Projection Visual Acuity Chart- Calibration

Visint Health Care Pvt. Ltd.,

Manipal

FINAL DISSERTATION REPORT

SUBMITTED TO MANIPAL UNIVERSITY, MANIPAL

in partial fulfilment of the requirements for the award of degree of

MASTER OF COMPUTER APPLICATIONS

By

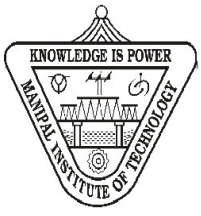
Punith Bandodekar (Reg. No: 140970027)

Under the guidance of

Mrs. Archana H.
Assistant Professor- Senior scale,
Department of Computer Applications,
M.I.T, Manipal - 576 104

Mr. Adithya C and Mr. Nagarajan T
Research Scholar, Research Assistant,
Department of Optometry,
SOAHS, Manipal - 576 104

DEPARTMENT OF COMPUTER APPLICATIONS
MANIPAL INSTITUTE OF TECHNOLOGY
(A constitute college of Manipal University)
MANIPAL-576104, KARNATAKA , INDIA



June 2016

Date: 10th June 2016

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that the project report entitled **Projection Visual Acuity Chart- Calibration** is an authenticated record of the project work carried out by **Punith Bandodekar**, in partial fulfilment of the requirements for the award of degree of **Master of Computer Applications** offered by Manipal University, under my guidance and supervision from *27th January 2016* to *27th May 2016*.

External Guide

Signature **Seal**

Place: Manipal

Date: 10th June 2016

DECLARATION

I hereby declare that the project work entitled "**Projection Visual Acuity Chart-Calibration**" is original and has been carried out at Visint Healthcare Pvt. Ltd., Manipal under the guidance of **Mr. Adithya C, Mr. Nagarajan T** and **Mrs. Archana H.** I further declare that the work reported in this document has not been submitted either in part or full to any other Institute/University for the award of any other degree.

Punith Bandodekar

Reg. No 140970027

Date: 10th June 2016

CERTIFICATE

This is to certify that the project report entitled "**Projection Visual Acuity Chart- Calibration**" is an authenticated record of the project work carried out by **Punith Bandodekar (Reg. No. 140970027)**, in partial fulfilment of the requirements for the award of degree of Master of Computer Applications offered by Manipal University, under my guidance and supervision, from 27th January 2016 to 27th May 2016.

Internal guide	**HOD**
Mrs. Archana H.	Dr. Hareesha K.S.
Assistant Professor- Senior scale,	Head of Department,
Department of Computer Applications,	Department of Computer Applications,
M.I.T, Manipal - 576 104	M.I.T, Manipal - 576 104

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Punith Bandodekar

ABSTRACT

In the present and future world automation is the key factor and everyone relishes to go with this flow. Along with automation comes precision and speed. The Projection Visual Acuity Chart is one, which is time efficient. This project aims at developing an application for the implementation of the different types of charts utilized in the diagnosis of an eye related problems in the Android devices like tablets and smart phones which would avail the person with eye problems in improving their vision in a better way. The task is to computerize the process of diagnosis of eye problems. This project is developed in Android Studio. We utilize the Android Software Development Kit (SDK) that avails us  elop mobile applications on Android platform.

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Chapter 1

Introduction

The unprecedented opportunity offered by mobile technology to transform eye care is driving transformational innovation. The current system is a computerized version of the eye diagnosis application for windows. Drawbacks observed in the existing system are that the application is not a portable device and is a standalone system. The application developed will be for an android device which is portable and very helpful to doctor in taking consideration the present scenario, where usually doctors use different type of charts such as Snellens Chart, Landolt C Chart, etc. which is printed on a chart paper. This application makes sure that the entire eye check-up is fully digitized and helps the doctor in finding a better solution for different eye problems.

1.1 Overview of the proposed system

We use Android Software Development Kit which includes a variety of custom implements that avail us develop mobile applications on Android platform. We would develop an android application which would be helpful in vision testing utilizing variants of charts such Snellens, Logmar, Landolt C and Sloan.Detecting vision defects utilizing our application in mobile devices such as smartphones and tablets which will avail the patient in testing their vision and treating the defects diagnosed.

1.2 Objectives

The Objectives of the proposed work are:

- To set the height and width of the character in the chart displayed.
- To project the charts using a mini projector which is portable.
- It include various types of charts such as Snellens, LogMar, Landolt C and Sloan in detecting vision chart.

Chapter 2

Software Requirement Specification

Software Requirements Specification (SRS) document is to provide a detailed description of the functionalities of project.

2.1 Introduction

This provides an overview of the entire SRS with purpose, scope, and references. The aim of this document is to gather and analyze and give an in-depth insight of project by defining the problem statement in detail. The detailed requirements of project are provided in this document.

