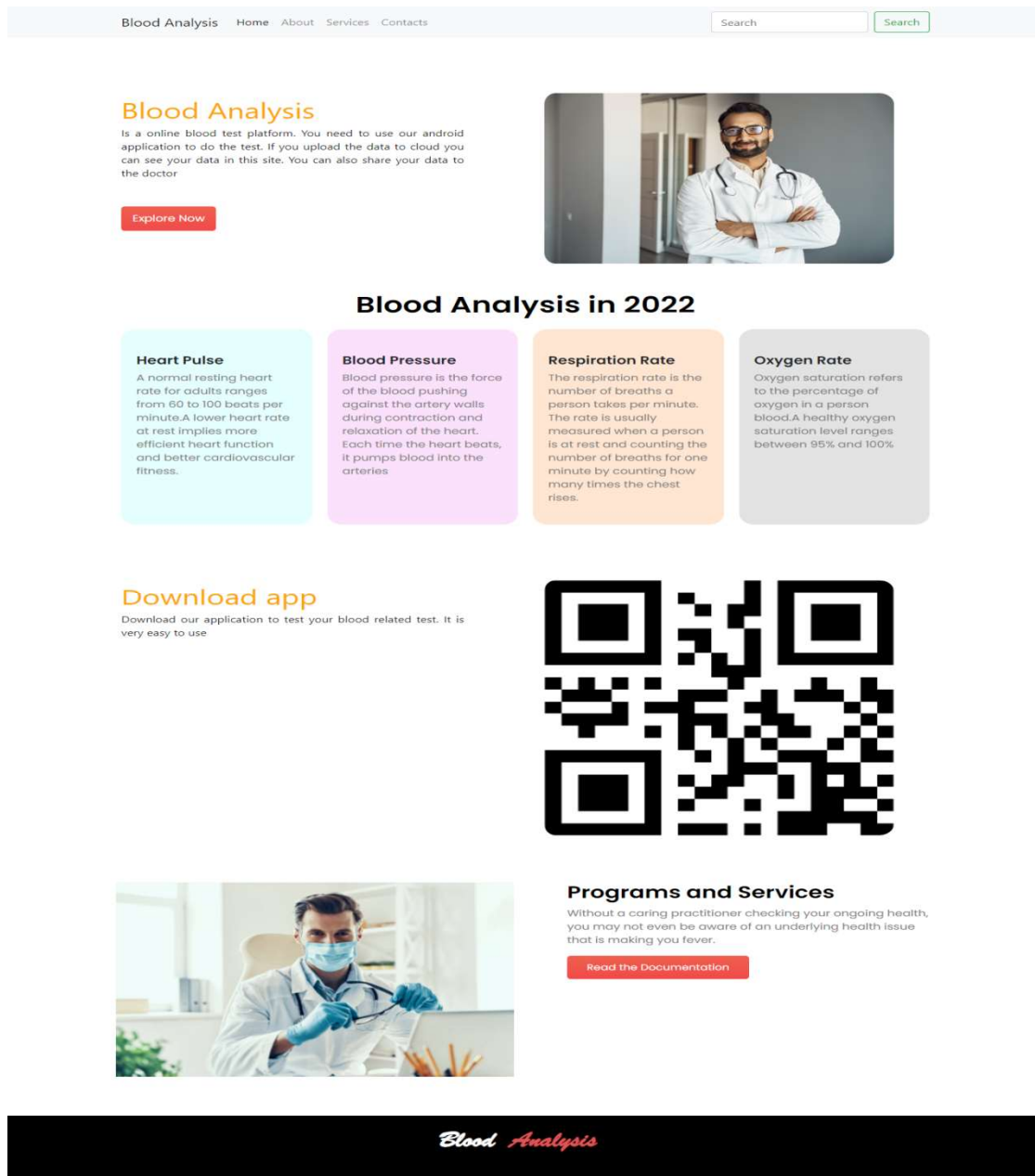


Figure 4.1.24: Web Home Page

This is a home page of the website. Here patient and doctor can see all Information. They can see service, contact and download the app from the QR code by the blood analysis website.

