Landmark Recognition and Retrieval System

Software Requirements Specification

Project Id - 18-107

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DECLARATION

I declare that this is My own work and this SRS does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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M.M.R.Marasinghe

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1   INTRODUCTION

The software requirement specification is created mainly to identify the requirements of the software implementation. This may specify the functional requirements and non-functional requirement of the project.

The SRS states the functionalities and capabilities of the software project that need to fulfil .There will be also some constraints too to be considered are included here. SRS coved basics of all phases like planning, design, coding and testing. All the people involves in the project like development team, technicians, customers and other support teams will be rely on the SRS. Then this document becomes an important role in the software project.

There are many significant advantages we can achieve from this document like communication with all the parties involves in the software product.

1.2   Scope

This research project is proposed to retrieve large databases from a query image to find duplicates and other images which are containing the same landmark (from different angles by different photographers).This will provide a solution to a database retrieval which is a fundamental problem in computer vision.

The image retrieval based on the content data of the image which will lead to get accurate output results from the databases. The dataset of more than a million images with 15k landmarks are provided from the kaggle web site as an on-going challenge in the research prediction challenge.

Here we are mostly focused on the people who are interest in worldwide travelling and most of them are willing to maintain memories of the past travelled places. When keeping memories they are mostly want to keep the photo collections and also they wish to collect data regarding their future dream spot of destination as well. The image retrieval will help them to maintain their travel diaries as well.

The overall app is providing the organizing image collection and more image retrievals, addition to this we are going to provide a some accommodations and dining tracking the location and also through the profiling by connecting to the twitter account of the app user.

Addition to this we are going to give the customers a ranking of the restaurant suggested from the profiling. Then they got a chance on selection the best one for the preferable accommodations or dining.

1.2.1 Problem statement

There are some methods where the image search is happen specially from meta data like captioning and key words bind with the image that we are going to search. The image retrieval is a fundamental problem in computer vision. The main reason for this is the lack of a large datasets. In the kaggle competition they have provided the largest worldwide dataset for image retrieval research, That helps to make this research more efficient and accurate. There are more than one millions of images are included in the dataset provided which contains more than fifteen thousand landmarks with different angles, views and captured in it.

In the existing methods of retrieving of databases are not so accurate due to lack of data and mostly retrieved by the metadata. And here in our research we are overcome that problems and weaknesses to get a success model on data retrieving process. The user may get a facility on maintaining the future traveling diary on their own.

1.2.2 Objectives of the project

Goexp is an mobile application that supports its users to plan their future trip to anywhere with proper guidance with more views of the destination landmark. And also can maintain a proper organized image collection.

Specific objectives

- Finding the duplicates of the relevant landmark.
- Find the other images of the same landmark.
- The images captured by different photographers.
- Keep the image collections with different angles.

1.2.3 Functionalities of project.

- **Upload a query image**

    The user is supposed to upload an image which we are considering the colours, planes, and sections of the image (Query image).The registered user can upload a image to get the required output from this function.

- **identify the features of landmark from the image**

Once the query image is uploaded the system is identify the significant segments and find one to any number of landmarks contain in the image by the features of the landmark.

- **Retrieve the landmarks of the images from database.**

From the identified features from the query image the system retrieve the duplicates of the image and also the other images captured in different views. Then the user can get the all retrieved images as output of this function.

1.2.4   Benefits of project.

- More user friendly.
- More accurate.
- Reliable
- Works according to user's desire.

1.3 Definitions, Acronyms, and Abbreviations

1.3.1 Definitions

Terms	Definition
GOexp	Name of the developing system.
Software Requirement Specification	A document that completely describes all of the functions of a proposed application and the constraints under which it must operate

Table 1: Definitions

1.3.2 Abbreviations

Abbreviations	Description
GUI	Graphical User Interface
CBIR	Contend based image retrieval
SRS	Software Requirement Specification

Table 2: Abbreviations

1.4 Overview

The goal of implementing this mobile app is to get comfortable experience for the people who are interest in travelling and who make photo collections of their future dream travelling spots and destinations. They can get the others travellers experiences of the significant landmarks from the "GOexp" users who can upload new photos of theirs journeys to the application too.

As main components of the app is to recognized the landmark in the photo and give the details relevant, Retrieve large database to find duplicates and other images with the same landmark. This will help to have the organized memories and future travel plans.

The people who are travelled to other countries or the hope to travel and if they were so worried about their accommodations and dining, here is the ideal app for their mobile phones. We suggest the preferable accommodations and dining for the particular user. Also we suggest the best ranked selection and also the app users most desired places as well.