2.1.1 Document purpose

The main purpose is to help the designers, developers and testers who are responsible for the development of the application entitled Projection Visual Acuity Chart-Calibration. It should give the developers all the information necessary to design, develop and test the system. It assists in validating with the client that the product which is being delivered satisfies their need. This section of the Software Requirements Specification helps the readers of this document to understand the purpose of this system and the document at a glance.

2.1.2 Scope

This describes the requirement of the system. It is meant for use by the developer and will be the basis for validating the final delivered system. Any changes made to the requirement in the future will have to go through the formal change approval process. This document contains a complete description of the functioning of the Projection Visual Acuity Chart-Calibration. This is to ensure that the person reading the document understands in brief what the system is all about.

2.2 Overall description

This section provides a high level description of the entire application. It describes the product perspective, functionality and characteristics of an expected user, constraints, assumptions and dependencies and the requirements.

2.2.1 Product Perspective

The Projection Visual Acuity Chart project is a new, self-contained product intended for use on the Android platform. The Project Projection Visual Acuity Chart-Calibration is an Android application developed on the basis of the drawbacks observed in the existing standalone system in windows. The existing system is an application through which doctors examine the patients vision. The drawback is that the existing system is not portable easily. The Android application developed will be used in Android devices such as tablets and smart phones, thus easily maintaining the patient details in an efficient manner and displaying the charts using a mini projector connected to the Android device thus displaying different charts with different character sizes, different number of characters per line and number of lines displayed which helps doctors get information of the patients vision.

2.2.2 Product Functionality

The following list offers a brief outline and description of the main features and functionalities of this project. The proposed project has following functionalities:

- Patient details module : This module helps the doctor to maintain the details of the patients and retrieve the same when required. It also allows the doctor to maintain the details of new patients.
- Search Box : Any search given by a user works basically to retrieve the information about patients from database and to filter out the results for quick access.
- Calibration : In the calibration module, we adjust the height and width of the character in the chart in order to diagnose patients vision. We additionally adjust the character on the projection screen with respect to the distance between the patient and projection screen. The size of the characters in each line and the number of lines varies from chart to chart.
- Chart Settings : In this module we select different types of chart, number of lines and number of characters per line, the shuffling of characters, the vision test settings for different eye.
- Visualizing Charts : This module exhibits the selected chart for patients vision testing. The visualization displays different types of charts such as Snellen's, Logmar, Landolt C and Sloan charts.
- Test Result : The displaying of vision details of patient with respect to the tests.
- Import and Export Database : This feature allows users to export the data related to the application and store it on the internal memory associated with device. This data can be transferred to other device and can be accessed through that device by importing the data back to phone memory.

- Report Bugs : This module is used to report bugs to the developer. The bugs is specified by the user and is sent through Gmail to the developer.

2.2.3 User characteristics

Doctor : Doctor is a potential user who uses this software to perform optometric tests to the patients. He is the only user who uses this software and performs the tests by displaying different charts through a mini projector.

2.2.4 Assumptions and Dependencies

Few Assumptions and Dependencies that is taken into consideration are:

- One assumption about the product is that it will always be used on mobile phones that have enough performance. If the phone does not have enough hardware resources available for the application, for example the number of patients might be more and accessing their data would be time consuming, there may be scenarios where the application does not work as intended or even at all.
- User must have basic knowledge of how to use an Android device.

2.2.5 Design and Implementation Constraints

This project is completely Android based, so the basic knowledge of using an Android smart phone or tablet is necessary. In order to maintain the reliability and durability of the system, some design and implementation constraints are applied. User must have the basic knowledge of the domain in order to understand the results which are retrieved. Since the application is designated for mobile handsets, limited screen size and resolution will be a major design consideration. Creating a user interface which is both effective and easily navigable will pose a difficult challenge. Other constraints such as limited memory and processing power are also worth considering. This application is meant to be quick and responsive, even when dealing with large number of patients details, so each feature must be designed and implemented with efficiency in mind.

2.3 Specific Requirements

An Android device such as a smartphone or tablet is useful (and of course the ultimate target for development), but is in fact not essential to getting started since the software contains virtual device emulators that allow you to develop and test.

2.3.1 Hardware Requirements

Following are the hardware requirements, as shown in table 2.1

Table 2.1: Hardware Requirements

Hardware	
RAM	2 GB RAM and above
Hard Disk	400 MB hard disk space
Processor	Intel Pentium 3 or higher

2.3.2 Software Requirements

Following are the software requirements, as shown in table 2.2

Table 2.2: Software Requirements

Software
• Microsoft Windows 8/7/Vista (32 or 64-bit) • At least 1 GB for Android SDK, emulator system images, and caches • 1280 x 800 minimum screen resolution • Java Development Kit (JDK) 7 • Optional for accelerated emulator: Intel processor with support for Intel VT-x, Intel EM64T (Intel 64), and Execute Disable (XD) Bit functionality

2.3.3 User Interface Requirements

The device running the application should have a minimum RAM of 512 MB, minimum version of Android OS required is Android 4.2.1 (Jelly Bean) and a screen size of 5 inch and above.