Dashboard

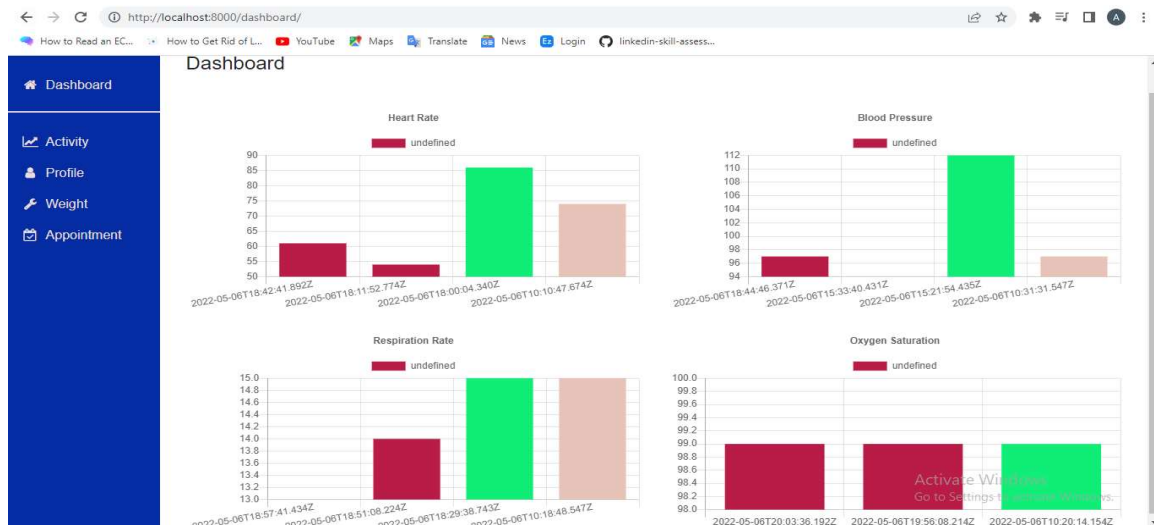


Figure 4.1.25: Dashboard

This it is a dashboard of blood analysis website, here Doctor or patient can easily see heart rate bar chart, respiration rate bar chart, blood pressure bar chart and oxygen saturation bar chart.

Profile

The Profile page displays two appointment cards. The left sidebar contains navigation links: Dashboard, Activity, Profile, Weight, and Appointment. The main content area shows the following data:

Appointment #1001	Appointment #1002
Doctor Name	Doctor Name
Date Time	Date Time
08/15/2021	09/22/2021
Cancel Appointment	Cancel Appointment
Reschedule	Reschedule
Details	Details

Figure 4.1.26: Profile

This it is a profile of blood analysis website, here Doctor or patient's can see Appointment serial number, date time, details activity.

Weight

Weight

Enter your weight

1

Submit

Your weight history

May 7, 2022, 4:12 p.m.
Your weight is 62.00

May 7, 2022, 4:12 p.m.
Your weight is 58.00

Activate Windows
Go to Settings to activate Windows.

Figure 4.1.27: Weight

This it is a Patient's weight, here Doctor or patient's can see Patient's weight, date and time.

Appointment

Appointment

Patient Name
First Name :
Last Name :

Appointment Time
Slot Time : 08:20 PM
Date : 08/16/2021

Doctor Types
Treatment Type : Cardiology
Doctor Name : Dr. Asif Islam

Submit

Save Appointment
Patient Name
Date and Time
Doctor Name
Unsubmit

Unsubmit Appointment
Date and Time
Doctor Name

Patient's Complaints
Date and Time
☒ Heart Rate
☐ Blood Pressure
☐ Respiration Rate
☐ Oxygen Rate
☐ All Vital Signs
Details

Figure 4.1.28: Appointment

This is a Patient's Appointment, here Patients can see Patient's name, Appointment time, doctor name treatment type and submit. Doctor and Patient's can see appointment time and doctor name if patient can want to unsubmit all then he can.

4.2 Back-end Design

The back-end is made up of a variety of elements that vary depending on the platform. I used to create my application. In addition, I establish a database in my website's backend system to store data that the server receives from users. For the building of my website, I used it in django administration.

