

ANDROID BASED OFFLINE TRAVEL APP

BY

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

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APPROVAL

This Thesis titled “**ANDROID BASED OFFLINE TRAVEL APP**” is submitted by **Nusrat Jahan** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **December 12, 2018**.

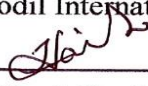
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I hereby declare that, this thesis has been done by me under the supervision of **Dr. Syed Akhter Hossain, Professor and Head, Department of CSE, Daffodil International University**. I also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

"**TravHelp**" is an android application which will be developed mainly to help tourists who are eager to visit the Dhaka city. The application is mainly featured to be an offline app, so that the user can use the app without any hassle to acquire data services. Both English and Bangla language are supported so that not only foreigners but also the local people can also use the app flexibly. The app is developed to be user friendly and to support different screen sizes of various mobile and tablet devices. It has features like details about point of attractions and map of the Dhaka city. Other features include a language translator in the app. This paper details the development process of the travel application.

This thesis is intending to design & development idea of a user-friendly android-based offline mobile and web-based application. The travel application will be developed to provide information about the point of attractions and map of the Dhaka city. Map will consist of the regional main attractions, travelling path and assumed expense. An extension of the work is including an instant voice translator in the app which might be very helpful for the foreign travelers who are traveling the Dhaka city. An automatic voice responder based on AI (artificial intelligence) is also planned to be included in the application. By using this tool, foreigner can be easily able to communicate with the local people which will lead to a very convenient travel.

Keywords: Free offline app, point of attraction, voice translator, AI.

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CHAPTER 1

INTRODUCTION

1.1 The Context

Information technology (IT) has become the most important aspect of today's world. Increasing the assistances of mobile phone use is now the focus for lots of development projects. Despite the fact that few specialized activities target helping help laborers or giving gathering apparatuses to entire networks, cell phones have extraordinarily turned out to be effectively available and valuable for individual clients.

As the capability to communicate increases, mobile apps are being created at an expanding rate. About thousands of mobile applications are already available and the number will keep on growing as mobile devices are becoming the go to devices for accessing Internet. The rise of mobile applications, also called apps, are allowing to access to information on the go. This advantage of mobile phone technology allows programmers and developers to offer users exactly what they want within their favored area of interest. Android is one such unique innovation made by Google. It has instantly dominated the mobile market. It is an open source portable stage which permits engineers from around the globe to create applications for android upheld cell phones.

One of major category of mobile applications is travel and guide sector. There are apps that can make holidays a little easier, more enjoyable and more memorable. They let the user do anything one can do online or with a guidebook, but more quickly and easily and while being on the move – with maps and GPS (global positioning system) to tell where the users are and capture wonderful memories.

Concerning the traveler satisfaction, it becomes essential to develop a mobile app for benefiting the people who loves to travel the world and facing different issues while traveling through the world. For this reason, Dhaka has been selected to deploy a new tourist trip planner. Many people around the world are travelling to the Dhaka city

(capital of Bangladesh). Bangla is native language of Bangladesh and people, coming from the rest of the world, are has their own native language. In this research, a voice simulator is planned to integrate so that traveler can easily communicate with the local people. Also, it is planned to design an offline integrated map by which traveler can easily access their travel plan with specific route along with the other amenities when they will have no internet in their mobile device. App will show and navigate the traveler to their destination with an interactive offline map.

1.2 Goal of the Thesis

There are lots of android mobile apps available for travelers. These apps have many features which help the users for specific purpose, but still users face many problems which can be reduced by developing an app by considering the user needs. Most of the android mobile apps available in the market run only in online mode, which can be problematic for a traveler in a foreign country due to unavailability of internet. International roaming is also very expensive. So, user needs to buy a local SIM card and recharge for internet which is an extra hassle during travel. Also, most people are not comfortable with a new number. There are different types of ways and algorithm that are used for different android apps, but users are happy when an app is designed with the help of point of interest (POI) of traveler.

Users want to visit tourist attractions in minimum time with maximum comfort. In that case solving the tourist trip design problem (TTDP) to ensure proper route planning will help in making a perfect travel app. Moreover, travel apps are using global positioning system (GPS) to detect the user's location. Information from road segments and passing of said information from one vehicle to another using the IEEE 802.11p wireless link when in range of transmission and using the GPS, a defined algorithm can help find out the shortest possible route to a destination or a route with the least fuel consumption (C. Chang, et al., 2013). In that case using visual directions of city map can be helpful for users to find a specific place within minimum effort.

Another problem faced by user is verbal communication with the people in foreign country. A possible solution can be using voice translator for that specific country. In that case a voice communication facility can be used as language translator in the app. This voice communicator will help the users to make their travel more convenient and easier.

The main objectives & goals of this thesis in parts are as follows:

- An innovative technical solution to solve TTDP (tourist trip design problem) concerning with UX (user experience).
- Develop a travel app in the basis of POIs and usability.
- User interactive app with gain maximum user satisfaction.
- An offline app which will lead users to travel with visual images and command.
- A voice translator which will help traveler to communicate in abroad with local people.
- App will archive all the trip details, which will help user to get an automatic suggestion through AI integration.

1.3 Structure of the Thesis

The following description is provided to understand which chapter covers which topics and their relevant discussions.

- In the chapter "Introduction", the basic principle and purpose of this thesis is already described.
- In the chapter "Literature Review", gives the theoretical background that is needed for this thesis. This chapter provides discussion about the various components of android development. The study also shows what the best practices for developing travel apps are.
- In the chapter "Research Methodology", a brief discussion will made on how the thesis has been conducted.
- In the chapter "Software Methodology", detailed description about what software development methodology should be chosen for this study. Agile software

development should be chosen for developing the travel application as a native app.

- In the chapter "System development plan & Analysis" discusses about the design of the application and how all the components of the travel application are implemented. The main parts are map, travel planner and translator.
- In the chapter "Conclusion and Future Scope" shows the summary of work plan that has been completed to fulfill this thesis. Further recommendations have also been made which will improve the application in the future.

CHAPTER 2

LITERATURE REVIEW

2.1 Research

According to the findings of a research (Xu, Liu and Panneerselvam, 2014) based on China, it is expressed that application planners are basically keen on uniting ease of use and portability together which empowers explorers in utilizing the movement applications all the more proficiently and effortlessly.

Close by the ease of use, adjusting the content and realistic components are other critical criteria of the movement applications, requiring more consideration. Additionally, explorers are keen on the accessibility of an extensive variety of information identified with going from the movement applications.

Travel tips offered by the movement applications, assume an essential job in the achievement of the movement applications. Great travel tips encourage voyagers to achieve their goal effortlessly, which can assist the explorers with finding their imagining places.

