“Shirt Spy”

Android Application Using Eclipse IDE & Metaio SDK

By

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Dedicated to
My Family & Friends

Acknowledgement

ALLAH has been the biggest source of strength for me and I am humbly thankful for the blessings He has conferred upon me. My father and siblings' love, trust and support have always played a major role in the achievements that I have been blessed with throughout my life.

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Project in Brief

- ***Project Title***
- *Shirt Spy*

- ***Under Taken By***
- *Warda Rasul Malik*

- ***Supervised By***
- *Miss. Sidra Batool Kazmi*

- ***Started***
- *6th Feb, 2013*

- ***Completed***
- *6th July, 2013*

- ***Software Tool***
- Java DK (includes the JRE) (JDK 7)
- Eclipse IDE for Java Developers the Kepler version
- Android SDK (Jelly beans 4.2.2 –API 8)
- Metaio SDK (4.1.2)
- Designing tools for the UML will be Microsoft Visio.

- ***Operating System***
- *Windows 7*

- ***System Used***
- *Core i5*
- *Ram 6GB*

Abstract

This project is an application which provides the information of cricket history of country. The shirt spy is an android based phone application. It will use the smart phone camera to scan a shirt for logos on the kit of different cricket playing countries and after processing that image it will pop up the cricketing history of that country with respect to ODI, Test and T20 international wins and ICC ranking.

To use this application the user must have an android powered smart phone. The internet connection will be required to download this application. The advantage of using this application is that the user will not always have to be connected with the internet.

In future it can be improved to have database online and to be able to show results of all the cricket teams of the world.

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Chapter No. 1

Introduction

1.1 Introduction

This is the era of technology and it has reached the hands of people through smart phones with applications that assist masses in daily routine. Android is a Linux based operating system which was basically designed for the touch screen mobile devices i.e. smart phones and tablet computers. It was initially developed by Android, Inc. after sometime it was financially backed by Google and then was bought in 2005. The first Android powered phone was sold in October 2008. Android smart phones use android OS to run these applications. Most of the android development is done using Java programming language but there are other tools available too for development. These applications have captured the interest people from all walks of life and of every age. According to some researches as of October 2012 over 700,000 applications have been developed for android with over 25 billion downloads. In 2012, around 105 million android smart phones were shipped which is 68% share of the total smart phones sale in 2012. The android OS has captured a big market share.

1.2 Motivation

This is the era of mobile computers like smart phones, tablets etc. Huge advancements and developments have been done during the past few years in this field. Smart phones and tablets having applications assisting human daily routine life; have captured hearts and mind of people from all walks of life and of almost every age. The scope of development in this field of smart phones applications has increased tremendously. Jobs for developing these applications are increasing on free lancing sites by every day because their demand is increasing in the world. The sales of touch screen smart phones have increased by millions of units during the past years. The advancement in this field and increase of scope has motivated me to work on this project.

1.3 Overview Statement

The shirt spy is an android based phone application. It will use the smart phone camera to scan a shirt for logos on the kit of different cricket playing countries or it can just look for an image of logo and after processing that image it will pop up the cricketing history of that country, the number of big games they've won and world records etc.

1.4 Objectives

In today's world people want easy access to information whenever they need. Users, who are sports lover and like to follow the team's sports history, will have use of this application. The user can have the cricketing history of the country he wants to know about, easily. This is an easy and quick access to information. The purpose is to make the user able to reach the information that he needs.

- The basic purpose of doing android based language is to learn to develop in this platform.
- To provide quick and easy access to the information that user requires.
- To gain experience in development with java programming.

1.5 Existing systems

We may have android augmented reality based applications but not same as the *SHIRT SPY*. An android application called *OLAROUND* is a unique location-based loyalty service which helps you explore restaurants, retails nearby and earn rewards at partner venues for example getting discount offers at McDonald's.

With this app you can:

- Find restaurants and retail outlets around you.
- It gets all the venue information including address, contact details, maps and directions to the place.
- View the menu cards or product lists with updated pricing.
- Get instant discounts.
- Claim rewards on frequent visits at Olaround powered venues.
- See where your friends are punching &getting rewards.
- Share your Olaround activities for example Punches & Check-ins with friends on Facebook.

So how it work? Well, that's really simple!

You just have to:

1) Walk into any Olaround powered venue.

2) Ask the venue staff for Olaround Punch Card and scan this card using Olaround.

3) Get instant deals and redeem Punches to unlock exciting rewards.

1.6 Advantages of This Application

One can ask so many questions about the utility of this application for example

- How is this application any good when mostly the smart phones can access internet and could search the history of any country's sport from Google. Well, to answer their question, what if the you do not have internet access at that time or if you do you will have to first open the search engine write different queries about the topic and then search from those results what you are looking for. But the **Shirt Spy** on the other hand does not require internet connection because of a local data that is already present in the application. If you have this application in your smart phone just open this application and use it. Authentic, accurate and to the point result will be shown in no time.
- The history in the database will soon be outdated because the history does not remain the same forever. To answer that I can tell that a time to time update will be available as soon as there is any change in the cricket history of a country and as soon as the smart phone connects to an internet the update will appear which the user can download and it will automatically be updated in the application.
- A big database will slow down the processing of the smart phone and also will need battery recharge in short distance of time. To answer that the data is going to be very small because it is a student level beginners application. A very few number of countries are included at the start.
- It is most likely for a cricket lover to want to know the cricket history when there is a match going on and he wants to know about the teams playing, how he is going to find a logo for that purpose. To answer that I can tell that if the user is in a stadium it is most likely that crowd is there and with the team flags or with the team's shirt on so not very difficult to find a logo in a stadium. What if the user is at home and watching on television? We all have seen matches on TV and we know that when

there is match going on, both team's logos appear on the screen in a short distance of time and user can use this application.

These are some critical questions that me and my supervisor could think of and gladly I was able to find the answers but there can be so many other questions which could be ask regarding utility, benefits , advantages and entertainment that this application provides, so I will not judge it to be a perfect application. But as we know there is always room for improvement in technology and that is why it has reached this greatness and still improving.

1.7 Scope

This application will provide cricket lovers with information about the famous world cup playing teams of the world. It provides the service of quick and easy access to the information about the cricket history of a particular country. The scope of this application covers the provision of history regarding the ICC world ranking in ODI, Test and T20 internationals and total ODI, Test and T20 international matches won and lost.

1.7.1 Context

The application will be used by the people who are cricket lovers and like to follow their favorite teams. The app will be deployed in context with the user.

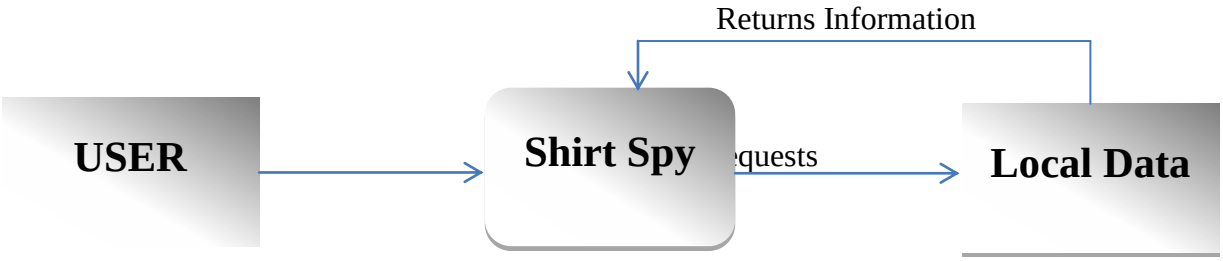


Figure No. 1.1 Context Diagram

1.7.2 Information objectives

Any common smart phone user who may be is a cricket lover with decent internet connection in his smart phone can download this application and use it to get information i.e. the cricketing history about the cricket team of any country that the user wants.

1.7.3 Functions and Performance

The application will make the user able to get the information that is the cricketing history of the country from the local database. Using smart phone camera this application will capture the logo on the shirt or from any other source n which there is an image of the logo and after that the rest is on the Metaio SDK that I am using in the development of this application. The Metaio library will run its function that I am calling in the main activity class and match the image with the markers that I have created using this SDK online and show the result.

1.8 Resource Identification

1.8.1 Human Resource Identification

This system is developed by Warda Rasul Malik, student of Institute of Information Technology at Quaid-i-Azam University.

1.8.2 Hardware Resources

1.	System	64-Bit Operating System
2.	Processor	Intel(R) Core(TM) i5-3210M CPU 2.50 GHz
3.	Hard Disk	450
4.	RAM	6.0 GB

1.8.3 Software Resources

1.	Operating System	Microsoft Windows 7 Ultimate 64–Bit Operating System
2.	Tools and languages used	• Java DK (includes the JRE) (JDK 7) • Eclipse IDE for Java Developers the Kepler version • Android SDK (Jelly beans 4.2 –API level 8) • Metaio SDK(4.1.2) • Designing tools for the UML will be Microsoft Visio.

1.9 Selection of Process Model

Incremental process model will be used in development of this project because we can expect versions of this application in future.