In the back-end various different tasks are performed for example data handling, third party system integration etc. The process of showing data is performed from the back-end. In the back-end data is stored as Jason. After user connects with the real-time database the user receives updates with new data instantly since it is a real time database in our back-end I got all data of user and sessional information. The information about comment are also going to be stored here.

Administration



Figure 4.2.1: Administration

This is a Administration, here store weight, doctor name, type, time, Appointment time.

Firestore:

This firestore is for used to store their Heart Rate result, Respiration Rate result, Blood Pressure result, Oxygen Saturation result, types, date and time. I also used to store registration of the users to sign in to their account. Here I used firebase realtime database that patient and doctor can see realtime data. It is a NoSQL database online hosted. When the patient give their data for storage it synchronized in realtime to every connected patient.

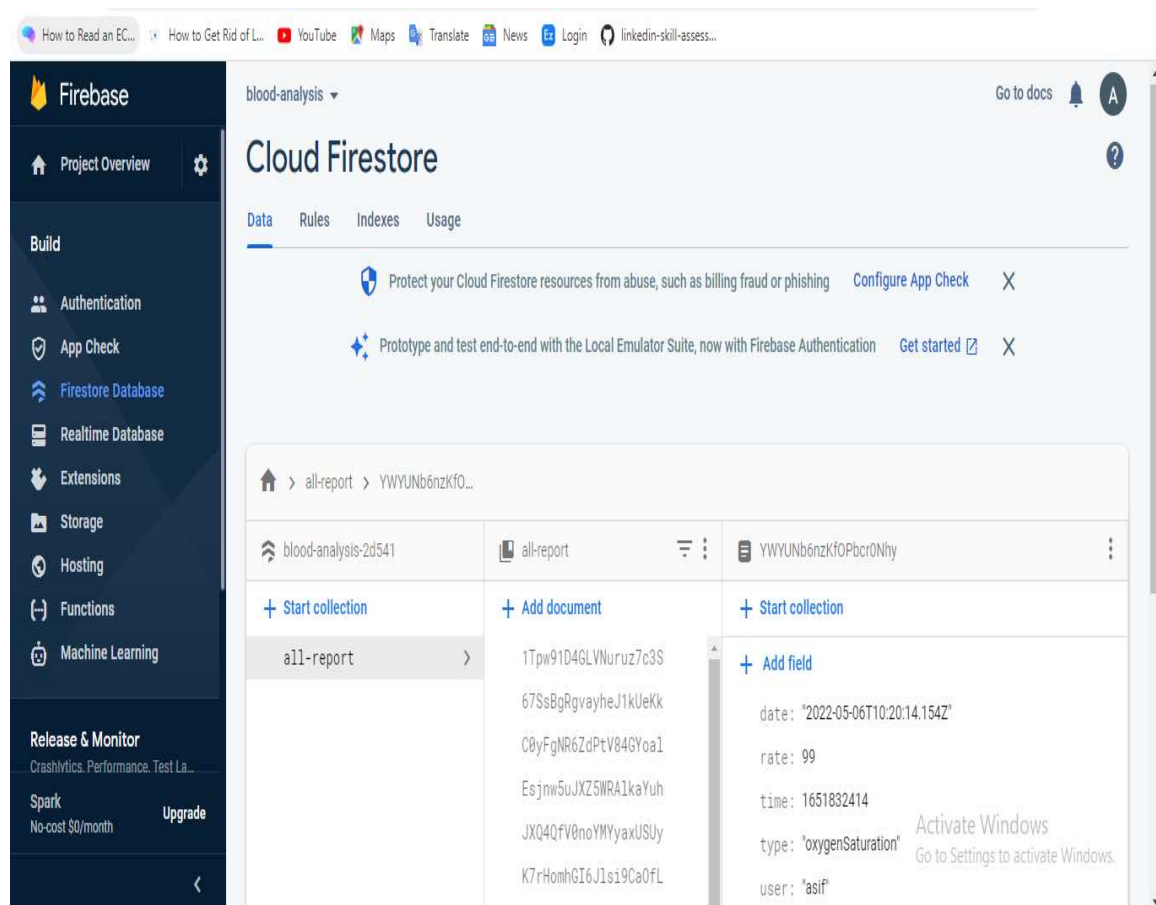


Figure 4.2.2: Firestore

4.3 Interaction Design and User Experience (UX)

I use to work heart rate, oxygen saturation, all vital signs, respiration rate and blood pressure to calculate by java, xml and I have to need the camera sensor where patient's put on their fingers. I am designing my android app by XML and I use JAVA for calculate BPM. I also use to HTML, CSS, JavaScript and BOOSTRAP for design the website.