2.3.4 Communication Requirements

Requires an open internet connection on mobile device for sending an email to report bugs if any to the developers through Gmail.

2.3.5 Functional Requirements

Functional requirement is described as a set of inputs, the behaviour, and outputs. These are the following requirements:

- The code needs to be highly maintainable, as software engineering and design methodology is constantly evolving. This software product is to be updated or maintained in a time and cost effective manner.
- The performance of a number of functions is described as being interactive. This is defined as the user being able to get continuous and quick-to-respond on the operation that they are performing.

2.4 Non-functional Requirements

2.4.1 Behavioural Requirements

Behavioural requirements defines all constraints on the system outputs (e.g., value, accuracy, timing) and resulting system state for all possible inputs and current system state. By this definition, security, safety, performance, timing, and faulttolerance are all behavioral requirements. Following are the diagrams related to ”Projection Visual Acuity Chart”:

1. Activity Diagram : Activity diagrams are graphical representation of step-wise activities. as shown in figure 2.1.

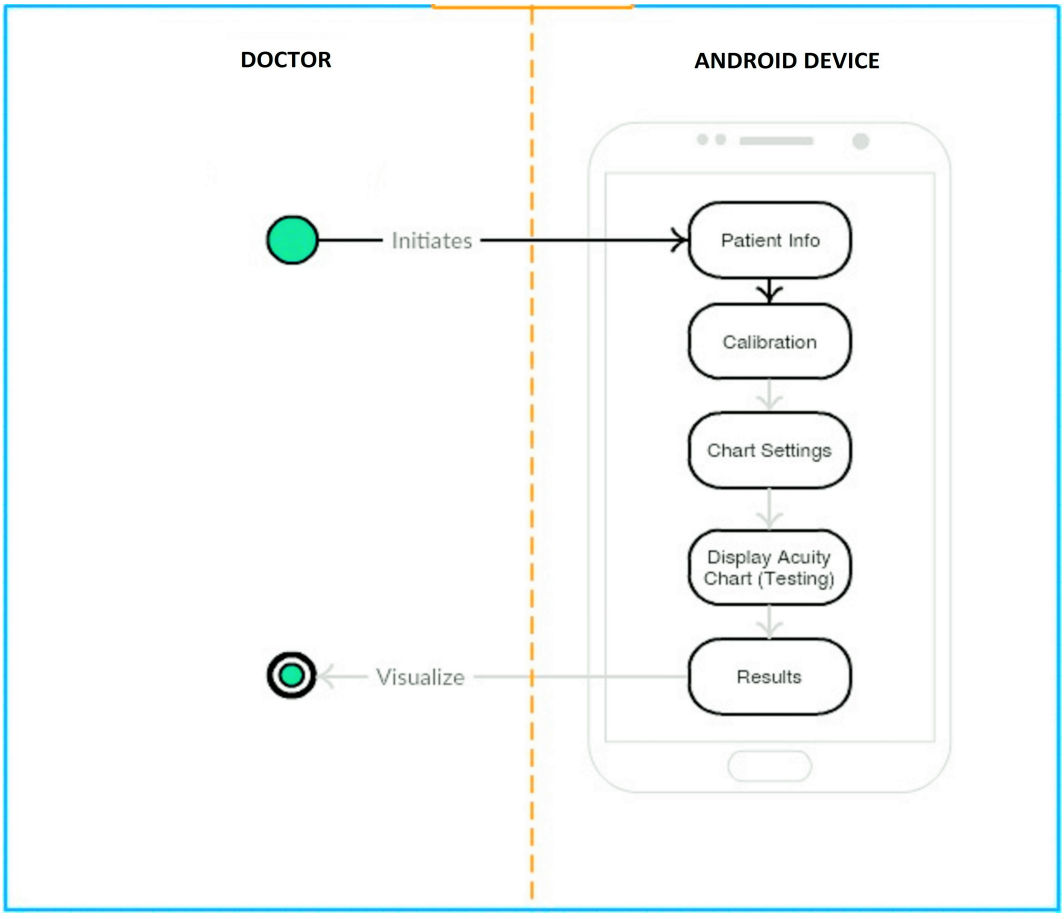

Figure 2.1: Activity Diagram

2. Sequence Diagram : Sequence diagram is an interaction diagram that shows how processes operate with one another and in what order. as shown in figure 2.2.