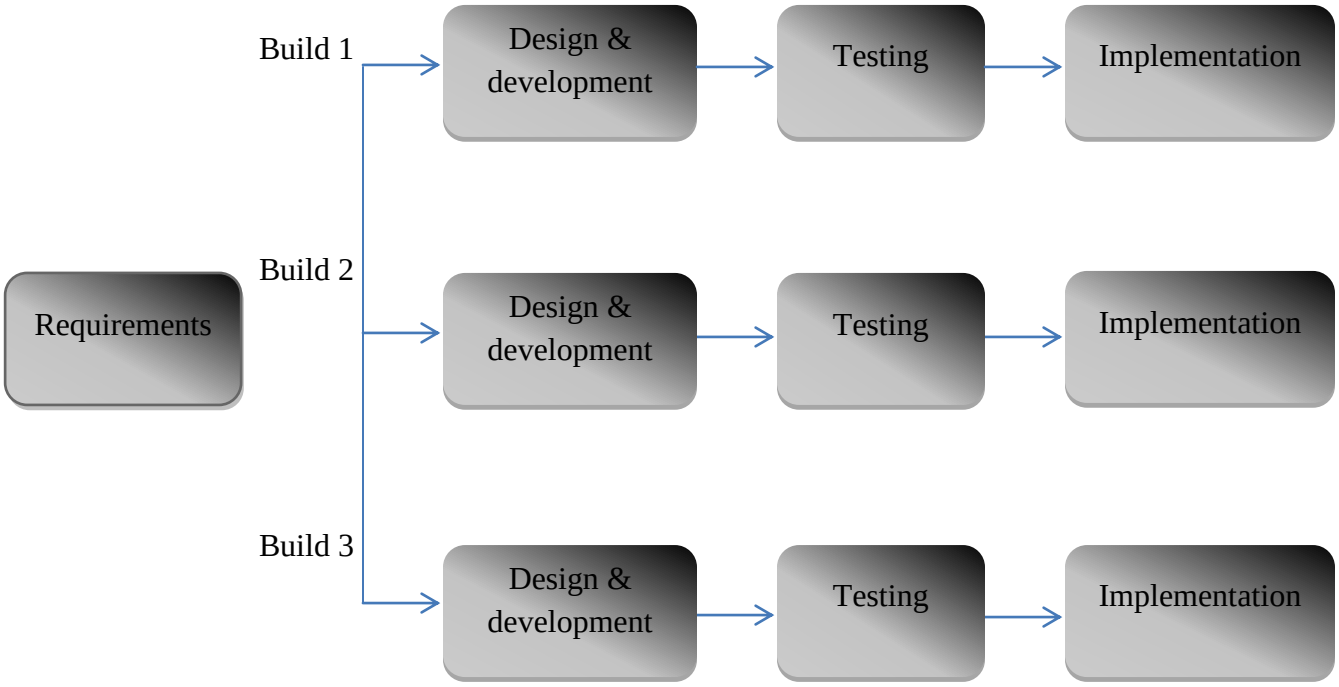


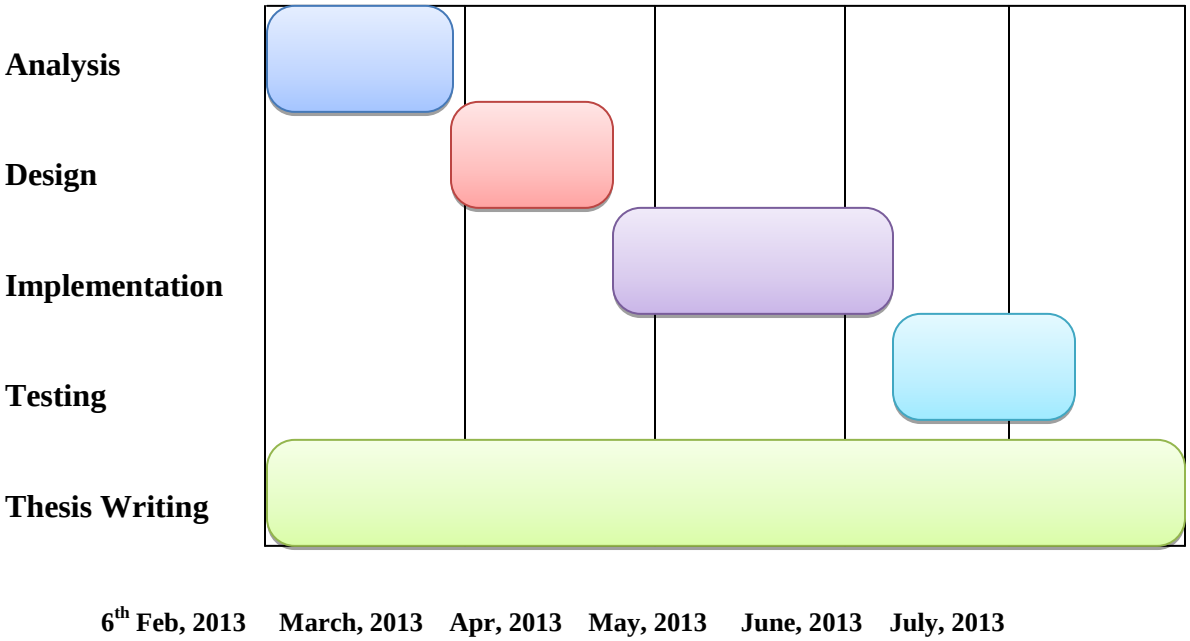
Figure No. 1.2 Incremental Process Model

1.10 Risk Management

No	Risks	Category	Probability	Impact
1	Technology Expectation	Technology Risk	15%	Marginal
Technology of the project will meet the future requirements as new framework and software model has been used, this will reduce the risk.				
2	Changing Requirements	Technical Risk	22%	Critical
During the development of the application, the changes in the requirements will be countered efficiently.				
3	Inability to meet deadline	Project Risk	13%	Critical
Delivery date might be tightened because of the delays caused by the session tests and the assignments. Project plan will help us to manage the available time up to the maximum extent for the project to avoid possible delays.				
4	End user	Customer Risk	6%	Marginal
End user requirements will be kept in mind that he does not have any difficulty in using the software, so the system will be user friendly.				
5	System Crashing	Development Risk	15%	Catastrophic
Periodic Backups will be taken during the development phase to avoid this risk and the arrangements will likely be made for the system's recovery.				
6	Inadequate help	Development Risk	14%	Marginal
Proper help will be available for each tool through online tutorials and professionals thus reducing the risk involved in the development of the project.				
7	Integration of Software Tools	Development Risk	15%	Marginal
Developing a little test project to resolve integration problems that I may confront and to make decisions if any alternative is needed.				

1.11 Project Schedule

Gantt chart



Chapter no. 2

System Analysis & Design

2.1 Requirement Analysis

Requirements analysis in systems engineering and software engineering, encompasses those tasks that go into determining the needs or conditions to meet for a new or altered product, taking account of the possibly conflicting requirements of the various stakeholders, analyzing, documenting, validating and managing software or system requirements. Requirements analysis is critical to the success of a systems or software project. The requirements should be documented, actionable, measurable, testable, traceable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design.

Requirements are the functionality, capability and conditions to which the project must conform. Before starting the development and implementation process the requirement of the system that we are developing must be fully known to us. Requirement elicitation is a very vital part of the system engineering. Mostly the failure reason of the project is the failure of accurate system requirement. There are two types of requirements:

- Functional Requirements
- Non Functional requirements

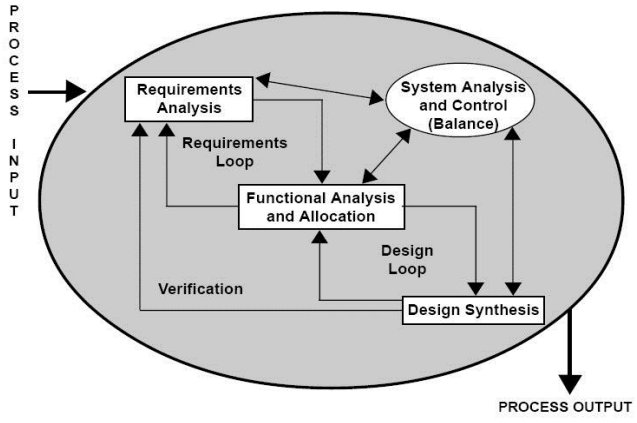


Figure No. 2.1 Requirement Analysis Model

2.2 Functional Requirement

Function requirement are the functions of the system or its components. The function can be input, output or behavior of the system. A functional requirement can be any function that the system does for example calculations, data manipulations, processing and other specific tasks. Following are the functional requirements of the system:

- Launches the app
- Finds logo
- Scan logo
- Retrieve the information from tracking data which is a zip folder in the program.
- Shows demo
- Shows text help
- Shows the right result
- Quits app

2.3 Non Functional Requirement

In development process and requirement elicitation, a nonfunctional requirement is a requirement that defines the standard or criteria that is used to judge the operation of the system. These requirements are often referred to as quality of the system. These requirements are also known as quality goals, quality attributes and quality of service requirements.

- Usability
- Reliability
- Interoperability
- Scalability
- Security

2.4 Object Oriented Analysis and Design

2.4.1 Actor Identification

Only actor of this application is the user of the app.