Then again, an extensive variety of movement data may present complexities to the voyagers in finding the setting they are keen on. This prompts the expanding requests for the exact data driving administrations, since voyagers are not completely happy with the key data.

To take care of the consistently changing demand of the voyagers, the applications data ought to be adjusted according to the decisions of the clients. Data, for example, online buy history, data shared through online web based life and web crawler records ought to be accurately dissected to recognize the trademark inclinations of the explorers, by utilizing information mining innovation.

2.2 Inspiration to design a new Android App for travelers (Especially for Dhaka city)

1. Design and implementation of the travelling time- and energy-efficient android GPS navigation app with the VANET-based A route planning.

Authors: Ing-Chau Chang, Hung-Ta Tai, Dung-Lin Hsieh, Feng-Han Yeh, Siao-Hui Chang.

Description: This paper deals with finding the shortest route to a destination or a route with the least oil consumption, which is calculated by the VANET based route planning algorithm. The algorithm works using the traffic information from the roads and the information from the google maps.

2. Solving tourist trip planning problem via a Simulated annealing algorithm.

Authors: Kadri Sylejmani, Atdhe Muhaxhirix, Agni Dika_ and Lule Ahmedi.

Description: This paper presents a simulated annealing algorithm which helps to solve tourist trip planning problem. Tourist trip planning problems mainly relate to time and budget of the travelers. The algorithm can help to solve this problem.

3. mTourism multilingual integrated Solution: A case study "EgyptTravel".

Authors: Wafaa El-Kassas, Aymen Solyman, Mohamed Farouk.

Description: The various challenges and experience of developing the EgyptTravel app is presented in this paper. A travel app's features and functions are presented very clearly in this paper. This paper helps us to understand how a travel app is built which help us as a guide in how to build a travel app.

4. User experience evaluation of Chinese travel app software.

Authors: Rongyan Xu, Lu Liu, and John Panneerselvam.

Description: This paper presents the findings of a research on user experience of Chinese travel apps. The research evaluations find out what the users are experiencing using the current apps. Future improvements of the apps have also been suggested using this evaluation. This paper helps us to understand what the users require and provides us with ideas to improve the apps in future.

2.3 Challenges in Mobile Application Development

Nowadays mobile phones are not only used for communication. Mobile technology has been improved in the last decade due to better cellular network systems. Convergence of internet and telecommunication technologies is increasing rapidly (HUANG et al., 2012). There are some complexities regarding to the development of mobile applications to meet the demands. There are a many different mobile brands, with various devices being produced by them. These devices tend to differ due to their operating systems, resolution of screens; RAM, Storage and software update capability. These differences between devices tend to increase the cost and time to produce applications for the mobiles.

The various devices available in the market offer support for diverse functionalities, for example proximity sensors, gyroscope, infrared, etc. Performance of the hardware present in the devices also varies.

It is significantly important to consider the aspect of screen resolution in the development of the application. Devices are being built with bigger screen resolutions to help support better multimedia functionality, presentation of data, and internet browsing. The manufacturers of mobile devices also produce devices to support multi- range of resolutions to address the needs of different user segments (Karnam, 2011).

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Interview

“Interview is a research method for providing insight information on daily life experience, behavior of people, thinking and reacting. The interviews provide with data for analysis. This data can be in written, video or voice recording format. The analyzed data is used as support and guideline for the development process. Often the best solution comes from the interviews” (Stickdorn and Schneider, 2011).

The go for the examination meet is to explore the points of view, feelings and inspirations of individuals on specific issues. Subjective procedures, similar to interviews, are acknowledged to give a 'more profound' comprehension of social marvels than the outcomes that can be accomplished from quantitative techniques. Meetings are most reasonable for situations where just next to no information is thought about the point (Center Suites, 2017). Meetings are pertinent for examining touchy subjects, where members probably won't want to talk about such issues in gathering gatherings.

During the study, an interview was conducted which was aimed to gather the application requirements and development wishes.

The interviews were conducted on 10 local people. They were asked a set amount of open ended questions. The aim of the interviews was to identify what the consumer wanted in a travel application. Every one of the group had a mobile device from which they accessed mobile applications. Both male and females were well represented in the study.

3.1.1 Interview Results

Most people in the interview had used travel apps previously. Some of the features that impressed them are interactive maps, trip planning feature and beautiful design.

When asked what features were most important for a travel app majority emphasized reliability, user-friendliness, minimal storage requirements, customizability, and a responsive map.

The interviewees as a whole agreed that the map of a travel should be interactive. It should be able to show nearby places of interest and the location of the user. Route of travel from one place to another is also a handy feature that interviewer felt can enhance the travel app further.

My app's offline feature will be very useful for the users according to the interview, as there are no other offline travel apps available for the Dhaka city. The offline feature can be used without having to pay data charges which can be very costly and can be unreliable due to network problems.

Interviewees were very impressed by the idea of a voice translating feature in a travel app. The interviewer felt that this would allow for better communication between the foreigners and local people, who don't know each other's language.

3.2 Benchmarking

Benchmarking is the activity of concentrate comparable existing items, their execution, and best practices identified with the improvement of the application. With this method the applications related in the required field are recognized and contrasted with the item that will be created.

“Benchmarking is used for making improvements on the developing service, by comparing it to the best similar services provided on the market. The main objective of the method is to learn from these similar applications already present in the market and add or improve features in the application, which will be created” (Stroud, n.d.).

The most focused area of the study is as following: visual appearance of the mobile applications and their features. The outcome of the benchmarking was a list of some popular travel applications and their features.

Some of the travel apps made specifically for the Dhaka city has been tested to find out what features they are providing the users and what their limitations are.

1. Dhaka Travel Guide & Map by Tripomatic

Features

- Helps to plan a trip.
- The free app only shows the map using the internet connection. A paid offline map option is also available.
- Has a list of places of attractions which provides their location, some images of the attraction, general description of the place, location on a map and duration to reach there.
- Weather forecast is also available.

Limitations

- Users need to pay for a full offline experience.
- Supports only one language.
- Not stable (prone to crashing).

2. Dhakar Dorshonio Sthan by bdExpress

Features

- Have only names of places of interest and their time schedules of visiting and any fees required.

Limitations

- No trip planning option.
- No maps.
- Does not provide full address of the attractions.

3. Dhaka Location Diary by Riajur Rahman

Features

- Good user interface – easy to understand.

- Provides names and locations of places of interests which are divided in related categories.
- On tapping a location, it provides a map indicating where the place is located.

Limitations

- Works only with an internet connection.
- No route direction is available.