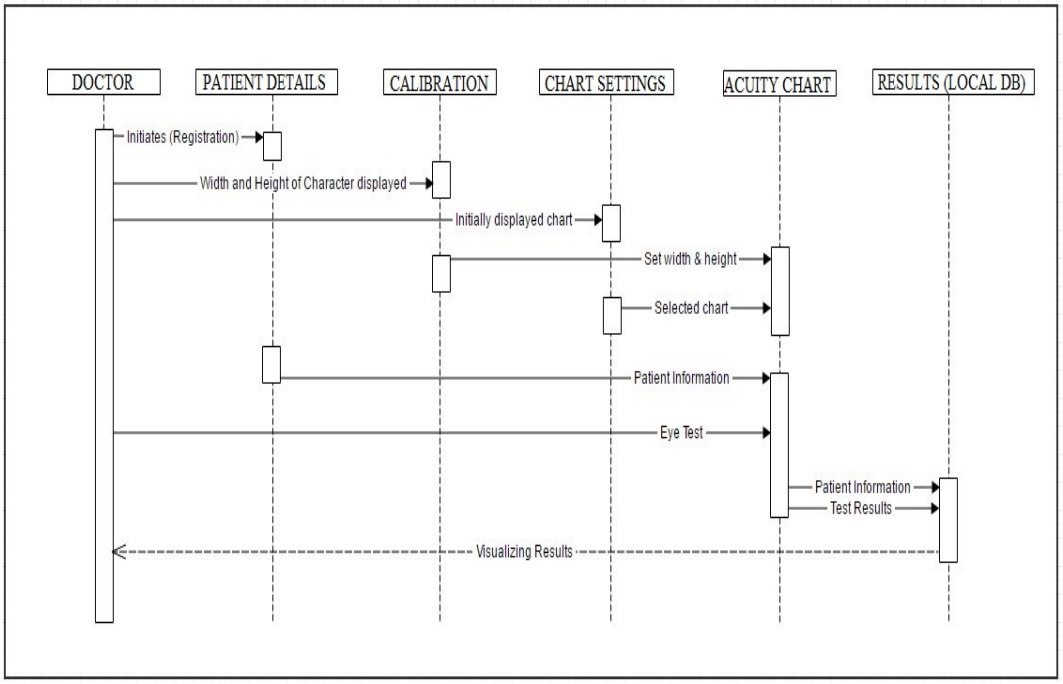

Figure 2.2: Sequence Diagram

2.4.2 Performance Requirements

This application ensures fast response and works very well with the light graphics to provide user friendly experience. Changing screens will require very little computation and thus will occur very quickly. The performance depends upon hardware components of the device. This product is real time and hence should be performed in minimum requirements.

2.4.3 Safety and Security requirements

There are no safety requirements with this application, other than any normal hazards of a mobile device. It cannot cause any damage to the phone or its internal components.

2.4.4 Software Quality Attributes

The graphical user interface of Projection Visual Acuity Chart-Calibration is to be designed with usability as the first priority. The application will be presented and organized in a manner that is both visually appealing and easy for the user to navigate. From this application the eye specialists will find it easy to perform the tests which gives accurate results and it is time saving than performing manual operation. It also makes the doctor in taking decision about further treatment, if required.

2.5 Process Model

The process model we use for this project is Waterfall model. It is well suited for routine types of projects where the requirements are well understood. That is, if the developing organization is quite familiar with the problem domain and the requirements for the software are quite clear, the waterfall model works well, and may be the most efficient process.

2.6 Development Approach

The development approach we have used is Bottom-up approach. Bottom-up strategy is more suitable when a system needs to be created from some existing system, where the basic primitives can be used in the newer system.

2.7 Team Structure

The team structure we have used is Controlled Decentralized(CD) since the team size is very small, the problem is relatively simple, the team's lifetime is around 4 months and the system can be modularized easily among the team members.

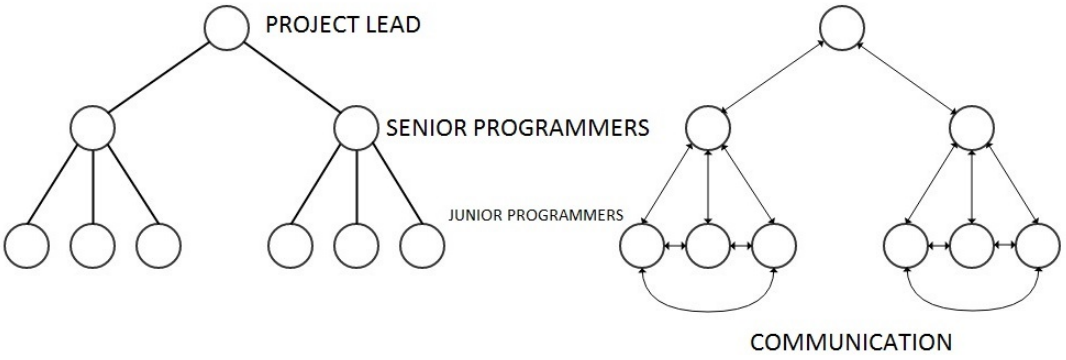

Figure 2.3: Team Structure

2.8 Duration

The duration of the project is four months.