2.4.2 Use Case Identification

Following use case have been identified in the system:

- Launch Application
- View Demo
- View Help
- Share
- Save to file
- Quit Application

2.4.3 Use case Diagram

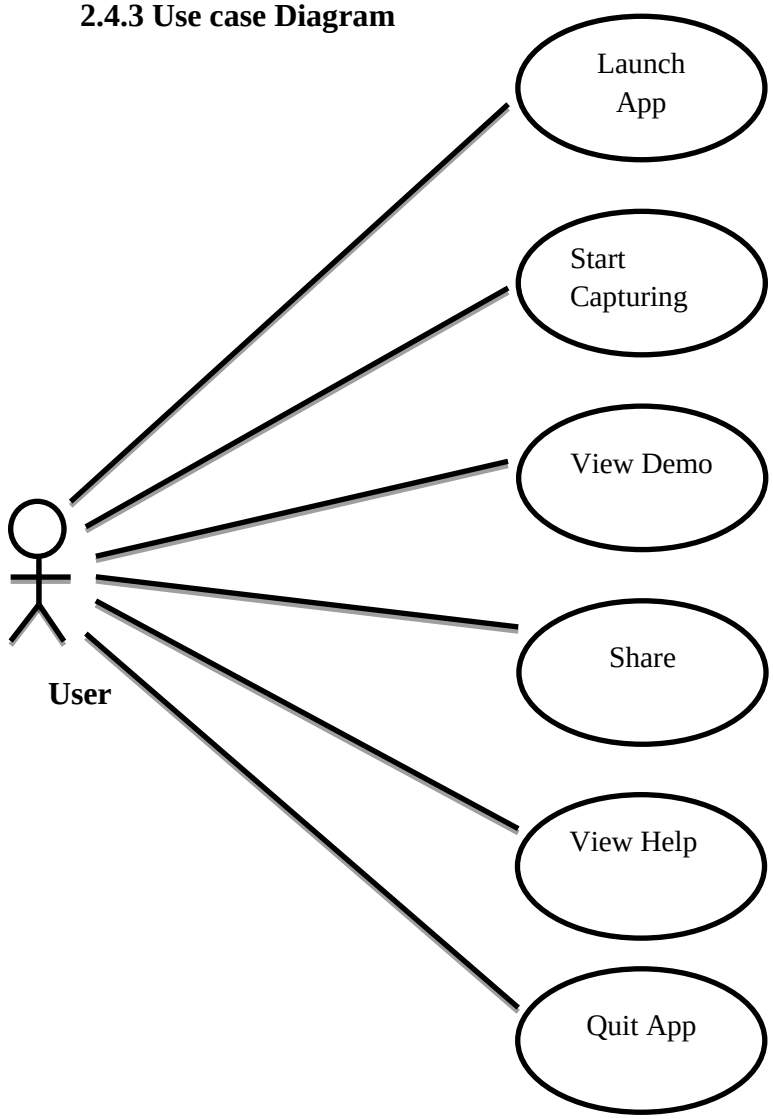


Figure No. 2.2 Use Case Diagram

2.4.4 Activity Diagram

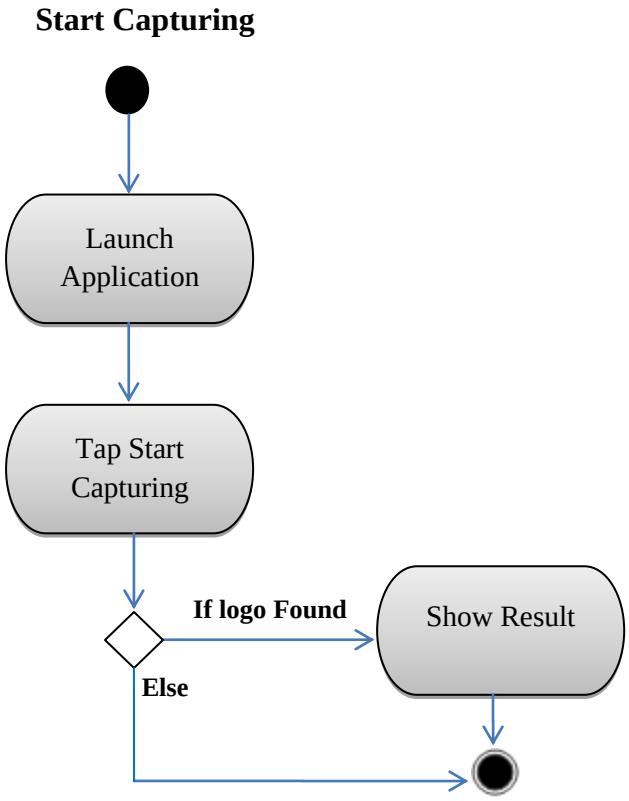


Figure No. 2.3 Activity Diagram: Start Capturing

View Help

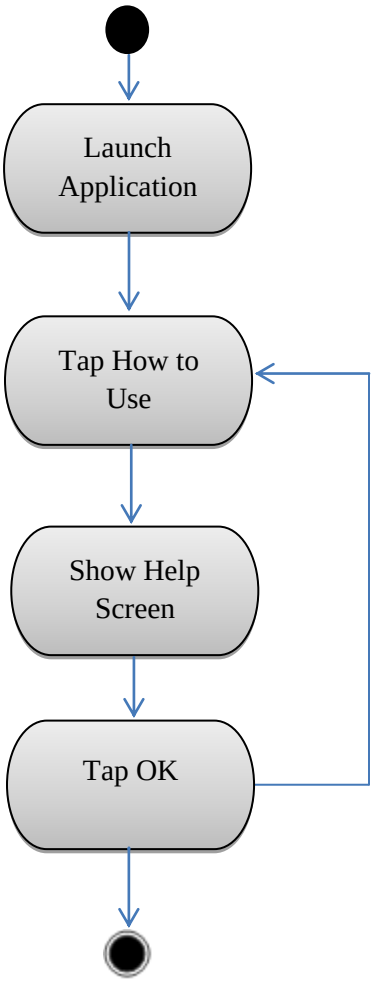


Figure No. 2.4 Activity Diagram: View Help

View Demo

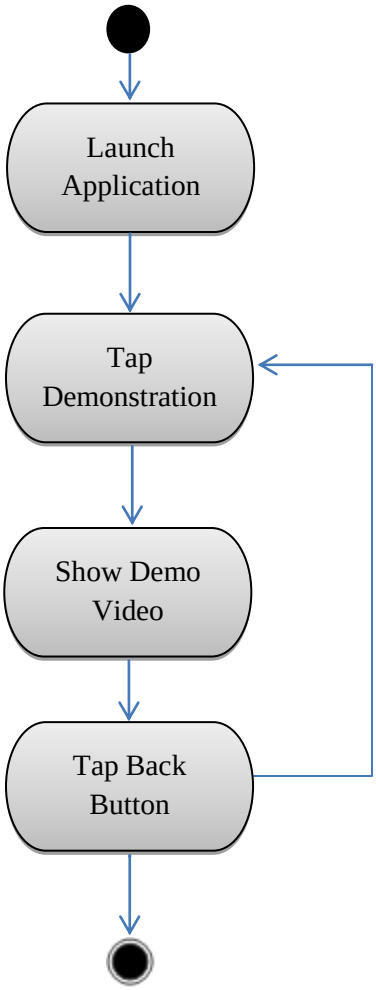


Figure No. 2.5 Activity Diagram: View Demo

Quit Application

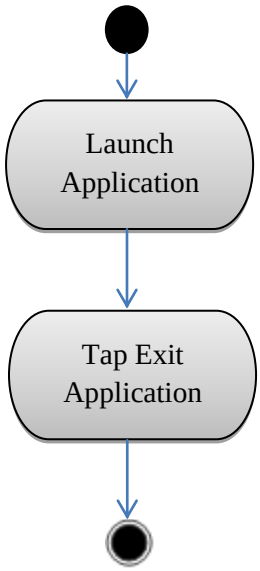


Figure No. 2.6 Activity Diagram: Quit Application

Share

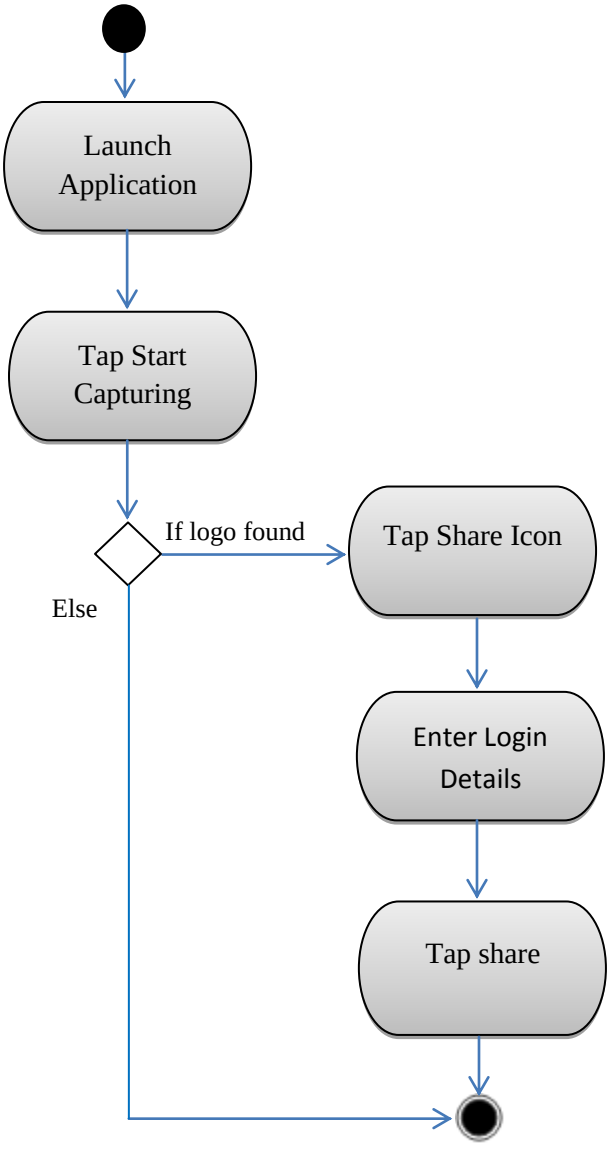


Figure No. 2.7 Activity Diagram: Share

2.4.5Use case Description

Table No. 2.1

Use case ID	SS-01	
Use Case name	Launch Application	
Actor	Mobile User	
Description	It will launch the application.	
Pre-condition	The application has been downloaded and installed on phone.	
Post-condition	The application has been launched and working.	
Flow of events	**Actor Action**	**System Response**
	1. User clicks on the application icon.	2. The system launches the application.