4. Dhaka Offline Travel Guide by iniCall.com

Features

- A hotel search option is available.
- Has offline map of the whole city and directions from one place to another.
- Places of interests are listed with images of location, address, and description of the attractions.
- A weather forecast is also provided in the app.

Limitations

- Has only one language support

3.3 Requirements Specification

The primary goal of this project is to develop an app which will provide a user-friendly interface and easy to use services for the travelers. The android app markets have various well-developed apps for travelers, but the research done in section 3.2 shows that users want some more features and functions from these apps.

One of the first requirements of the app is to be more interactive with the app users. The ease of use and understandability of the features of the apps is an important aspect of making a good travel app. Using general terms for the functions and services of the app will allow the users to understand what these are meant to work for.

The functionality of the app to work without internet is another requirement of the users. Not having access to internet is a major problem for travelers, as most apps require

internet for navigation, location, and route planning. Having a functional and complete native app will allow the travelers to easily access location and route data without internet which in turn will save their time and money.

A visual map should be available in the app which will help users to find the tourist attractions with minimum effort. A point of interests-based trip planner can help the users to find the attractive place in minimum available time. The map will be responsive and detailed. It will provide data about the tourist attractions when tapped on the marker on the map denoting the attractions. It will also help in route planning from one place to another showing the duration and the approximate rent required to travel.

A voice translator can help users to communicate in a foreign country which will help the trip to be easier and more comfortable. The traveler will be able to ask for help from the locals using the app’s translation function. This would allow the traveler to ask for location of places and where they can find essentials.

A research in China (Xu, Liu and Panneerselvam, 2014) states that a successful travel app should serve not only as a mobile database, but also facilitate easy-to-use platform.

Table 0.1: System Requirement

System Requirements	
1. User friendly interface and interactive	<ul style="list-style-type: none"> ● General terms for functions ● Simple UI (user interface)
2. Offline app	<ul style="list-style-type: none"> ● Native app ● Database downloaded in device ● No internet needed
3. Map	<ul style="list-style-type: none"> ● Interactive ● Offline support ● Route plan

4. Trip Planner	<ul style="list-style-type: none"> ● POI popularity ● Tourist interest ● POI details ● Route planning ● Automatic suggestion about trip details
5. Translator	<ul style="list-style-type: none"> ● Voice translation ● English to Bangla ● Bangla to English

Functional Requirements

Table 0.2: Map (Requirements)

Details	Priority
1. A map of the Dhaka city will be shown in the app.	H
2. The map will be interactive	H
3. The map will be able to show the app user's present location	H
4. Point of interests of the Dhaka city will be labelled in the map.	H
5. The route between one place to another can be viewed in the map	H
6. Map of the city will be downloaded to the device for offline usage.	

Table 0.3: Offline Application (Requirements)

Details	Priority
1. The app will be fully functional without the need to be connected to internet.	H
2. All the point of interests' information will be retrieved from the data stored in the device.	H
3. The map and POI location markers will also be retrieved from the stored data in the device	H

Table 0.4: Trip Planner (Requirements)

Details	Priority
1. A form will be presented for the user to select and input their choices regarding travelling locations, time and date, to create plans.	H
2. The trip planning service will also be able to suggest recommended tour plans based on their interests and the popularity of the POIs.	H

Table 0.5: Translator (Requirements)

Details	Priority
1. The app will be able to input and output voice data	H

2. The translator service will allow receiving speech in English, process this data for translation and then output the translated Bangla speech.	H
3. It will also allow receiving speech in Bangla, process this data for translation and then output the translated English speech.	H

Non-Functional Requirements

As per the goal of this study, the application needs to have a user friendly interface and the build of the app need to be such that it can be easily be tailored. Technologies that are already present need to be integrated with the app for complete functionality.

Table 0.6: Non-Functional Requirements

Details	Priority
1. The app will be user friendly. The user will be able to easily understand the functionalities of the application.	H
2. Integration of services such as Google Maps API and Google Translator API with the travel app.	H
3. The app can be easily tailored in the future	H

CHAPTER 4

SOFTWARE METHODOLOGY

If a small system needs to be developed, it is easy to manage the software development without using any particular framework. But as a system grows a more disciplined development methodology is needed so that it is more efficient to manage.

There is many software development lifecycle cycle models, each pursues one of a kind example of ventures, to guarantee great achievement during the time spent programming advancement. The most widely recognized SDLC improvement models are cascade, iterative, winding, and lithe models (Istqbexamcertification.com, 2017). For this project the most suitable of the various models is the agile SDLC. The reasons for choosing the agile SDLC are described in the following section.

4.1 Agile Development Method

The SDLC show decided for this contextual investigation is the coordinated improvement display. Deft SDLC centers on brisk conveyance of working programming item by versatile process and consistent client criticism. Lithe model represents the arrangement of ventures amid the deft advancement process. Agile mobile application is a technique for building applications that are portrayed by the division of tasks into short phases of work and continuous reassessment and adjustment of plans (Appknox, 2014).

The goal is to streamline the procedure of mobile application development with the objective that the subsequent applications are versatile after release. The coordinated model isolates the entire task into littler parts called cycles. Every cycle endures between one to three weeks and incorporates the means of arranging, dissecting, planning, building, and testing. After every cycle the result is introduced to the client and criticism is gotten. If the user satisfaction is achieved the product is released into the market, if not the process continues with the next iteration.

According to, Gartner expert van baker, the customary practices won't work for mobile application development and organizations should rather use agile methodology for app development (Gartner.com, 2014). Prior, the greater part of the undertaking application improvement groups used to utilize customary practices for creating work area applications. These days, a large portion of these don't work with mobile application development because of the variety of devices available, advancements in cellular networks, changing buyer demands and numerous different components (Appknox, 2014).

Some of the advantages of using agile development are given below:

1. Changes can be made rapidly

More often than not customer demands for alterations at last moments, designers think that it is hard to actualize toward the end. Utilizing agile, extra changes can be completed effortlessly without interfering with the progressing advancement stream (Umre, 2017). Some of the time customer can ask for changes which are impacted by the quickly changing business sector requests. This agile system gives adaptability to the customer to ask for adjustments at the later phases of improvement as well.

2. Testing is performed simultaneously alongside the development

Testing is an important part of any development process; it helps in checking the accomplishment of code. In the event that testing is performed all the while other than improvement, it guarantees the execution at a similar minute, preventing any issues at the time of app release.

3. Tasks are broken down to smaller phases

Agile methodology permits breakdown of extensive number of utilitarian prerequisites into reasonable lumps, which empowers the designers to work in detail on each functionality, bringing about enhanced quality. Due to the functionalities being planned independently, the user experience shows signs of improvement than before each time the build is released (Umre, 2017).