Chapter 3

Software Design

3.1 Introduction

The unprecedented opportunity offered by mobile technology to transform eye care is driving transformational innovation. The current system is a computerized version of the eye diagnosis application for windows. Drawbacks observed in the existing system are that the application is not a portable device and is a standalone system. The application developed will be for an android device such as smart phone or a tablet which is portable and very helpful to doctor in taking consideration the present scenario, where usually doctors use different type of charts such as Snellen's Chart, Landolt C Chart, etc. which is printed on a chart paper. This application makes sure that the entire eye check-up is fully digitized and helps the doctor in finding a better solution for different eye problems.

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3.2 Initial Design

Following is the block diagram which explains the overall design of Projection Visual Acuity Chart, as shown in figure 3.2

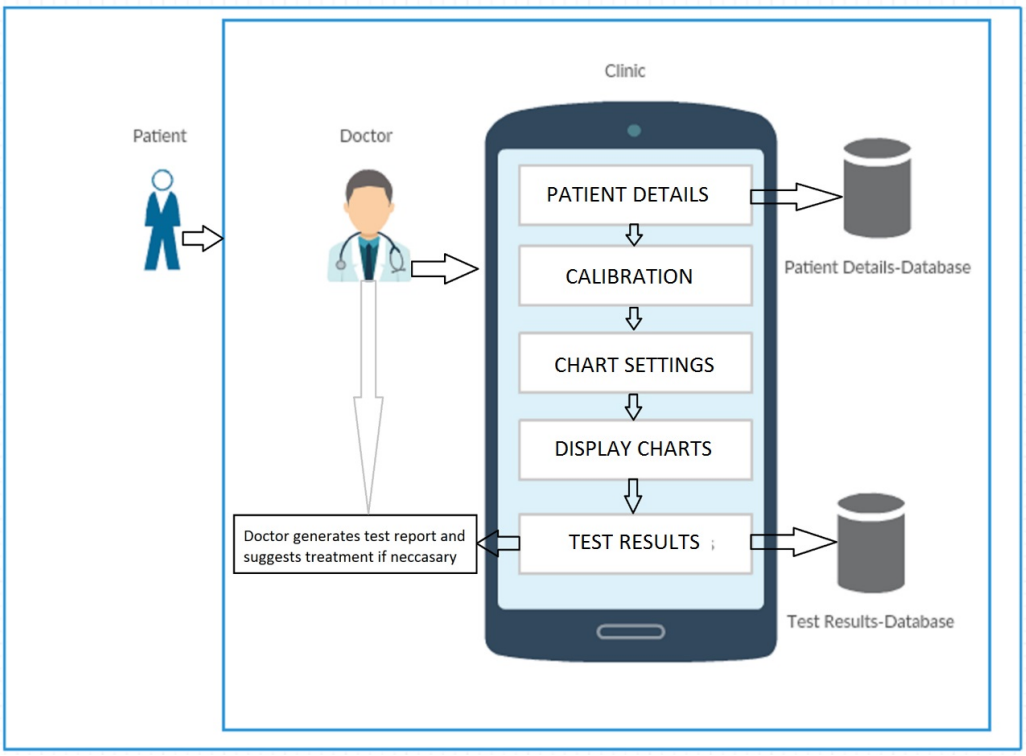

Figure 3.1: Block Diagram

3.3 Detailed Design

Before taking the test patient registration is performed by the doctor using this android application. After registration calibration is performed by the doctor defining the distance of the projector and projected screen and the distance between patient and the projected screen is input later in chart settings the chart to be displayed is set and the number of characters per line and and number of line is set in chart settings. After this the chart is displayed to the patient and if he is able to see the characters on the chart and till what characters he is able to see, the data is taken and the test results are generated thus determining the patients vision using the android application Projection visual acuity chart.

3.4 User Interface Design

Adding patient details like name, address, contact details etc. as shown in figure 3.2.

Figure 3.2: Patient Registration

Calibration module : This module is used to set the distance between the patient and the projection screen as in figure 3.3.

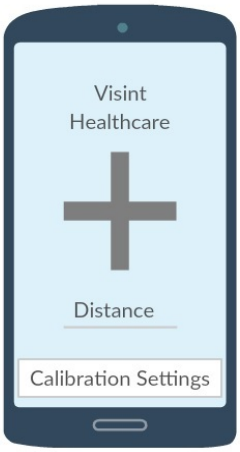

Figure 3.3: Calibration

Chart settings : This module is used to set the default value of the acuity chart as in figure 3.4.