Table No. 2.2

Use case ID	SS-02	
Use Case name	Start Capturing	
Actor	Mobile User	
Description	It will allow the application to use the mobile camera and prepare it to start scanning logos.	
Pre-condition	Mobile application menu is on the user screen.	
Post-condition	Camera is launched.	
Flow of events	**Actor Action**	**System Response**
	1. User taps on the start capturing button.	2. the application launches the camera. 3. If there are any logos available the camera will scan them and show the result.

Table No. 2.3

Use case ID	SS-03	
Use Case name	View Demonstration	
Actor	Mobile User	
Description	This will show the video to help the user to use this application and explaining how it works.	
Pre-condition	Mobile application menu is on the user screen.	
Post-condition	The demonstration has been successfully viewed.	
Flow of events	**Actor Action**	**System Response**
	1. User clicks on the demonstration button.	2. The system launches the video.

Table No. 2.4

Use case ID	SS-04	
Use Case name	Share	
Actor	Mobile User	
Description	It will share the information fetched from logo on Facebook.	
Pre-condition	The application has scanned a logo and showed a result.	
Post-condition	The information has been successfully shared on Facebook.	
Flow of events	**Actor Action**	**System Response**
	1.User clicks on the share icon. 3. User enters his/her login details and taps share button.	2. The system launches the login form of Facebook. 4. System will share this information on the Facebook wall of the user.

Table No. 2.5

Use case ID	SS-05	
Use Case name	View Help	
Actor	Mobile User	
Description	It will show a page with information for user to use this application and explaining how it works.	
Pre-condition	Mobile application menu is on the user screen.	
Post-condition	The help page is successfully viewed.	
Flow of events	**Actor Action**	**System Response**
	1. User taps on the How to use button.	2. System will launch the "How to use" page.

Table No. 2.6

Use case ID	SS-06	
Use Case name	Exit Application	
Actor	Mobile User	
Description	It will exit the application.	
Pre-condition	The application has been launched.	
Post-condition	The system has exited the application.	
Flow of events	**Actor Action**	**System Response**
	1. User clicks on the exit application button.	2. The system exits the application.

Chapter no. 3

System Implementation

3.1 Introduction

The implementation phase is the construction phase of the application. The application that we have been working on will not exist without the implementation. The code is the deliverable thing that a client wants, when he hires you for the development of his desired application, and a working application. To write the code a developer should be familiar to the language that he wants to the write the code in.

The development phase is the last step towards getting the application done. After this the application is ready for testing, use and future maintenance.

We start the development phase soon after all the analysis and design of the application is complete, we are clear about what we want to build and we know our requirements. All the things studies and steps that we have been through were the preparation for the implementation phase.

3.2 Objectives

The objectives of this phase are crystal clear i.e.

1. We want to construct or write the code for our application.
2. We will install the application on the desired environment which would be a mobile phone in this case.
3. In some cases when the system is installed we have to train the end users but here as we have discussed earlier that demos will be included in the application.

3.3 System Architecture

Shirt spy will be developed as a mobile application using java programming language and Metaio SDK for augmented reality application.

3.4 Tools and Implementation

The selection of tools, technology, languages and platform for the development of the application is always a critical phase. For an experienced developer it is not a very difficult task but for a student and a first timer with no experience of developing something of this nature it becomes a rather difficult one. All these things that I have mentioned above are selected according to the need of this application that we will be using for the development of this application.

3.5 Platform

The platform or say the operating system that I have chosen for this system is the android operating system. This application will be used on the smart phones with android operating system. The reason for choosing this platform is that Android operating system which is a Linux based OS was basically designed for the touch screen mobile devices i.e. smart phones and tablet computers. The android platform is a top standard OS for the smart phone and it acquires a total share of 68% of the total smart phones usage in the year. The first Android powered phone was sold in October 2008. Android smart phones use android OS to run these applications. Most of the android development is done using Java programming language but there are other tools available too for development. These applications have captured people from all walks of life and of every age. According to some researches as of October 2012 over 700,000 applications have been developed for android with over 25 billion downloads. In 2012, around 105 million android smart phones were shipped which is 68% share of the total smart phones sale in 2012. Apple I Phones also have a big market but android OS has captured a big market share in the past few years.

3.5.1 Android Platform

Figure 3.1 Android Logo

Android is an operating system for mobile devices which provide a foundation to the application that have been developed for the smart phones to run on them.

3.5.2 Versions of Android OS

- Cupcake 1.5
- Donut 1.6
- Éclair 2.0 - 2.1
- Froyo 2.2
- Gingerbread 2.3 - 2.3.2
- Gingerbread 2.3.3 - 2.3.7
- Honeycomb 3.1
- Ice Cream Sandwich 4.0x
- Jelly Bean 4.1x
- Jelly Bean 4.2

3.5.3 Fundamentals of Android

Following are the fundamentals of android:

- Android applications are written in JAVA programming language.
- The android application, once installed works in its own security sandbox.

- The android OS is a multi-user system in which each of the application is treated as a different user.
- Every process has its own virtual machine so the code of the application runs in isolation from other application's codes. It is possible for an application to share data with another application. This is done by arranging the two applications to have a same ID. In this they can run in the same Linux process and a same virtual machine.
- Android is a Linux based operating system so the system assigns a unique Linux ID to every application. This ID is only used by the system and is not known to the application.
- It is by default in the android OS that every application run in its own Linux process and the OS starts the process whenever any component needs to be executed and also shuts it down when it is no longer needed.

3.5.4 Android Application Components

- Applications
- Application Framework
- Libraries
- Android Runtime
    - Core Libraries
    - Dalvik Virtual Machine
- Linux Kernel

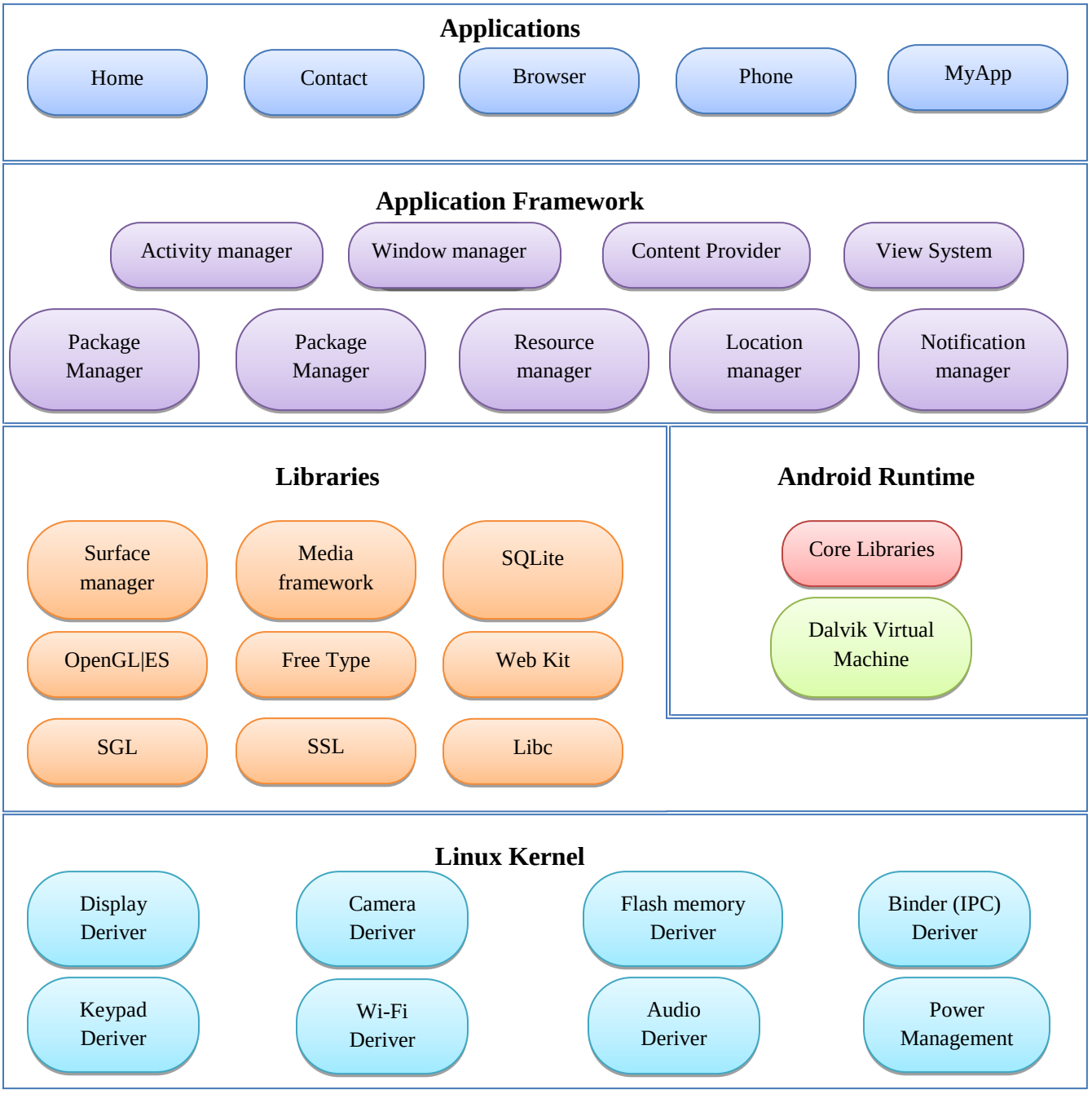


Figure 3.2 Android Architecture

3.5.4.1 Applications

In the android architecture applications is the top layer and this where the application that I am making will fit. Some of the standard applications are by default present in the phone are:

- A browser
- SMS application
- Contacts manager
- Dialer

3.5.4.2 Application Framework

There are some blocks to which the applications directly interact. The basic functions of the phone are managed by these programs for example voice call management and resource management etc. I am being a developer will consider that these are some basic tools with which I will be developing this application.