4.4 Implementation Requirements

This app make it more useful and more user-friendly so I use xml, java in this app and I give some requirement in this app. It is:

- User-friendly
- Easy to Create Sign up
- Easy to Excess
- Easy to Manage
- Easy to Use
- Android Mobile
- Permission Camera
- Camera sensor
- Prefect Light

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

I had a user login to contribute to the app. I have used the MYSQL server.

5.2 Implementation of Front-end Design

I calculated BPM on the application. It is a XML, JAVA which is used by this app for the patients.

5.3 Testing Implementation

I tested this app, but I could not find any problem with it. In this app users give their name and password then login. Then they see a camera and they put their finger on this camera and calculate their blood rate by sensor. They can send the data to a website. There are no problems with use.

5.4 Test Results and Reports

I already tested this app and website, it runs 100 percent. There were no errors when that app and website is running.

Table 5.4: Test Results and Report

Test Case	Test Input	Expected Outcome	Obtained Outcome	Pass/Fail	Tested On
Interface testing	Testing in various android devices	Perfectly tested in various devices	App is supported in all devices	Pass	22-2-2021
Application is not responding	Testing in various devices	Very rare not responding	Problem rate is very rare	Pass	26-2-2022
User Sign Up	Required User Information	Successfully Registered	Successfully Registered	Pass	1-3-2022
User Sign In	Username and Password	Successfully Sign In	Successfully Registered	Pass	1-3-2022
Password	Wrong Password	Wrong Password	Wrong Password	Pass	3-3-2022
Internet access permission	Connect through application	Connected	Connected	Pass	4-3-2022
Camera Permission	Camera Permission on	Camera on	Camera on	Pass	6-3-2022
Measurement of bpm by sensor	Put finger	Calculated	Calculated	Pass	9-3-2022
Share Result	Shared Result	Shared	Shared	Pass	13-3-2022

CHAPTER 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Society

In our society, many people do not know how to solve rising heart rate. This app will show heart rate, information, oxygen saturation, all vital signs, blood pressure, instruction, respiration rate and patients can know if their oxygen saturation, blood pressure, heart rate, respiration rate is normal or abnormal. If their heart rate is abnormal then they can go to the doctor and take medicine.

6.2 Impact on Environment

It impacts the environment when they use this app. Many patient's can solve their problem very quickly from use this apps. It helps to the patient of time saving and they can do another more work.

6.3 Ethical Aspects

These android application proposals allow the reduce patient suffering problem. Keep patient immediately check and immediately get result is my first priority. Many patient suffer from various kind of health issues and they have to do their regular check up. My app wishes to show accurate result while they are measurement. I also link to the safety data storage in Firebase. Anyone cannot hacking any data or stored another server, exchanged, through me. If the user gives any information, it verifies properly.

6.4 Sustainability Plan

My application and many patient need to be sustainable. Mainly the user patient needs to be regular and use for their immediate get result then my application will be more sustainable. I need my project can be updated in the future and I think huge people give me good support. My plan to give more measurement test and if anyone wants to work on it they can join with me.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Discussion and Conclusion

This application can help the patient to do their medical test at home. Today's era most people use online doctor portal. So, they meet doctor virtually. For some test they need to go to clinic or medical. With this application they can send the test report to doctor instantly by self doing the test. I have added heart pulse, oxygen saturation, blood pressure, respiration rate test in this app. Patient need to put his finger on the back camera. This application computing the quantity of light absorbed by the finger tissue, It capture multiple image, do image processing to detect the red cell and complete the measurement.

7.2 Scope for Further Developments

I want to update my application in the future. I will add:

- I will work to calculate diabetics rate.
- I will work to calculate blood cell count.
- I will work Blood group detection.
- I will work to Blood disease detection.

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