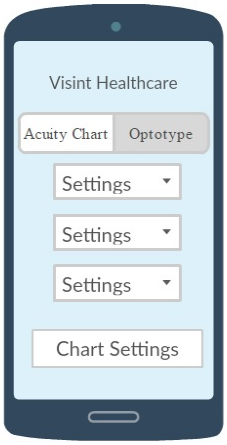

Figure 3.4: Chart Settings

Chapter 4

Testing and Implementation Details

4.1 Testing Strategy

The testing strategy followed in the case of ”Projection Visual Acuity Chart” is White box testing which is also known as structural testing to test our software application. The White-box testing is one of the best methods to find out the errors in the software application in early stage of the software development life cycle. The test case designed in such a way that all lines of source code will be executed atleast once. Initial focus for testing is testing small pieces of code, Integration of modules is performed later for further testing. So,we begin by testing in the small and move towards testing in the large.

4.2 Levels of testing

Testing levels are basically to identify missing areas and prevent overlap and repetition between the development life cycle phases. In software development life cycle models there are defined phases like requirement gathering and analysis, design, coding or implementation, testing and deployment. Each phase goes through the testing. Hence ”Projection Visual Acuity Chart” uses following levels of testing.

4.2.1 Unit Testing 

In this application unit testing plays very important role. Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

4.3 Implementation Strategy 

The implementation strategy defines the general approach for the system implementation. The intent of the implementation strategy is to identify the assumptions and establish the framework. This project is completely mobile based. The user must have the knowledge of the domain in order to understand the results which are retrieved from database. In order to maintain the mobile application, some design and implementation constraints are applied. Considering the clients requirements the team decided to create those interfaces in a simple realistic manner using affordable technology.

4.4 Test Cases

It is the combination of the input data, the state of the system and the expected output.

Following are the test cases and the expected results for the Patient Registration module, as shown in table 4.1

Table 4.1: Test Cases for Patient Registration

Test Cases For Patient Registration				
Test ID	**Test Case**	**Expected Result**	**Observed Result**	**Status**
1	Patient ID field empty	Enter Patient ID	Enter Patient ID	Pass
2	First name field empty	Enter First Name	Enter First Name	Pass
3	Last name field empty	Enter Last Name	Enter Last Name	Pass
4	Gender Selection	Gender Not Selected	Gender Not Selected	Pass
5	DOB field empty	Select DOB	Select DOB	Pass
6	Address field empty	Enter Address	Enter Address	Pass
7	Mobile No field empty	Enter Mobile number	Enter Mobile number	Pass
8	Consultant field empty	Enter Consultant Name	Enter Consultant Name	Pass

Chapter 5

Sample Screen Shots

This application is developed using Java and Xml.On running the app initial home page will be displayed where user can navigate to options for entering patient details, modifying chart settings, entering calibration settings later displaying charts. Doctor will be asking the patient if he is able to see the characters displayed on the chart he clicks on the line of characters in the chart which patient is able to see thus the results of the patients vision will be stored respectively. With detailed results description if doctor finds some problem he will suggest the possible treatment to the patient.