Important blocks of Application framework are:

- **Activity Manager:** The activity manager as understood by the name manages the activity cycle of the application.
- **Content Providers:** The application may share some data so it will manage the data sharing between the applications.
- **Telephony Manager:** It manages the voice calls.
- **Location Manager**: Location management
- **Resource Manager:** Manages the resources that our application uses.

3.5.4.3 Android Runtime

Android runtime consists of two things i.e. Dalvik VM (Virtual machine) and java core libraries.

- **Dalvik Virtual Machine VM**

Dalvik Debug Monitor Server (DDMS) is the process virtual machine in Google's Android operating system. The applications on the android devices are run through this software. Dalvik virtual machine is a necessary part of the Android which is used on mobile devices for example mobile phones and tablet computers. Dalvik VM is a type of JVM which is used the android powered devices and is made as perfect and effective as

possible for low processing power and low memory environments. The Dalvik virtual machine runs .dex files, which is opposite to the JVM machine which runs .class files. To provide higher efficiency in resource environments the .dex files are built from .class files at the time of compilation. The Dalvik VM allows multiple instance of Virtual machine to be created simultaneously providing security, isolation, memory management and threading support. It is open source software which was written by Dan Bornstein.

- **Core Java Libraries**

The core libraries consist of classes which are used by many portions of the JDK. The actual set of files has evolved over time, but mostly they include functionality which is close to the VM and is not explicitly included in other areas, such as Security or Networking. Also included are commonly used tools which are either built on top of the core libraries for example jar or are used by developers working with them for example rmic.

3.5.4.4 Libraries

Next layer in the Android architecture is the native libraries of Android. This layer enables the device to handle different types of data. These libraries are written in c or C++ language and are specific for a particular hardware.

Some of the important native libraries include the following:

- **Surface Manager:** It is used for compositing window manager with off-screen buffering. It means you cannot directly draw into the screen, but your drawings go to the off-screen buffer. There it is combined with other drawings and form the final screen the user will see. This off screen buffer is the reason behind the transparency of windows.
- **Media framework:** Media framework provides different media codecs allowing the recording and playback of different media formats.
- **SQLite:** It is the database engine used in android to store data.
- **Web Kit:** The HTML content is displayed on this browser engine.
- **OpenGL:** Used to render 2D or 3D graphics content to the screen.

3.5.4.5 Linux Kernel

The basic layer is the Linux kernel. The whole Android OS is built on top of the Linux Kernel with some further architectural changes. It is this Linux that interacts with the hardware and contains all the essential hardware drivers. Drivers are programs that control and communicate with the hardware. For example, consider the Bluetooth function. All devices have Bluetooth hardware in it. Therefore the kernel must include a Bluetooth driver to communicate with the Bluetooth hardware. The Linux kernel also acts as an abstraction layer between the hardware and other software layers. Android uses the Linux for all its core functionality such as Memory management, process management, networking, security settings etc. The Android is built on a most popular and proven foundation, it has made the porting of Android to a variety of hardware.

3.6 Language Selection

The language selection to be used to develop the application is a critical step. A better language and tool support helps to avoid upcoming difficulties as we move forward in the development phase.

As I have mentioned earlier that Android applications are written in Java programming language, so the selection of language was pretty much done with the selection of the platform.

3.6.1 Why Android Has Chosen JAVA

One can ask that why did Google use Java for android development? There are so many other powerful languages that can be used like Python, C, C++ or ObjC, these languages are also strong as java. C or C++ may be difficult to code in but they run faster because of less overhead.

Google uses Java a lot. The search features are written in java. Also, for most of the tasks java runs faster than python. It runs in a virtual machine so there is no need to recompile it for every phone. It is easy to secure. As a beginner in the field of development and because of less practical knowledge about the languages, because they are so many, I can conclude that Google mostly like to work with java.

3.7 Java

Java is an object oriented programming language and it is developed by Sun Microsystems. It is similar to C++, but is simplified. It is simplified in a way that some language feature that cause common programming errors are eliminated. Java is a platform independent language which is designed to work in the distributed environment on the internet.

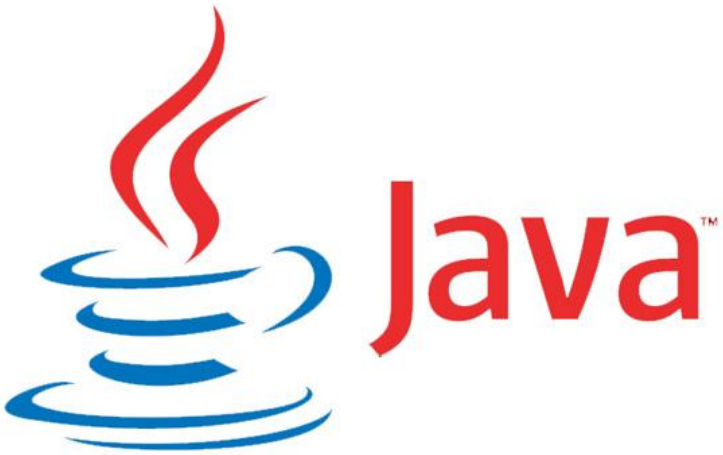


Figure 3.3 Java Logo

3.7.1 History of Java

Java is an object oriented programming language which was developed by James Gosling Mike Sheridan and Patrick Naughton at Sun Microsystems in 1991. Java was originally designed for interactive television, but it was too advanced for the digital cable television industry at the time. It was initially started as a project named Oak in June 1991. Gosling's goals included hat he wanted to implement a virtual machine and develop a language which has a familiar C/C++ like notation but is more uniform and simple than C/C++. The first public implementation of java was released in 1995.

3.7.2 Characteristics of Java Language

Java is a simple, with a style notation like C/C++ but cause less common programming errors, programming language which is easy to learn and code with. It is language with a lot of attributes and features which makes it a better language to use for World Wide

Web. Java is easy to learn and easy to use so it has gained the confidence of a number of developers all over the world. Following are some of the major characteristics of Java.

3.7.2.1 Simple

Java is Easy to write and more readable and eye catching. Java has a concise, cohesive set of features that makes it easy to learn and use. Most of the concepts are drawn from C++ thus making Java learning simpler. It is a language that could be programmed easily without a difficult training and which also is in compliance with today's standard practice. Java is one of the most modern programming languages and it is a mixture of many other programming languages for example C, C++, Objective-C, Modula3 etc. The syntax of Java is very similar to C and C++, but Java is simpler to code in than the other languages. This simplicity, with the fact that java is a one of the most used languages, makes Java a powerful programming language.

3.7.2.2 Object Oriented

Java is an object-oriented programming. As I have mentioned earlier that java is built just like C/C++ and we know that C++ is an object oriented language and it has mostly all the features of an object oriented language. Java is pure object oriented Language.

3.7.2.3 Distributed

Java was designed with the distributed environment to create applications on network. It can share data and programs over a local area network. Java can be transmit and run over internet.

3.7.2.4 Robust

Java is designed for writing codes of programs that are supposed to be reliable in so many different ways. Java emphasizes on checking for problem on a very early stage and also dynamically checks for errors and removes the reasons which cause errors in the code. The only and most important difference between Java and C/C++ is that Java has a pointer model that dismisses the possibility of overwriting memory and corrupting data.

3.7.2.5 Secure

As I have mentioned earlier that Java is designed in such a way that it can be used in networked or distributed environment. To achieve that purpose a lot of emphasis has been put on reliable security. If this language is to be used on World Wide Web then it should

be reliable and secure because security is very critical topic and Java enables the construction of virus-free and tamper-free systems.

3.7.2.6 Architectural Neutral

Java is not made to be programmed or used on a specified machine or operating system architecture. Java is independent of hardware and can be used on any operating system on any hardware.

3.7.2.7 Portable

Java programs can be executed in any environment for that purpose there is a Java run-time system which is Java Virtual Machine (JVM). Java programs can be run on any platform which can be Linux, Windows or Mac. Java programs can be transferred over World Wide Web.

3.7.2.8 Interpreted

As I have mentioned earlier that java is not machine or environment dependent so, it supports cross-platform code through the use of Java byte code. Byte code can be interpreted on any platform by Java Virtual Machine JVM. The Java interpreter can execute Java byte codes directly on a variety of machines to which the interpreter has been ported. Since linking is a more incremental and lightweight process, so the development process can be much more rapid and exploratory.