In this documentation we have describe the details of software requirements, the functionalities, constraints, limitations and additional features on the software project we suppose to implement.

2 OVERALL DESCRIPTION

2.1 Product perspective

When we consider about the landmark retrieval process most of the approaches are based on the Meta data like captioning and keyword bind with the digital image. Then it will not be the most accurate result or the output. So in our research project we are going to consider the pixel data of the image.

Retrieve images for landmark can be done by considering some significant are or a particular section of the landmark because as this is an landmark this is going to be a significant place, It won't be change its appearane time to time. And also not going to depend on any environmental fact.

2.1.1 System interfaces

From this section of landmark retrieval the document covers the individual research area that contributes to the application "GOexp". Retrieving large database to find out the other images of same landmark.
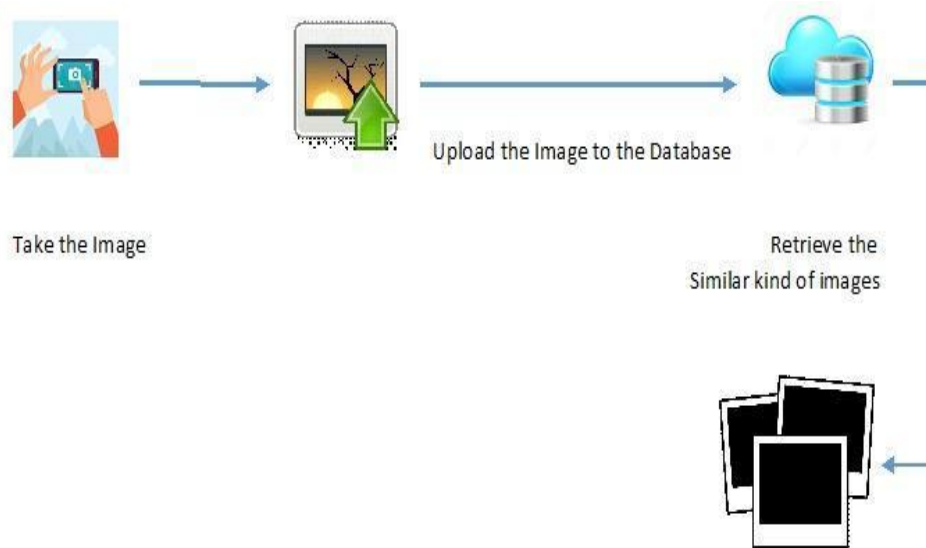
Figure 1: Overview of Image Retrieval

2.1.2 User interfaces

In here we have included the sketches of the main interfaces use for this component of the android application GOexp. The user who want to get the images of his\her future travelling destinations or for to get the collections landmarks can upload a query image by pressing the button upload image. Then the image you selected or captured is uploaded to the application. Then click the retrieve image button to get the output or the retrieved results from databases.The following interface is designed as a wireframe of the interface to derive the final design. When the process of development the sketched interfaces may change.
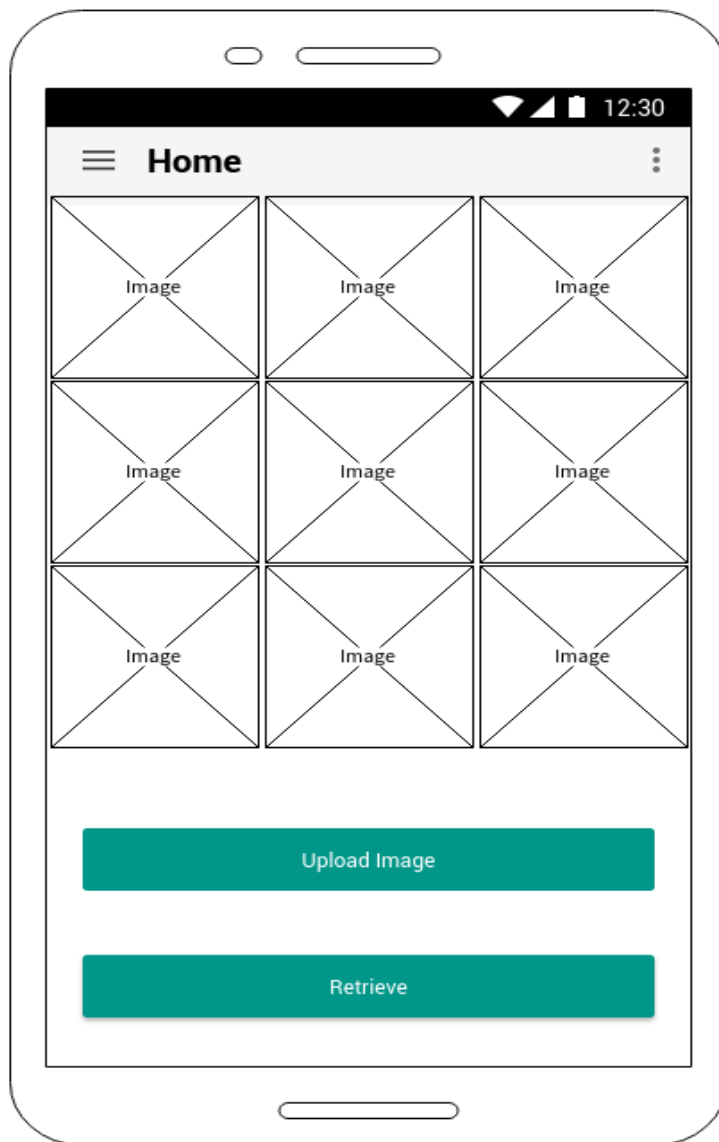