4. Minimal framework

The specialized and practical scene is advancing significantly, which influences the general business estimation of the mobile applications. To quicken the business esteem, agile development offers lightweight structure to help deliver faster releases, organizing the most significant highlights.

One of the greatest issues that have come up on account of agile development is the absence of quality testing, particularly regarding security and protection.

CHAPTER 5

SYSTEM DEVELOPMENT PLAN & ANALYSIS

5.1 Process of Development

Qualitative research methodology has been used to do the research related to the development of the application. “This type of research is portrayed by its points, which identify with seeing some part of social life, and its techniques which (when all is said in done) create words, as opposed to numbers, as information for investigation” (Coursehero.com, 2017).

The proposed app is mainly being built to help the tourists to explore the different categories of tourist attractions in Dhaka through a user-friendly interface.

5.1.1 User Centered Design Process (UCD)

User-centered design (UCD) is a way to deal with structure that grounds the procedure in data about the general population who utilize the item.

UCD (User Centered Design)

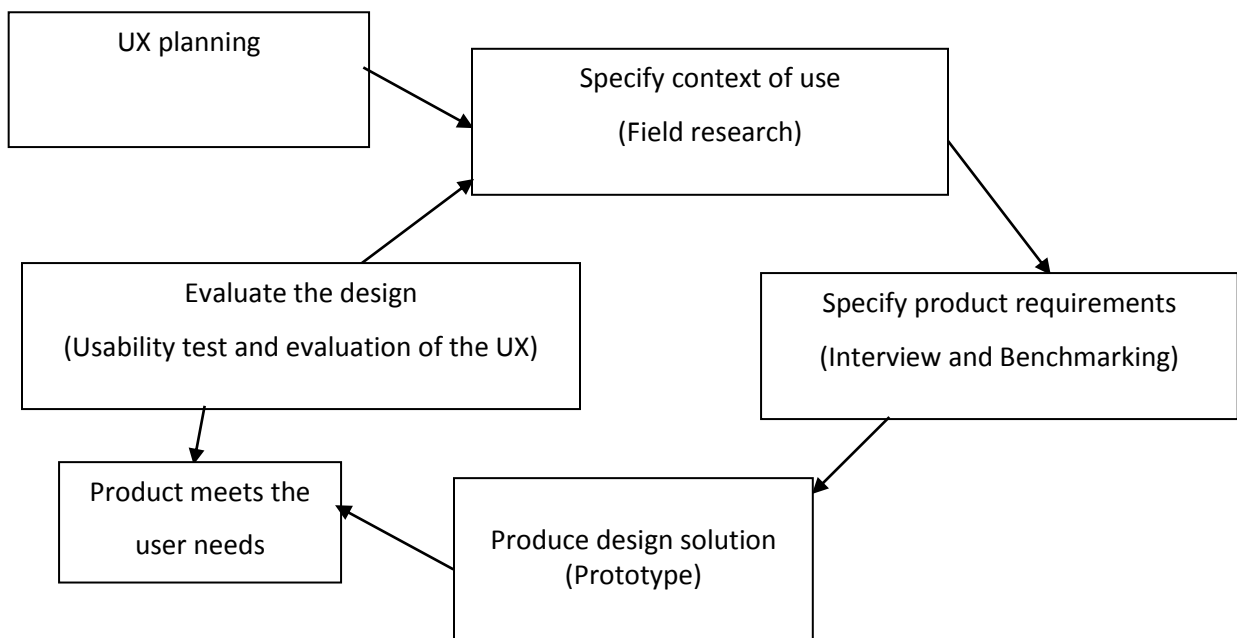


Figure 5.1: Own illustration based on ISO 9241-210 standard (Sippola, 2017)

5.1.2 UX Planning for UCD

Designing the interaction of the app on the basis of user taste is the motive of this planning. In this app, interviews have been performed and discussed with the end users to learn about their requirements which have helped us to define and plan the UX design along with interaction of the app.

5.1.3 Specifying Context of Use

The findings of the field research have helped to define the potential features that are required by the end users. Online journals, books, websites, and mobile applications are the secondary sources which are available in the app markets, are the base of this research. The required evidence and research materials are gathered from these secondary sources of information.

5.1.4 Specifying Product Requirement

The data gathered from the end users are used to specify the user requirements as well as the problems the users face using other similar apps. According to the opinions of the users and the results of research on other similar online apps came out with a resolution and plan to develop the proposed Travel app.

5.2 Development Plan

The development plan of the Travel app has been made as following:

Research and Plan

- Studying and analyzing the market.
- Learning about similar apps to the idea.
- Figuring out who the target customers might be.
- Talk to potential customers to get their input and thoughts on the concept.
- Setting concrete and realistic goals for the development process.

Design

- Developing a wireframe of the app. This will allow getting a concrete feel of what the app will look like.
- Layout of all the intended features.
- Paying close attention to the user interface.

Coding

- Mobile application coding.
- Developing with the goals in mind.

Testing

- Testing the app.
- Testing it out in as many situations and on as many devices as possible.
- Finding situations where the application may break or quit working appropriately so that the code can be revised as needed.

Launch

- Submitting the app to the Google play store.

Application Type

There are 3 types of mobile apps as follows:

- **Web App:** It is a website developed using the web technologies and customized for mobiles. It is not downloadable from the store but accessed using the URL in the mobile browser.
- **Native App:** It is produced utilizing the local instruments and dialects given by the stage merchant. The local Application is downloadable from the stage merchant store and keep running on this stage as it were.

- **Hybrid App:** It is a blend between the web application and the local Application. Created utilizing the web innovations and rendered inside a local control in a local application. Amid the investigation stage, we have to pick the appropriate application type.

The decision to develop a native app was based on many factors such as

- The availability of mobile phones in Dhaka.
- Speed.
- IDE.

App Architecture

The architecture of the app consists of three main layers as follows:

- a. The presentation layer consists of the mobile app.
- b. The logic layer contains the functions of the mobile.
- c. The data layer which consists mainly of the database and file server beside the mapping service of Google maps.

5.3 System Design & Implementation Plan

The proposed Travel is an application being built using android framework for mobile platform. The mobile app will be used for exploring the different categories of tourist attractions in Dhaka through a user-friendly interface and having a voice translating feature.

5.3.1 Android Platform

Android is the most popular operating system for smart mobile devices. Android Inc. was the original developers of android, and sold to google in 2005 (Thomas, 2010).

Linux kernel and GNU software form the base of the android platform. Programming pile of the android runs java applications utilizing the core libraries of java. Each case of java

application keeps running on its own virtual machine (VM) called dalvik (Developer.android.com, 2017).