3.7.2.9 High Performance

In earlier discussion I have mentioned that java is a faster language. Byte codes are highly optimized. JVM can execute them much faster. When it can be executed faster than it can be said that it gives high performance

3.7.2.10 Dynamic

Java programs carry with them substantial amounts of run-time type information that is used to verify and resolve accesses to objects at run time.

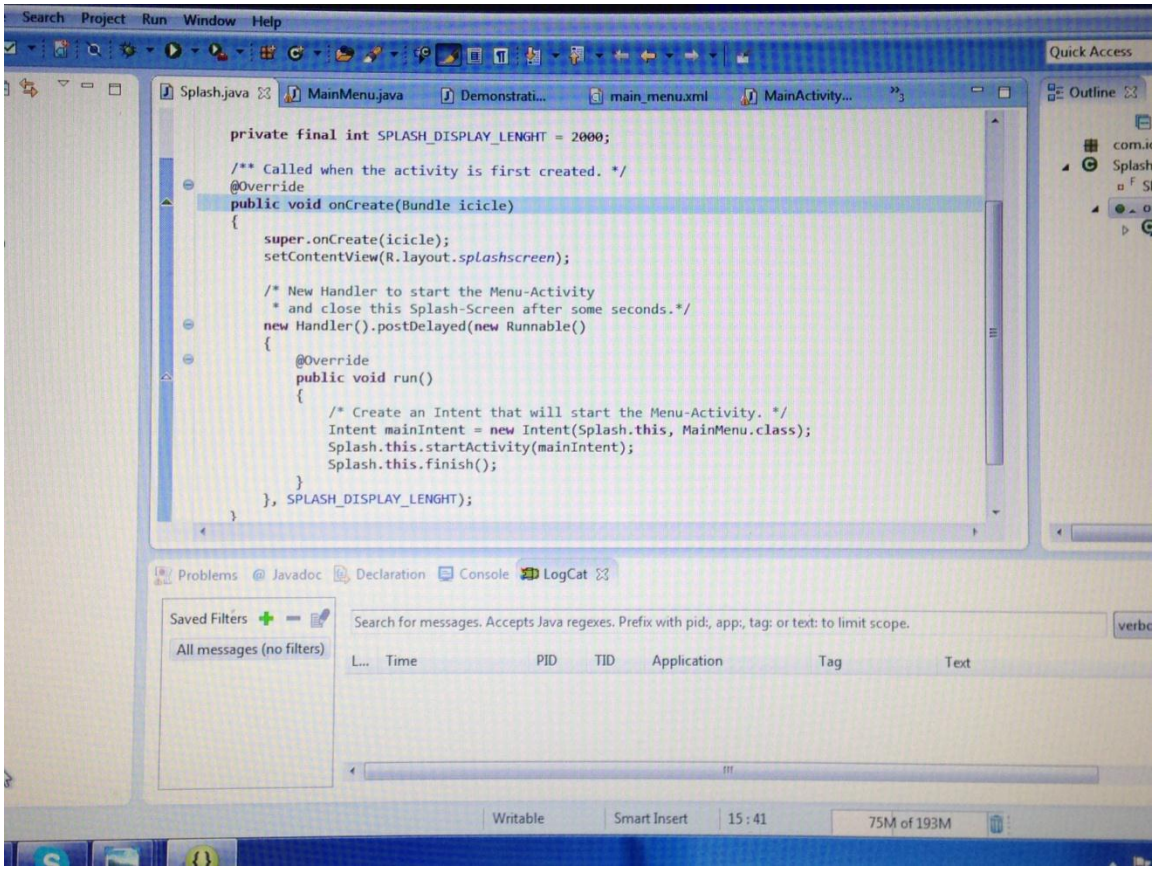
3.7.2.11 Multithreaded

Java provides integrated support for multithreaded programming.

3.8 Implementation

The implementation of this system is done in JAVA programming language. I used five classes in this code that I wrote in java i.e. ARELViewActivity.java, Demonstration.java, Mainactivity.java, MainMenu.java and Splash.java. All the classes are communicating with MainMenu.java. This class communicates with the main class i.e. ARELViewActivity.java.

These classes interact with each other in order successfully run the program.



3.8 Development Environment Selection

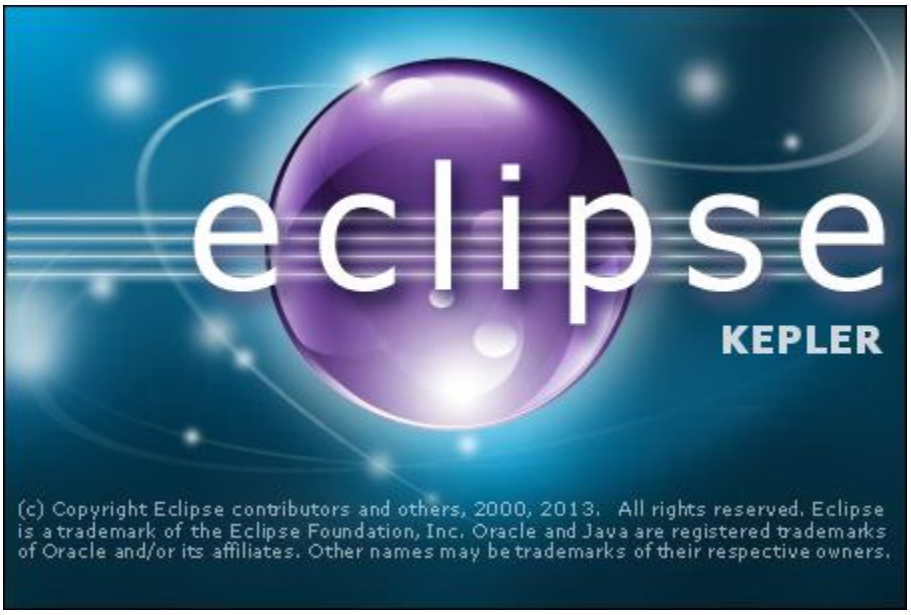


Figure 3.4 Eclipse Logo

3.8.1 Eclipse, the Kepler Version

Eclipse is a multi-language Integrated development environment (IDE) comprising a base workspace and an extensible plug-in system for customizing the environment. Eclipse was developed by an open source community and it is used for developing java and Android application. To run eclipse on your computer you need a java runtime environment preinstalled on your computer because JRE to work and also mostly it is written in java and also the android applications are written in Java. Android Development Tools (ADT) is a plug-in for the Eclipse IDE that is designed to give you a powerful, integrated environment in which to build Android applications.

ADT extends the capabilities of Eclipse to let you quickly set up new Android projects, create an application UI, add packages based on the Android Framework API, debug your applications using the Android SDK tools, and even export signed or unsigned .apk files in order to distribute your application.

When a new project is made in eclipse it generates a main activity class. When the application is launched the functions in this class are called "onCreate". In this case the main page is launched i.e. the menu layout.

3.8.2 Versions

Since 2006, the android community has been annually releasing versions of eclipse and other projects.

- Callisto 3.2
- Europa 3.3
- Ganymede 3.4
- Galileo 3.5
- Helios 3.6
- Indigo 3.7
- Juno 4.2
- Kepler 4.3
- Luna 4.4 ; it is planned to be released in 2014

3.9 Metaio SDK for Augmented Reality Solutions

Metaio is a privately held Augmented Reality (AR) company that develops software technology and provides Augmented Reality solutions.

Figure 3.5 Metaio Mobile SDK logo

The library can be downloaded from the metaio webpage for experimental purposes. To utilize the library to the full extent we have to buy it. As for now the library allows us to make only two markers online for our application. Metaio is a software development kit for developing augmented reality applications for Android and I Phone.