Figure 2: Landmark Retrieval User Interface

2.1.3 Hardware Interfaces

There will be no specified hardware requirement for the allocation as it is directly connected with databases. The followings are some necessaries for more detailed

- Android enabled mobile phone or tablet would be required for the hosting purposes.
- Minimum processer speed of 3GHz, Ram of 512MB
- The mobile device should have 5MP camera.

2.1.4 Software Interfaces

While considering the software interface of GOexp, there will be several software running together in order to contribute vast functionality to obtain the optimal performances

The user will require an android device to have GOexp android application; therefore a mobile application should be installed in the user's android device. The application GOexp will be developed using the android studio. The phase suggestions will utilize a database management system which is currently proposed to be firebase.

2.1.5 Communicational Interfaces

The GOexp mobile application is based on recognizing, retrieving, find locations of data through internet the mobile device should be connected to the internet before using the application. 3G/HSPDA/Wi-Fi connection will be needed for high speed internet

2.1.6 Memory Constraints

GOexp mobile application should have at least 1GB RAM and 50 MB free space to gain better performance.

2.1.7 Operations

The system GOexp is aimed on recognizes and retrieves images. In the retrieving component they can plan the future traveling destinations.

Main Operation-Landmark recognition and retrieval

User Operation-Upload images and find out

Machine Operation-

i. Find same landmarks.

ii. Get the duplicates and other views of the landmark.

2.2 Product Function

Use case	Register
Preconditions	User should have an email address
Actors	User
Flow of events	1. When user launches the app for the first time. 2. System displays Sign-up interface. 3. System prompts the user to sign-up with GOexp 4. User is navigated back to his "GIIRA" profile. 5. Use case ends.
Extensions	3. A. User clicks on sign-up with Have a GOexp. 5. A.1. User enters email and password. 3. A.2.User clicks on sign-up. 3. A.3. User's email address is validated. 3. A.4. User is redirected to his GOexp profile.

Table 3: Use case scenario - Register

Use case	Login
Preconditions	User must be registered in the system.
Actors	User
Flow of Events	1. Use case starts when user launches the app. 2. System displays Login interface. 3. User enters username and password. 4. User clicks on 'Login' button. 5. User is validated. 6. System displays message "Hello <User Name>" 7. Use case ends.
Extensions	5. A. User is not validated. 5. A.1. System displays an error message.

Table 4: Use case scenario - Login

Use case	View profile
Preconditions	User should be logged into the system.
Actors	User
Flow of events	1. Use case starts when the user clicks on profile icon. 2. System lists the user's fiends' activities. 3. System suggests other users to be the user's friends. 4. User clicks on add friend icon to add other users as his friends. 5. Use case ends.