Well with respect to dalvik VM, it has its own particular java byte code and is intended to be to be ideal on memory and processor use. The VM executes dalvik executables with (.dex) expansion. Among the different devices worked in the android, 'dx' device is utilized to produce the executable that changes over the java classes into. dex design. (Developer.android.com, 2017).

Android depends on the Linux kernel to perform framework level capacities, for example, memory administration and threading. It also depends on the kernel for equipment connections and power administration.

The software development kit (SDK) created by google, helps developers to develop applications. It consists of application programming interface (API) used to develop robust java applications (Developer.android.com, 2017). These API's helps to access the various features and functionalities on the mobile devices and integrate them with external web service to provide online services.

5.3.2 High-Level Components

High level components are the basis in any undertaking to get a reasonable comprehension of the reasons for doing the project and the different modules included. The plan of high level components frames the foundation of the project whereupon the detail segments stem out. This segment shows the high-level components of this application clarifying the plan and the significance of every segment.

A single focused task that the user can perform at a time is called an activity. A user can interact with all the activities. The setContentView method is used for making the user interface activity. The activities form a key part in application's general lifecycle. Activity stacks are used for managing the activities. At the point when another activity is made, it is put over the present activity and turns into the running activity. After the present activity execution is finished, the past activities resume their actions. The activity lifecycle is demonstrated in Figure 3.

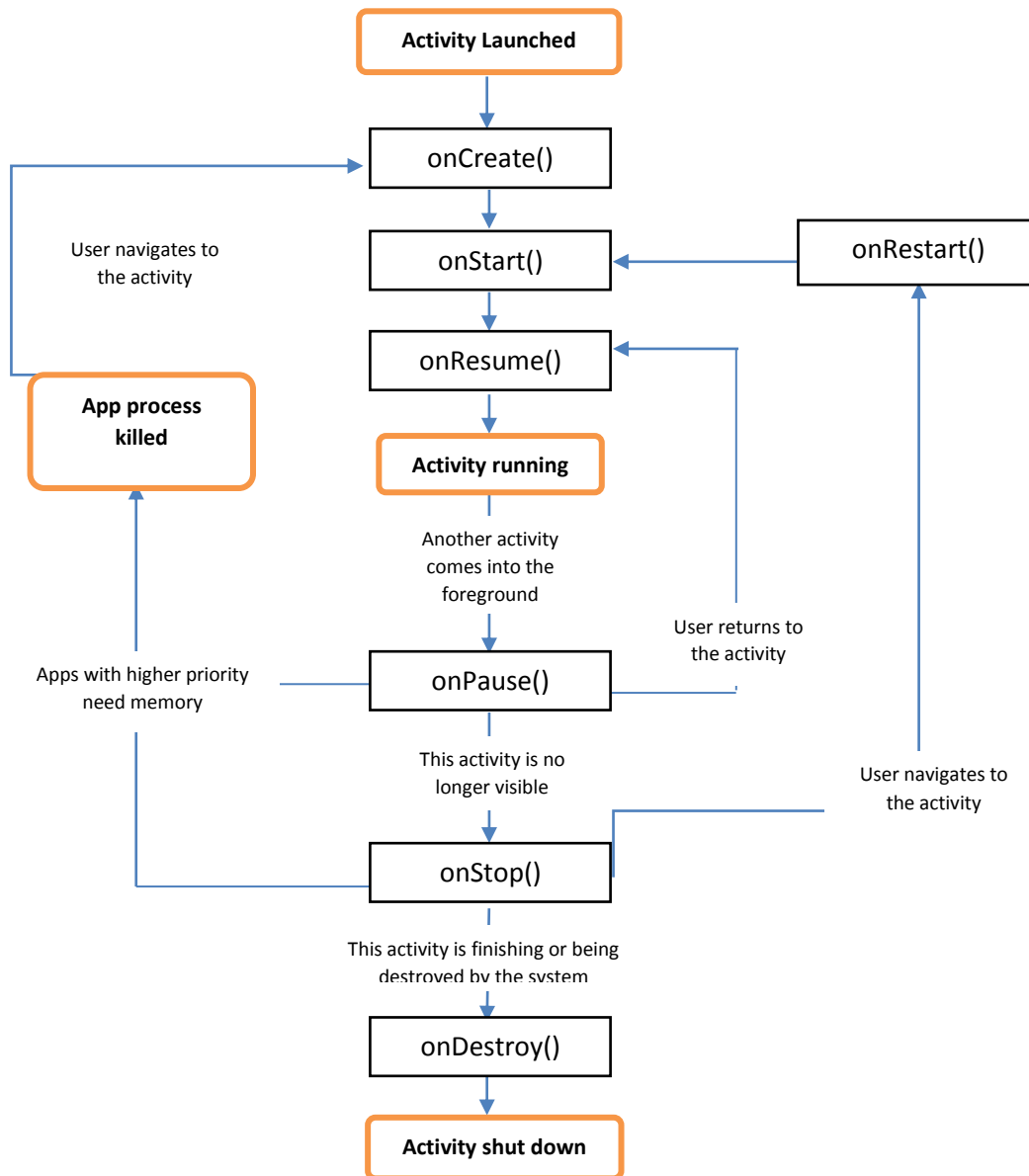


Figure 5.2: Activity Lifecycle as illustrated by Google’s guide on developer.android.com (2017) website

Intents are utilized to send non concurrent messages from one activity to another. Objects of sort “android.content.Intent” connect between the activities to send/get information utilizing the technique getIntent(). Every one of the intents and activities are determined in the AndroidManifest.xml document (Developer.android.com, 2017). This is an

unquestionable requirement required document for each application and is available in the root registry. This record presents fundamental data of the application to the android framework, the data which the framework must have before it executes the code of the application. It portrays the parts of the application, the classes that actualize the components and other related data. This tells the android framework what components are being used and under what conditions they can be used.