Figure 5.1: Splash Screen

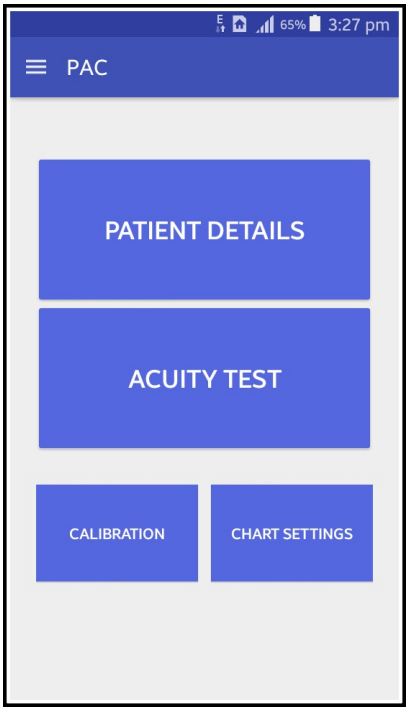

Figure 5.2: Home Page

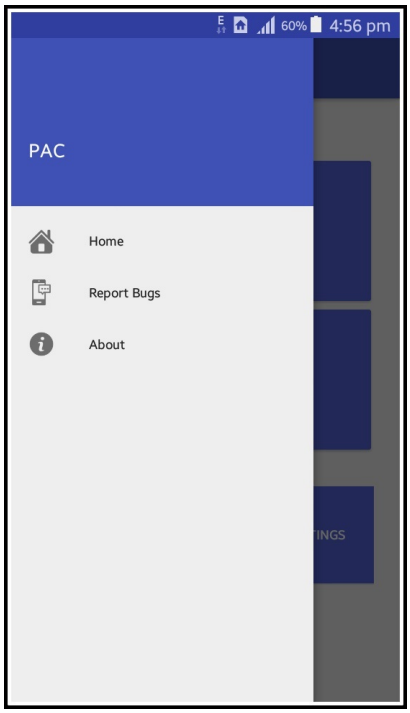

Figure 5.3: Navigation Drawer

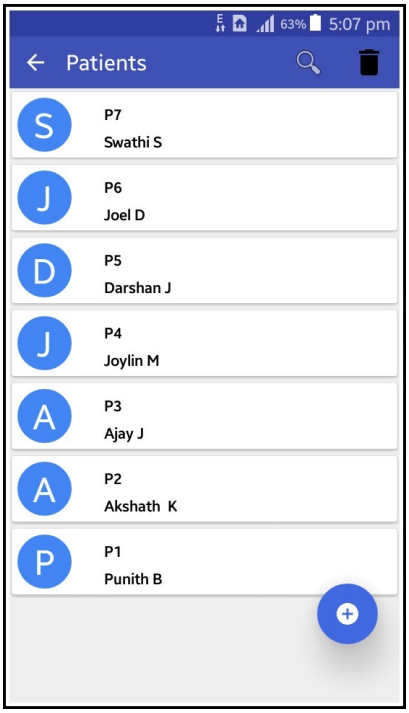

Figure 5.4: Patients List

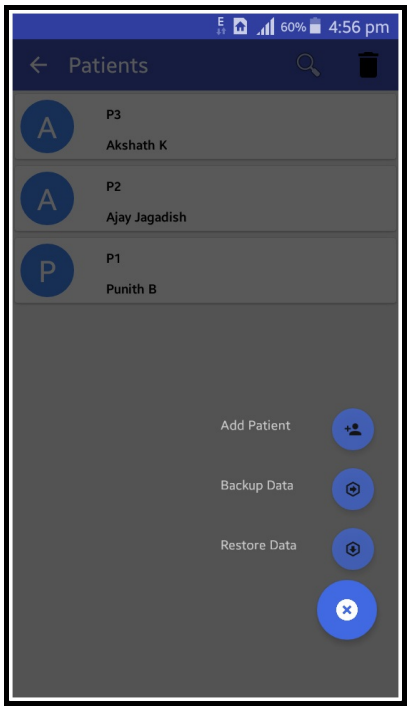

Figure 5.5: List Patient's Menu

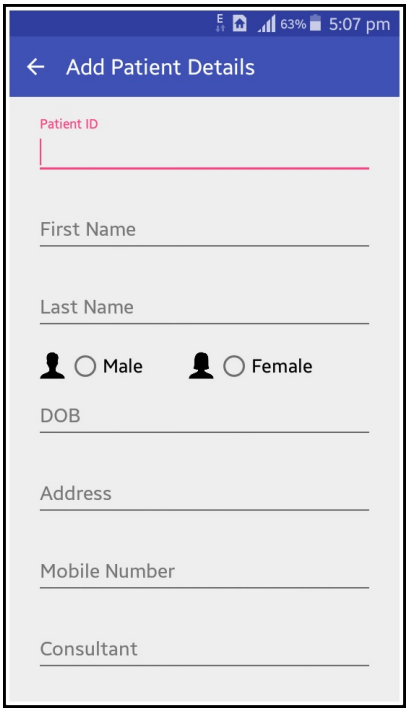

Figure 5.6: Add Patient

Figure 5.7: Edit Patient

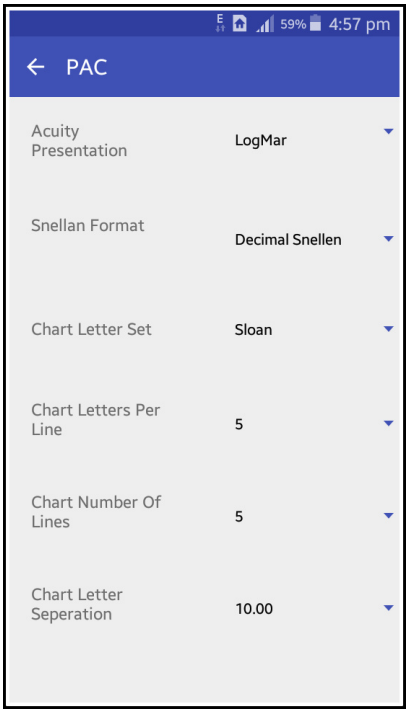

Figure 5.8: Chart Settings

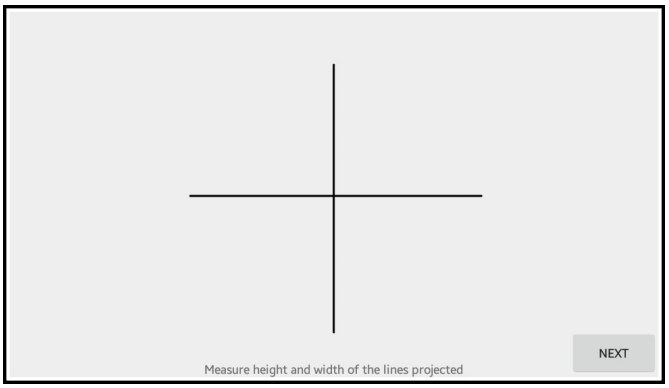

Figure 5.9: Calibration

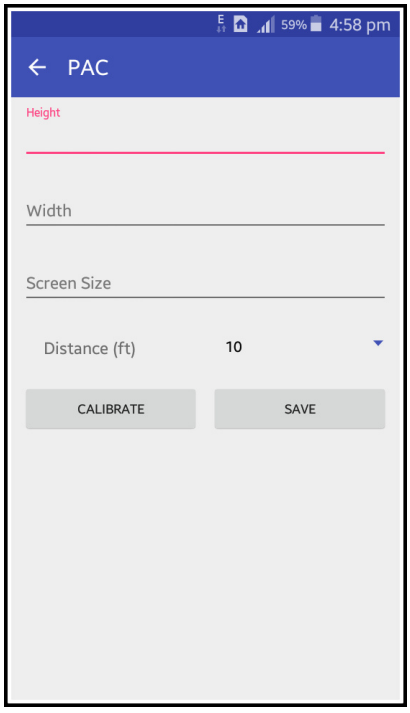

Figure 5.10: Calibration Settings

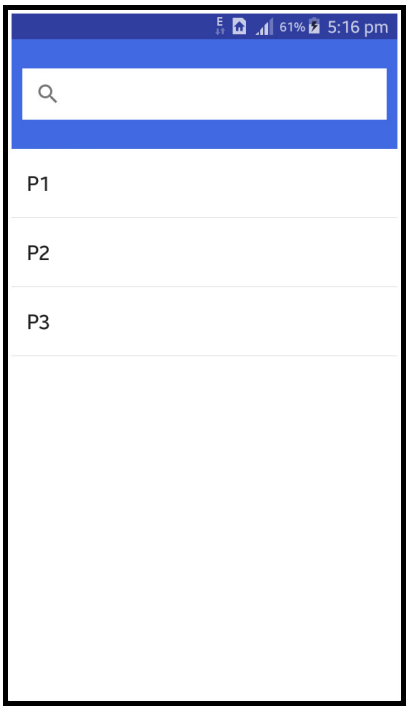

Figure 5.11: Patient Selection

Chapter 6

Conclusions and Future Work

This section explains about the conclusion of the project and also about the future work which can be added to the built application for further improvement.

6.1 Conclusion

This project is not a new concept but when the whole project is completed, the data which is obtained is of high value in the process of vision testing using the Android Application-Projection Visual Acuity Chart that is to be developed in the future.

6.2 Future Work

Since the trends keep on changing, this application can be customized to make it more user friendly in future so that we are adaptive towards the changing environment. This application can be developed further by adding vision testing using Letter Contrast Sensitivity, Refraction/Sight Testing, Stereo Acuity modules and also improving the accuracy.