Table 3: Use case scenario - View profile

Use case	Find the images
Goal	Upload a query image of the desired landmark
Scope and level	Large Databases
Primary Actors	User
Main success scenario steps	1. Use case starts when the user upload a query image. 2. System retrieve all the images in the database. selected route

Table 7: Use case scenario - Find the images
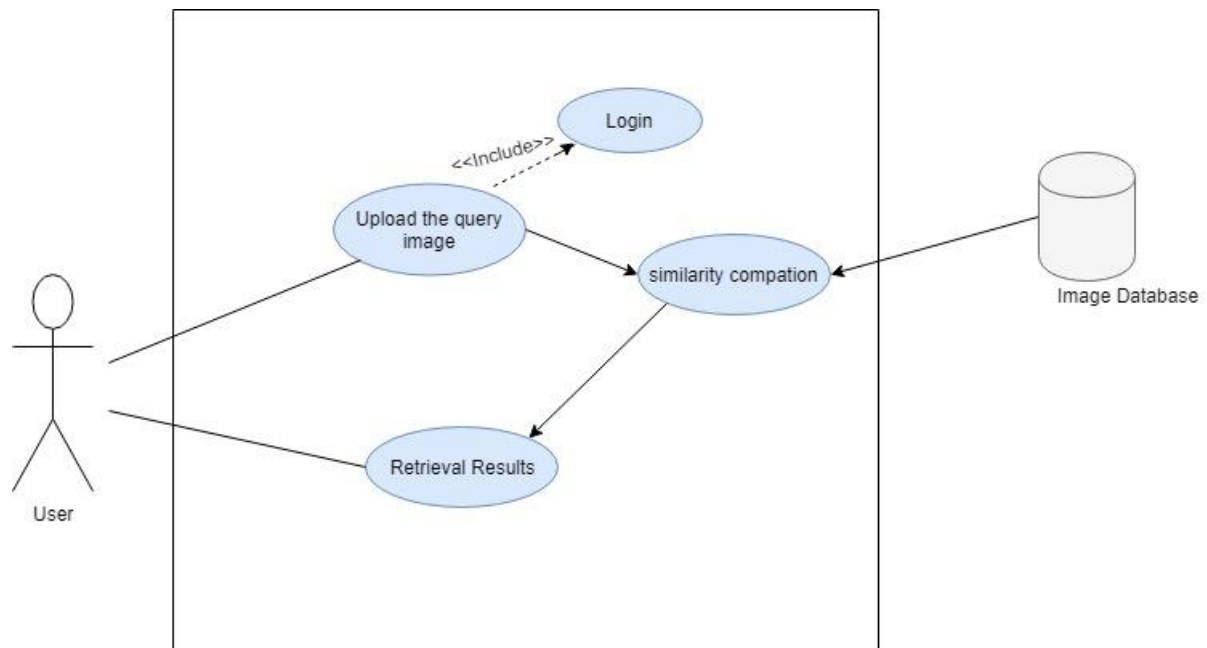
Figure *1:* Use case diagram for Image retrieval

2.3 User Characteristics

Anyone can use this app if they are interested in the travelling and significant landmarks on "GOexp" system,

- Individuals using Goexp for travel planning.

Person who are going to use this application need not to have great knowledge in computer literacy. Anyone can logged in and get the experience easy

2.4 Constraints

This system consists of mobile applications. Therefore mobile application constraints should consider. In order to work with better level of quality bellow mentioned memory limits are needed by the application.

Mobile application

- Mobile phone should have android operating system to run the application.
- The android version should be 4.0 or above. And must have most recent version of the application.
- Mobile phone CPU should be 1GHZ or above for optimal performance. So that all the processing tasks would be done faster and user would gain the output results very faster.
- Mobile phone RAM should be 1GB or above for better performance
- Mobile phone should have camera with a resolution of 5 Mega pixels or above for optimal performance.
- Internet connection is required for the software to function properly. High bandwidth is encouraged for smooth operation.

2.5 Assumptions and Dependencies

Assumptions

- There should be network connection
- The user should have th .
- The entire hardware and software requirement should meet the client and server.
- The database should be secured with passwords and username from unauthorized access.
- The system is developed with the understanding of both the language grammar.

Dependencies

- GIRA system is depended on the network and GPS connection as it is a location based mobile.
- The user should provide correct details in order to get good suggestions

2.6 Apportioning of Requirements

The SRS document section 1.5 provides the overview of the supposed system requirements and the section 2 provides the detailed overall description on the system. The section 3 contains detailed requirements that should be followed while design and implementations. The system GIRA is supposed to be implemented with the preliminary and functional specifications in the section 3. There may be few changes in the final product due to time constraint but will be fulfilled in future release. Implementation of GIRA is describe bellow,

- Managing places and suggesting places to travel.
- Disaster management and providing alternative paths
- User Management and Tour & Event planning.
- Rating system.