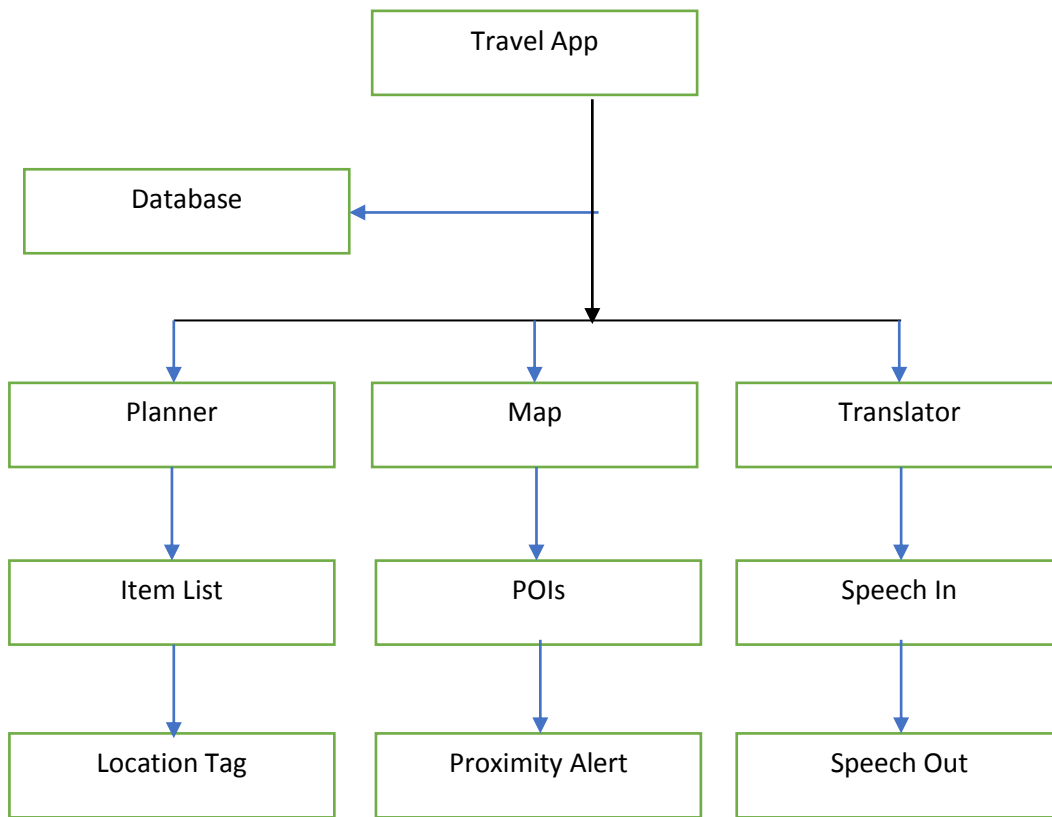


Figure 5.3: UML Diagram showing the application workflow

5.3.3 User Interface

Views and View Group objects were used for building the user interface (UI). Android UI is responsible for the layout manager and the widget organizer. View objects are the essential units of UI articulation on the android system. The view class fills in as the base

for subclasses named "widgets," which offer completely executed UI objects, similar to text fields.

The android UI structure is composed around a model-view-controller design. It gives structure and devices to building a controller that handles client input (such as presses of keys and taps on screen) and a view that extracts graphical data on the mobile screen.

The model is an important part of the app, defining what it really does. The view is the response of application to the client (Cs.ccsu.edu, 2017). The graphical bit of the android UI structure's view is executed as a tree of subclasses of the view class. The controller is the segment of the app that reacts to outside activities: a tap on the screen, press of a button, and so forth. It is actualized as an occasion line. Every outer activity is spoken to as a one of a kind occasion in the line. The system expels every occasion from the line all together and dispatches it. Figure 3 demonstrates the model-view-controller design.

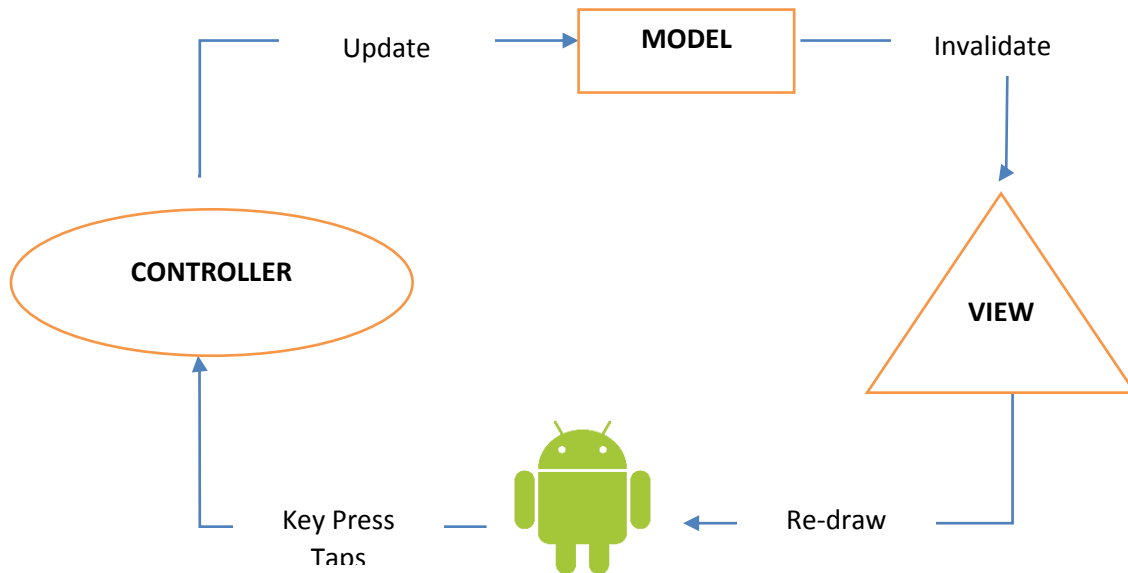


Figure 5.4: The app's model-view-controller design (Cs.ccsu.edu, 2017)

When an outside activity occurs (for instance, when the client taps, or strokes a key), the android framework enqueues an event representing to the activity on the occasion line. In the long run the occasion is dequeued—first in, first out—and dispatched to a suitable

occasion handler. The handler reacts to the occasion by advising the Model that there has been an adjustment in state. The model then takes the appropriate action in response to change in state.

5.3.4 Location and Maps

The project is being developed considering that users use their android phones with wireless network environment and having the ability of getting GPS data. Map activity in blue is the core and the start of map feature. Map activity imports google map as the map and gets data of POIs from the server/database. Map activity calls map overlay to add POIs mark to google map and map activity calls menu to present more functions such as reminder, search, and contact and so on.

The map of the application is retrieved using google map API, which will be implemented on the platform of android. Both android and google map are developed by google. The map can show almost all the cities in the world since google map shows map of the whole world.

Information about points of interest can be retrieved from the server/database. The data of POIs can include the location, name, description, etc. As the app will be offline all this information will be downloaded in device when the user installs the application.

The classes of the android Location package and external library of google maps allow the application to use the location services of the mobile device the google maps outer library. The location manager system service is one of the main components of the location framework, which provides APIs to determine location and bearing of the underlying device (Developer.android.com, 2017). The com.google.android.maps bundle utilized as a part of this application has features that allow downloading, rendering, and storing tiles of map, and also an assortment of choices and controls to handle the map activities.