3.9.1 Augmented Reality

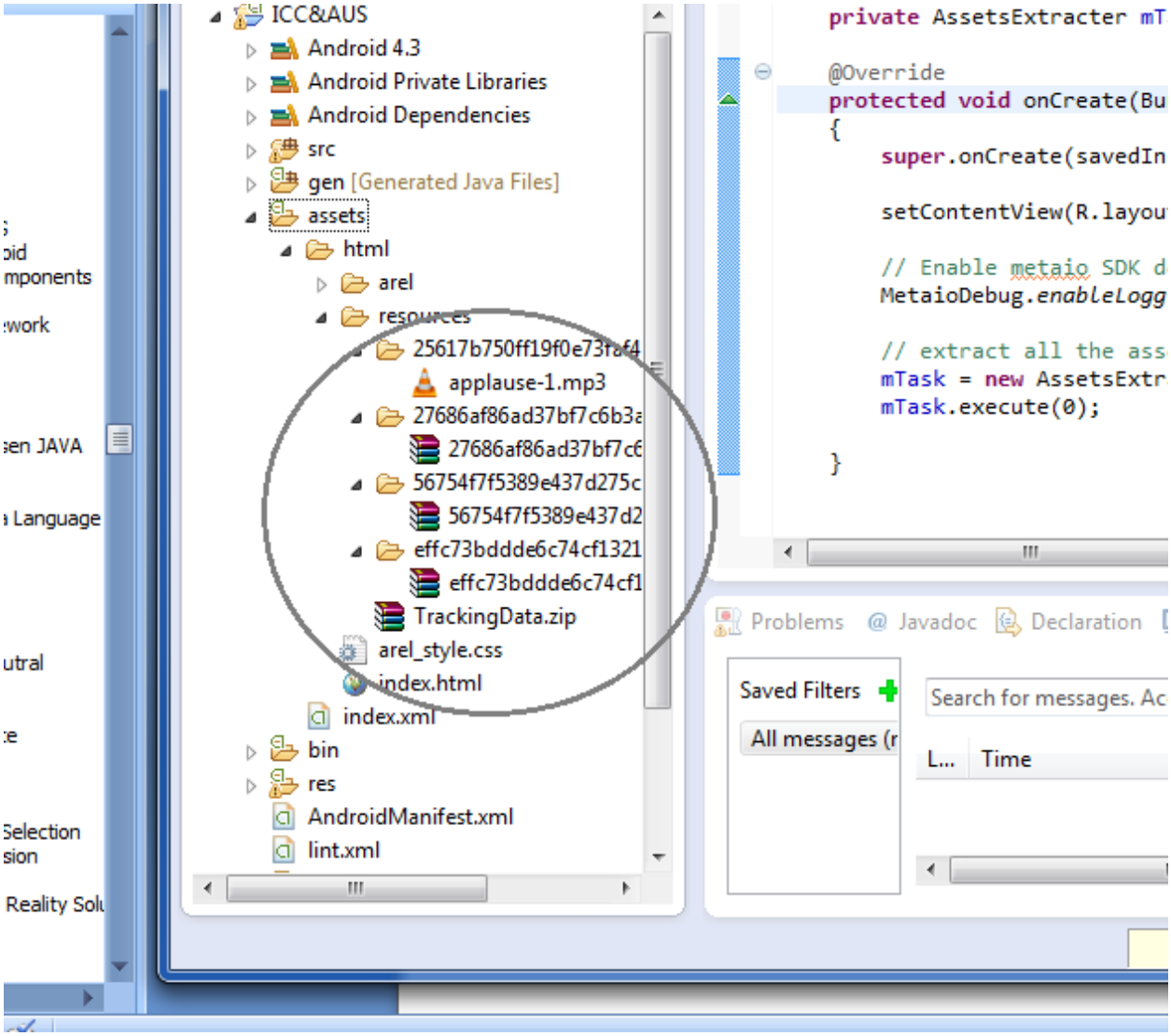
Augmented Reality is a new way of viewing digital information which has been superimposed onto a live of the physical and real world environment around you. The

information is given after scanning the environment through a camera. This means that the reality is augmented digitally.

3.9.2 Markers

Markers for this application can be made online. Metaio toolbox is an application which enables to you create or edit 3D tracking maps of all textured objects in your surroundings. More over you can also use your created maps in metaio SDK, through junaio or loading it to the metaio creator to build your own AR-application.

The tracking data zip folder contains the marker in zip form.



When the start capturing button is tapped it communicates with the MainActivity.class as shown below:

Intent myIntent = **new** Intent(MainMenu.**this**, MainActivity.**class**);

After this the "please wait" splash screen appears for the user while the camera is ready to start capturing the logos.

MetaioDebug.*enableLogging*(BuildConfig.*DEBUG*);

It enables metaio SDK debug log messages based on build configuration. So the markers that I have created will match with the logo and the result will appear on the screen.

3.10 Interface

The interface of this application is user friendly. It is designed in a way that it is easy to use and understand for an average user.

3.10.1 Splash Screen

This page appears on the screen of the mobile when the application is preparing to launch.

3.10.2 Main Menu

The following shown figure is the main menu which appears on screen when the application is launched.

3.10.3 How To Use

shown below are the screen of how to use the application.

Chapter No. 4

System Testing

4.1 Introduction

System testing is the last important step to complete software for delivery. After the development of the system is complete, we are required to test the product. The development of a system is done with keen interest that the system works according to desire but there is always a chance that after deployment wrong results of the input or some other software related logical problem occurs. To avoid such issues system testing is done to be sure about the system that it works fine and according to the desired functionality. It is a kind of investigation that is conducted to ensure the customer that the quality of the system is as desired.

A successful system testing unveils all the errors of the system, if there were any. It also shows that the required quality, usability, scalability, reliability and other functional and nonfunctional requirements of the system are met. This section of the thesis describes the system testing of my project.

4.2 Objectives of System Testing

System testing is done with a number of goals in the tester's mind but most importantly and basic goal of it is to verify the quality of the system. There are a number of priority issues that makes the system testing an important task. It includes:

- It ensures that we are building the system right. Meeting the requirements gathered during the requirement elicitation is the most important goal of the system. It overall covers all the factors for which we are testing the system before deployment.
- If a bug or an error stays undetected for a long time after deployment it will eventually shows itself but after doing harm to the system and costing up to 40 to 100 times more than it would have cost if found earlier. So another purpose of the system testing that it reduces future costs of the system.

- When the software is thoroughly tested before deployment then it becomes easy for the customer get the hang of it. After deployment the customer requires some training. So if the system is working properly and as per the customers need, it will be easy and less time taking to train him/her.

4.3 Software Testing

Software testing is the process of ensuring the good quality of software. Testing is an evaluating process which is conducted by the testing team to check whether the software behaves in the required manner or not. It validates and verifies the software after development to avoid any future problems and issues.

4.3.1 Verification

Are we building the right product?

Verification implies that the software has been developed and working right. It means that the software is in accordance with the required specification and the conditions which were imposed at the start of the project.

4.3.2 Validation

Are we building the product right?

Validation assures that a software, service, or system meets the needs of the customer and other identified personnel who are somehow concerned. It is most likely that it involves acceptance and suitability with external customers.

4.4 Software Testing Techniques

There are three main software testing techniques:

4.4.1 Black Box

This technique means that the internal working or code of the software is unknown to the tester. He only knows the inputs and outputs of the system and makes sure that the output of the system is as per requirement defined by the customer and the functions of the software are working correctly.

4.4.2 White Box

The internal working or code of the system is thoroughly tested in the white box testing technique.

4.4.3 Grey Box

Grey box testing technique is a hybrid approach which includes both white box and black box testing technique. This testing technique is a software testing method which is a combination of Black Box Testing method and White Box Testing method.

4.5 Software Testing Levels

Following are the four testing levels:

4.5.1 Unit Testing

Unit testing refers to the testing of a functionality of a specific code. It means that it is the testing of the smallest unit of system i.e. a function or a class. A unit of work is a single logical functional use case in the system that can be invoked by some public interface. A unit can span a single method, a whole class or multiple classes working together to achieve one single logical purpose that can be verified.

4.5.2 Integration Testing

Integration testing is the testing of the units of code which have been already tested. The chunk of code which is already tested is integrated and then tested again to see whether the emergent properties of the integrated units are also in accordance with the system. If this is not the case even then this testing helps by unveiling the errors which occur after combining the already tested units.

4.5.3 Acceptance testing

This is the type of software testing which is by the customer himself at the time of delivery. This testing type also comes under the back box testing technique. The customer tests the product to check whether the system works according to the requirements and desired functionality or not.

4.5.4 System Testing

The process of performing a number of different types of test on newly developed software is called system testing. It ensures that the system as a whole is working in accordance with functionality requirements. The entire system needs to work properly as required so it is tested as whole also to be sure and to avoid any future occurrence of issues.

4.5.4.1 Functional Testing

Functional testing implies that the system functionality is in compliance with the required functionality defined during the requirement elicitation process. Functional testing is done in the black box testing technique.

4.5.4.2 Performance Testing

Performance testing implies the speed and performance quality of the system. It tests the time taken by the system to perform each function. It is important because if the software is slow and delays the results the customer will be exhausted and will not be satisfied with the performance of the system. It is also a black box testing technique.

4.6 Types of Software Testing

There are a number of software testing types that are used to test the software. Most of them are applied at the time of testing the software to be sure about the software. Following are types of software testing:

4.6.1 Installation Testing

The installation testing is done after the deployment at the customer's end. It is done to test whether the system is working at the customer's hardware as per his requirements.

4.6.2 Functional Testing

Functional testing implies that the system functionality is in compliance with the required functionality defined during the requirement elicitation process. Functional testing is done in the black box testing technique.

4.6.3 Parametric Testing

At the module level testing implies that the system's individual unit performs as expected by the user according to the requirements of the system, if we enter a full range of parameters which are valid for the function.

4.6.4 Regression Testing

Regression testing is retesting sub-systems, modules, units to insure that a modification to one sub-system, module or unit does not cause unexpected results in another sub-system, module or unit. This is also known as ripple effect testing. It ensures that if we modify a system or module it will not affect the rest of the system.

4.6.5 Ad-Hoc Testing

Ad-hoc testing is a type of unofficial testing or informal testing which can be done by any person who is concerned with the software or is a stakeholder. This person usually has a very good understanding of the whole system and the software requirements and tries to test the code to find the errors, issues and defects of the system with the experience that he has about the software and the retirements of the system.

4.6.6 Agile Testing

This type of testing approach is used when the agile process model is used for the development.

4.6.7 Alpha Testing

This is the formal type of testing which is done by the customer who has asked for the system in the first place. The customer tests the system at the development site. This testing is done before the beta testing. If the customer is satisfied the software is delivered to be installed or deployed at the customer hardware.

4.6.8 Beta Testing

Beta testing is done by the end customer before handing over or releasing the software to the customer. If the customer is fully satisfied after this testing, the system is deployed or delivered to the user.

4.6.9 Stress Testing

This is the type of testing in which the system is tested with the peak load and to the crashing point. It is done to test that how much stress a system can bear. It also tests that how will the system behave if it has to perform with inadequate resources like CPU, bandwidth and high load.