3 SPECIFIC REQUIREMENTS

3.1 External interface requirements
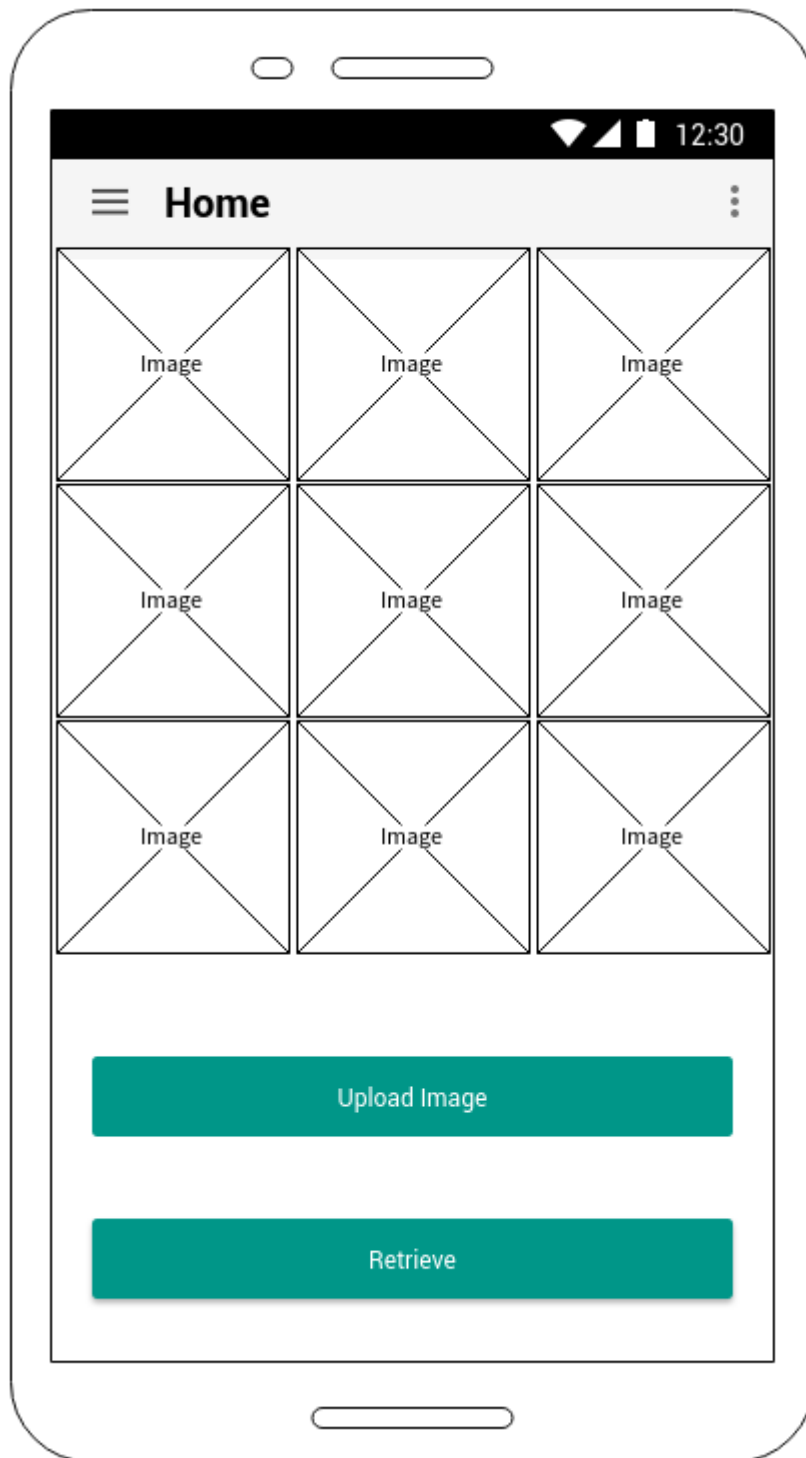
3.1.1 User interfaces

figure 2: Interface for retrieve database for landmarks

3.1.2 Hardware interfaces

There will be no specified hardware requirement for the allocation as it is directly connected with databases. The followings are some necessaries for more detailed

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3.1.4 Communication interfaces