“The key class in the maps package is `com.google.android.maps.MapView`, a subclass of `MapView`. A `MapView` displays a map with data obtained from the Google Maps service. When the `MapView` has focus, it will capture key presses and touch gestures to pan and zoom the map automatically; including handling network requests for additional map tiles. It also provides all the UI elements necessary for users to control the map. A `LocationListener` is the interface implemented to receive location updates” (Developer.android.com, 2017). To utilize Google Maps in the application, a Maps Programming interface key must be acquired to enroll with the administration and Android framework must be informed that the application wishes to execute the extra Google APIs which are outside to the base APIs. This was finished by utilizing the Utilizations library component in the Android Studio document, illuminating Android that the application utilized classes from the `com.google.android.maps` bundle.

The proposed Travel application furthermore uses outline to delineate to the customers the distinctive territories went to and a short depiction of each. This is finished by making Guide markers and delays. This has been possible by using separated overlay class to manage all the individual things set on the guide. Guide movement is the separating activity described to demonstrate Google Maps. This is contained in the guide action. Utilizing area and maps speak to a major arrangement for this application, since it uses high GPS activity and more power usage.

5.3.5 Tour Plan Recommendation

The tour recommendation is an important part of the proposed Travel application.

The tour recommendation problem definition.

Given the set of POIs P , a budget B , starting POI $p_1 \in P$, destination POI $p_n \in P$, the primary goal is recommending a tour itinerary that maximizes both user interests $Int(Cat_i)$ and POI popularity $Pop(i)$, season S , according to the budget B . The tour itinerary will be $I = (p_1, \dots, p_n)$ that

$$Max \sum_{i=2}^{N-1} \sum_{j=2}^N x_{i,j} (\eta Int(Cat_i) + (1 - \eta) Pop(i)) + S \quad (1)$$

where $x_{i,j} = 1$ if the user travels from POI i to j directly (i.e., we visit POI i , followed by POI j), and $x_{i,j} = 0$ otherwise. Then the Eqn. 1 is attempted to be solved, subjected to the following constraints:

(2)

$$\sum_{j=2}^N x_{1,j} = \sum_{i=1}^{N-1} x_{i,N} = 1$$

$$\sum_{i=1}^{N-1} x_{1,k} = \sum_{j=2}^N x_{k,j} \leq 1 \quad \forall k = 2, \dots, N - 1 \quad (3)$$

$$\sum_{i=1}^{N-1} \sum_{j=2}^N Cost(i,j) x_{i,j} \leq B \quad (4)$$

Equation 1 attempts to maximize both popularity of the point of interests and interests from the users on the tour recommendation, and η controls the emphasis given to either POI popularity or user interests.

Constraints 2 to 4 ensure that:

- (i) The itinerary begins and finishes at POI 1 and N , respectively (Constraint 2).

This constraint means the user needs to input a starting destination and the last destination of their wanted tour, in order for equation 1 to solved.

- (ii) All POIs in the itinerary are connected and no POIs are re-visited (Constraint 3).

This constraint helps to make sure that it is possible to travel from any point of interest to another (all the points of interests are connected to one another). It also ensures that in a suggested tour plan one specific point of interest is not visited again.

- (iii) The duration of time spent to visit all point of interests in the tour plan is contained according to the budget B , based on the function $Cost(p_x, p_y)$ it is calculated from user's duration of visit and the time it takes to travel from one POI to another (Constraint 4).

The application will have the capacity to consider visitor trip requirements, for example, beginning and closure at explicit areas (e.g., near the tourist's hotel) and having limited time for touring.

It will utilize GPS coordinates and list of POIs in the database to: (i) define the popularity of point of interests; (ii) the amount of time spent at the point of interests; and (iii) catalog point of interests into individual categories.

It will prescribe visits dependent on either POI notoriety or vacationer intrigue inclinations. Furthermore, suggested POI visit spans are customized dependent on the intrigue dimensions of the traveler, i.e., longer visit term for POIs that are fascinating to the vacationer.

The following tour recommendation framework and algorithm is used for solving this problem.

The Tour Recommendation Framework

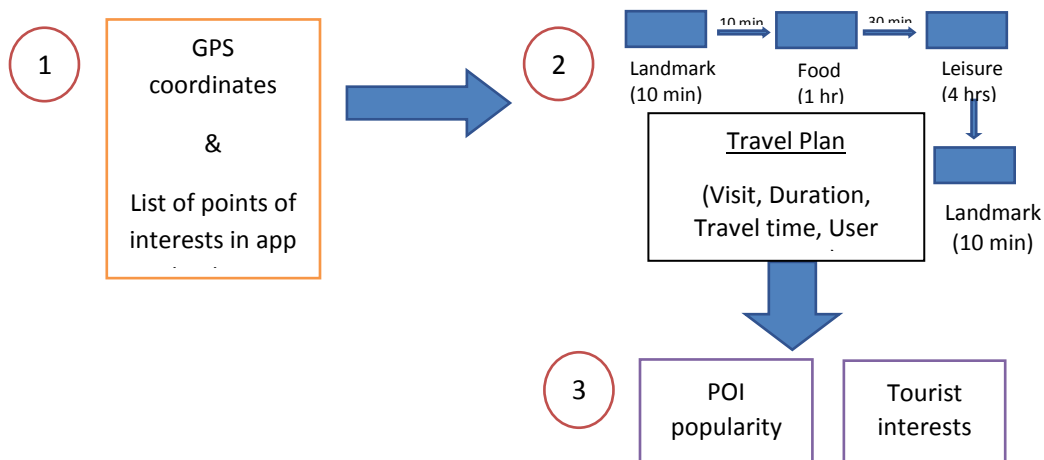


Figure 5.5: Planner overview

As illustrated in the figure above, the overall tour recommendation framework makes use of a user's GPS coordinates and POI list comprising of POI names, category of the POIs and coordinates of the locations.

1. GPS coordinates of the android phone will be used to know the user's visit at POIs and compare with a list of POIs, if his/her coordinates differ by a specific distance, e.g., 100m, which will count as POI visit.
2. Create the traveler's visit history by associating point of interest visits (acquired from the Step 1) of the same traveler. In particular, user's visit duration is calculated at a point of interest based on the time difference between his/her visits (of a consecutive nature) at that POI.
3. Compute the popularity of the point of interests and preferences of the travelers according to the findings of Step 2 (traveler visit history). The number of visits to a specific point of interest will generate the point of interest popularity. Whereas the amount of time spent at the point of interests will generate the tourist interests.