4.6.10 Load Testing

Load testing is a type non-functional testing. It is done to check the performance of the system under normal and high peak or load circumstances. This type of testing is done mostly using automated tools of testing, because this is not manually possible.

4.6.11 Security Testing

Security testing is the type of testing which is done to test whether the system is secured or not. Security testing ensures that the application or the system is open to any threat or

has loop holes that can let in any suspicious bugs or viruses. Security testing ensures that the system protects against unauthorized internal or external access.

Security testing needs to cover following basic security concepts.

1. **Integrity**
2. **Authentication**
3. **Authorization**

4.6.12 Interface Testing

User interface testing is the type of testing the system's GUI graphical user interface of the system that is being tested. This testing involves assuring the screens with the controls like menus, buttons, icons, and all types of bars like tool bar, menu bar, dialogue boxes and windows etc.

4.7 Testing Techniques Used in This System

The black box testing technique is used in the testing phase of this system.

4.7.1 Black Box Testing

Black box testing is also called behavioral and functional testing. It is also sometimes called structural testing. The main focus of the black box testing is on the functional requirements. Black-box testing is a method of software testing that examines the functionality of an application without looking into its internal structures, workings or code. This technique defines whether the software does what it is supposed to do or not. The main interaction of the system tester during the testing is with the interface of the system because this testing only takes the inputs and tests if the output is correct.

In every technique there are always advantages and disadvantages related to it. Following are some advantages and disadvantages of the black box testing.

- The tester does not need to check the code thoroughly.
- The tester and developer are independent of each other, testing is balanced and unprejudiced and unbiased
- This technique is successful on large projects.
- This test is done with the point of view of the user that is why it is often called acceptance test because it is also done by the customer.

- The tester does not need to be a technical person because he does not need to get inside the code.
- The tester has no idea or understanding of the code.
- Testing every possible input stream is unrealistic because it would take an inordinate amount of time; therefore, many program paths will go untested.
- If the test case fails the tester cannot find the reason.
- All the properties of the system cannot be tested through black box testing.

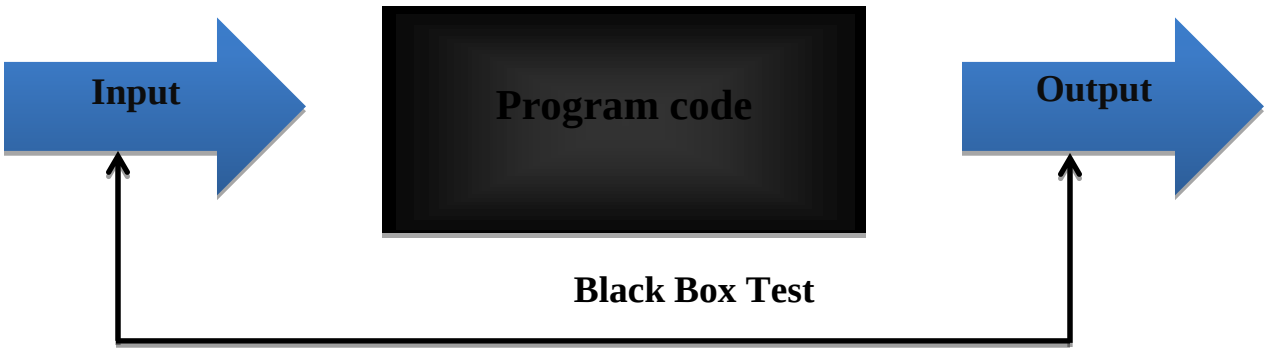


Figure No. 4.1

4.8 Black Box Test Case

The main or basic step that we do in black box testing is to create simple and priority test cases of the functional requirements or use cases. In black box testing, test cases can be prepared even before actually implementing the actual code because we know the functional requirements of the system which we have to implement and test. The requirements and specifications that we have gathered during requirement elicitation process give us an expected result of the functions. We can extract from the requirement specification the functions and what their result should be if we have coded correctly.

4.8.1 Black box testing template:

Table No. 4.1

Test Case ID	The ID of the test case.
Tester	Name of the tester.
Test Type	What type of testing technique is being used?
Test Case Name	The name of the test case.
Description	Description of the functional requirement.
Procedure	Describes the procedure or steps of that function.
Expected Result	What should it do?
Actual Result	What it did?
Status	Successful or fail.

Table No. 4.2

Test Case ID	SS-01
Tester	Warda Rasul Malik
Test Type	Manual-Black Box
Test Case Name	Launch Application
Description	It will launch the application.
Procedure	User taps on the application icon. System launches the application
Expected Result	The application should be launched and ready to use.
Actual Result	Application is successfully launched.
Status	Success

Table No. 4.3

Test Case ID	SS-02
Tester	Warda Rasul Malik
Test Type	Manual-Black Box
Test Case Name	Start Capturing
Description	It will turns on the camera which is ready to scan logo if found.
Procedure	User taps on the application icon. User taps on the start capturing button on the menu.
Expected Result	The camera should be turn on.
Actual Result	Camera turns on successfully.
Status	Success

Table No. 4.4

Test Case ID	SS-03
Tester	Warda Rasul Malik
Test Type	Manual-Black Box
Test Case Name	View Demonstration
Description	It will display the video demo on the phone screen.
Procedure	User taps on the application icon. User taps Demonstration button. System displays the demo on screen.
Expected Result	The application demo should be displayed.
Actual Result	Demo is successfully displayed.
Status	Success

Table No. 4.5

Test Case ID	SS-04
Tester	Warda Rasul Malik
Test Type	Manual-Black Box
Test Case Name	Share
Description	It will share the information fetched from logo scan where ever the user wants from the available options.
Procedure	User taps on the application icon. User taps on the Start Capturing button if any logo is found the share button will appear on the screen. User taps on the share icon. The system launches the facebook login detail box. User submits his/her login details. System shares the information on the facebook.
Expected Result	The information should be successfully shared.
Actual Result	The information has been successfully shared.
Status	Success

Table No. 4.6

Test Case ID	SS-05
Tester	Warda Rasul Malik
Test Type	Manual-Black Box
Test Case Name	How to use
Description	It will display the text help for the user which explain how to use this

	application.
Procedure	User taps on the application icon. Use taps on the how to use button on the menu screen.
Expected Result	The help should be displayed.
Actual Result	The help is successfully displayed.
Status	Success.

Table No. 4.7

Test Case ID	SS-06
Tester	Warda Rasul Malik
Test Type	Manual-Black Box
Test Case Name	Exit application
Description	It will exit the application.
Procedure	The application is in use. User goes to the menu screen. User taps the exit application button. System exits the application.
Expected Result	The application should be exited.
Actual Result	The application has been successfully quit.
Status	Success

Table No. 4.8

Test Case ID	SS-07
Tester	Warda Rasul Malik
Test Type	Manual-Black Box

Test Case Name	Scan a logo and show result.
Description	It will scan a team's logo and fetch information from the database.
Procedure	The application is in use. User uses the application to scan a logo of a team. The application will scan a logo and show the result on the screen.
Expected Result	The application should show the result after finding a logo.
Actual Result	The application has successfully scanned a logo and has shown results.
Status	Success

Table No. 4.9

Test Case ID	SS-08
Tester	Warda Rasul Malik
Test Type	Manual-Black Box
Test Case Name	Scan the wrong logo.
Description	It will scan a logo which is not in the database
Procedure	The application is in use. User uses the application to scan a logo of a team. The application will scan a logo and show the result on the screen accordingly.
Expected Result	The application should not show any result if the matching marker is not available. There will be no result on the screen.
Actual Result	The application has not shown any results.
Status	Success

Chapter No. 4 System Testing

Chapter No. 5

Future Enhancement and System Evaluation

5.1 Introduction

There is always room for improvement and enhancement in technology. The work on any system cannot be completely done as such there are no more requirements for more functions in it or improvements in the existing function. People who work on computers and have been using different software know that there are always updates coming for that software. Not just in the desktop applications but also operating systems and smart phone applications.

5.2 Improvements in Shirt Spy

Shirt Spy can be improved in the following ways:

- It can be improved to have database online and to be able to show results of all the cricket teams of the world.
- There are so many sports for example football with a millions of fans of this sport so we can include other sports and there team's and club's logo too. This kind of improvement will need a 24 hour internet support but that is possible in the developed countries where 3G technology is available. 3G, short for third Generation, is the third generation of mobile telecommunications technology. These telecommunication networks support services that provide a data transfer rate of at least 200 kb/s. Also there are many services published as 3G provide higher speed than the minimum technical requirements for a 3G service. So this technology provides you internet facility wherever you are to your smart phones and mobile modems in laptop computers.

5.3 Evaluation of the System

After the completion of the project an important final step of evaluation is done. Evaluation is necessary step for the improvement in the future enhancement in the application. Evaluation describes the activities which include the examination of system to check whether the goals which were defined at the start of the project are met or not and to see if there are any deficiencies or weaknesses in the system.

The purpose of evaluation is to do the assessment of the whole system. In this section the evaluation of my system's design and implementation has been done and it showed that the system is in compliance with the requirements gathered at the start of the system.

Number	Functional Requirement	Evaluation
1	Customer Requirements	Fulfilled
2	Launch Application	Fulfilled
3	Find Logo	Fulfilled
4	Scan Logo	Fulfilled
5	Retrieve the information from Tracking data.	Fulfilled
6	Display Demo	Fulfilled
7	User Interface Requirements	Fulfilled

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3) http://www.metaio.com/sdk/
4) http://www.eclipse.org/
5) http://en.wikipedia.org