As GIRA system is a mobile based application, it's heavily depended on the network and GPS connection. The client applications are connected to the server through several communication devices and internet.
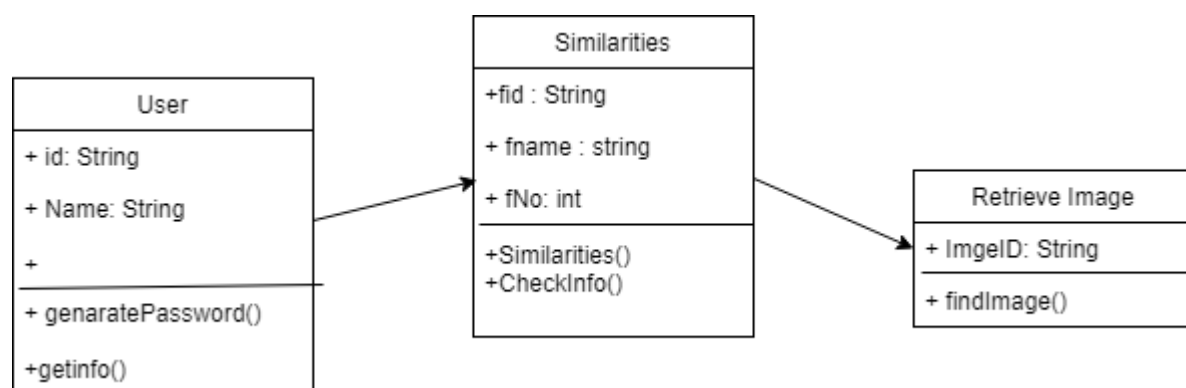
3.2 Classes diagram

Figure 8: Class diagram

3.3 Performance requirements

The successful result of the implementing system GOexp is the Proper performances without delaying. The system response the functionalities more than the expected time.

And this system is totally rely on the internet connection of the device. Then this mean the service must have the consistent connection. Also for more retrieval of large databases the performance of the device is also important

3.4 Design constraints

GIRA is a mobile application. Therefore while developing the mobile application main constraint is the display real state. Designer should follow a very consistence design throughout the application and should choose a very promotional and a state of art design. Navigation should be user friendly and should be able to wanted find information in few clicks

3.5 Software System Attributes

3.5.1 Availability

Availability of a system is the possibility that a system will work as required during the point of time and it should be able to deliver the requested service. That is a services should be available with minimal system down time or without having any system failures for longtime.

The application must be available to download and to use at any time without any crashes

3.5.2 Maintainability

Maintainability of a system means handling the system with new requirements in order to enhance the performance and capabilities of the application and making sure that new errors shall not be prone in the system because of the changes. That means the proposed system can be maintained easily if it needs some modification without causing any damage or interrupt to other system functionalities. As well as modifications can be done through low cost solutions. It is also a somewhat important feature to having a high maintainable system. In case of a failure, a re-initialization of the program is recommended. "GOexp" app does not have a fixed client or a customer. Therefore, the maintenance

requirements are handled by the development team by considering the future potential use of the mobile application. The application is designed in a way that it assists for updates of the software in future. The code will comment wherever it is necessary, especially in critical and complex code segments. This will help the developers or the maintaining team for further modifications in future.

complex code segments. This will help the developers or the maintaining team for further modifications in future.

3.5.3 Security

Security of a system is an attribute which reveal ability to resist unauthorized usage while still providing its services to legitimate users and it can protect itself from external assaults. In this component any authorize user should be able to use the mobile application

- The development team must consider about the security of the user's data.
- Because all the users provide their private data to the system. There for the database security must be on a higher place.
- The system must use HTTPS protocol. It will give more secure data transaction by considering to other protocols
- Passwords should be stored in database using an encryption method
- Sessions will contain a timeout
- Maintains strong server-side controls

As we are using Firebase as the Database server the security is at an optimum level as firebase provides Real-time Database Security

3.5.4 Reliability

Reliability of a system is the ability to perform its normal operations with minimum failures over a specified time in a given environment.

- The reliability of retrieve landmarks from large databases are doing using CBIR method.

messages. When user wants a suggestion for the places to visit, the system should correctly deliver services as expected by the user without any mistake and user friendly. The reliability of the system shall be good if it delivers the services as specified.

3.6 Other requirements

- The system should not crash
- It should not make the user frustrated, angry or terrified while using the system
- System should run perfectly without any feature limitations
- Functionality should be suitable to all end users
- Extensibility & Modifiability
- Adaptability

4 References

[1] *Google Landmark Retrieval Challenge*, Kaggle, 12 Mar. 2018, www.kaggle.com/c/landmark-retrieval-challenge.

[2] *NCBI*, PMC, 13 Apr. 2018, www.ncbi.nlm.nih.gov/pmc/articles/PMC3317765/.

[3] https://machinelearningmastery.com/large-data-files-machine-learning/