Bibliography

[1] Bailey, Ian L. and Lovie-Kitchin, ”Jan E.Testing Vision : From Laboratory Psychophysical Tests to Clinical Evaluation”, Vision Research, Elsevier, 20th September 2013.

[2] M. Ettore Giardini, ”The Portable Eye Examination Kit : Mobile phones can screen for eye disease in low resource settings.”, IEEE Pulse, vol. 6, no. 6,pp.15-17, 2015.

[3] http://www.androidhive.info/ [Last browsed on:07/03/2016]

[4] http://www.tutorialspoint.com/ [Last browsed on:15/02/2016]

PROJECT DETAILS

Student Details

Student Name	**Punith Bandodekar**		
Register Number	140970027	Roll No	27
Email Address	visitpunith@ymail.com	Phone No (M)	+919483803739

Project Details

Project Title	**Projection Visual Acuity Chart-Calibration**		
Project Duration	4 Months	Date of reporting	27-01-2016

Organization Details

Organization Name	**Visint Health Care Pvt. Ltd. Manipal**		
Full postal address with pin code	Room No. IC-105, 1st Floor, MUTBI Innovation Centre, MIT, Manipal - 576 104		

Supervisor Details

Supervisor Name	**Mr. Adithya C and Mr. Nagarajan T**		
Designation	Research Scholar, Research Assistant		
Full contact address with pin code	Department of Optometry, SOAHS, Manipal - 576 104		
Email address	adityaopt@hotmail.com	Phone No (M)	+919492991091
	tnagarajan14@gmail.com	Phone No (M)	+919535698639

Internal Guide Details

Faculty Name	**Mrs. Archana H.**		
Full contact address with pin code	Department of Computer Applications, MIT, Manipal- 576104		
Email address	archana.suk@manipal.edu	Phone No (M)	+919964278136