Using the above framework will allow the app's travel planner to recommend travel itinerary to the app users.

The primary commitment is in building up the framework that can prescribe POIs that are fascinating to the visitor and plan these POIs as a visit agenda. The key highlights of this framework are as per the following:

- Ready to suggest visits dependent on either POI notoriety or vacationer intrigue inclinations. Furthermore, suggested POI visit lengths are customized dependent on the intrigue dimensions of the vacationer, i.e., a more drawn out visit term for POIs that are fascinating to the visitor.
- For the tour recommendation, a modified ant colony optimization algorithm has been used.

- Usually, recommendation results are displayed in textual and an intuitive graphical form. The graphical form gives idea for a quick overview of the tour itinerary on a map, while the textual form provides detailed information about getting from one POI to another.

5.3.6 Analysis components of the system

- Data collection and analysis component

This data collection and analysis component is accountable for the retrieval of GPS coordinates and analyzing these coordinates to infer POI popularity, average duration of visits at POI and categories of POI.

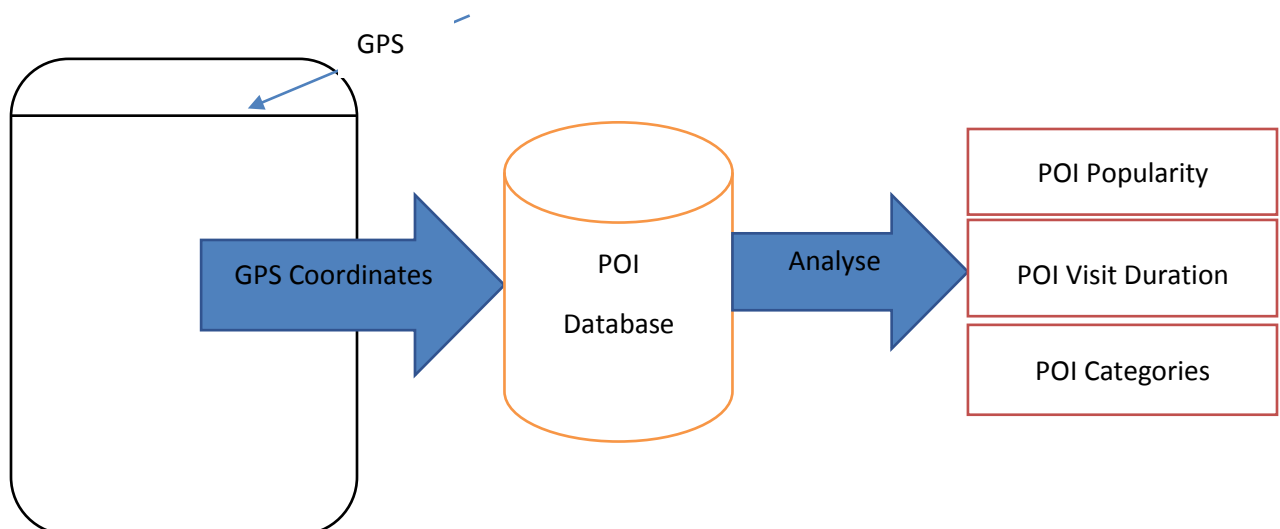


Figure 5.6: Data collection and analysis component

- Tour recommendation component

The tour recommendation component uses the POI data that has been processed (from the data collection and analysis component) for recommending and planning personalized tour plans. Then the data is sent to the user interface component

- User interface component

The user interface component is the front-end component of the system. It takes the data from the trip constraints and interest preferences from the tourist, and then communicates with the tour recommendation component to obtain a personalized tour itinerary, which is then displayed to the mobile screen for the tourist.

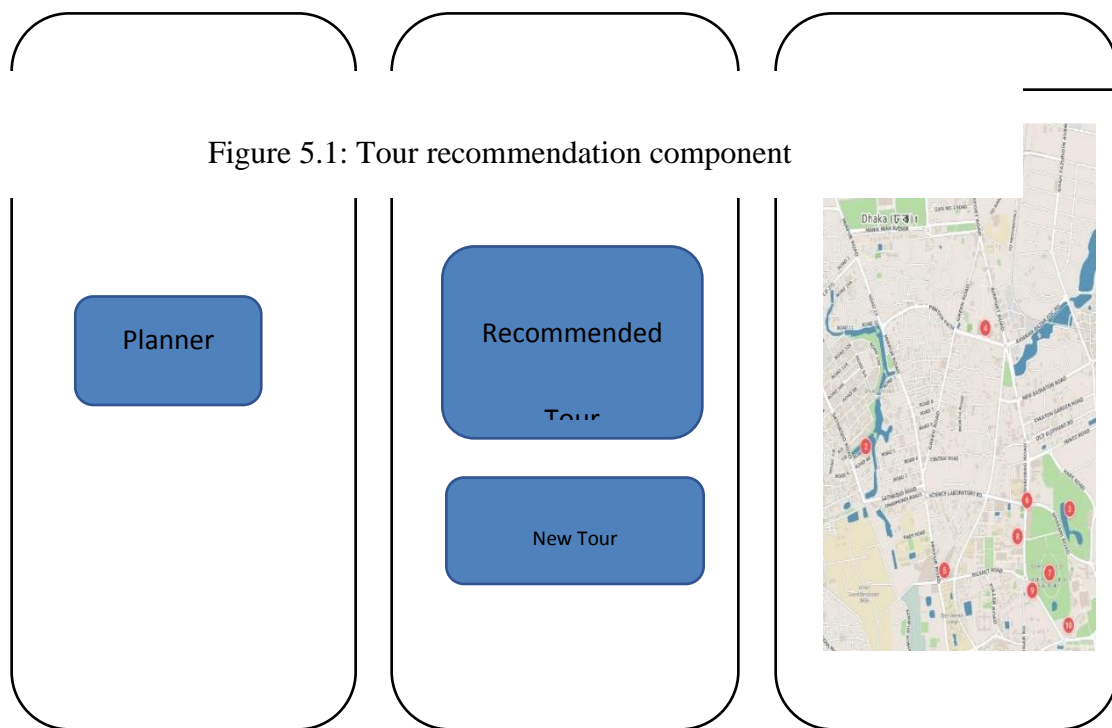


Figure 5.1: Tour recommendation component

Figure 5.7: User interface component

- AI integration in the proposed Travel with diagram

For AI integration there should have a dynamic database, where everyday data/information will be captured by the system. User will provide voice/audio input through microphone or can input text for specific purpose. A bot will analysis the input

and provide the required output. It could be an answer to any question, provide an outline of tour plan, provide route etc.

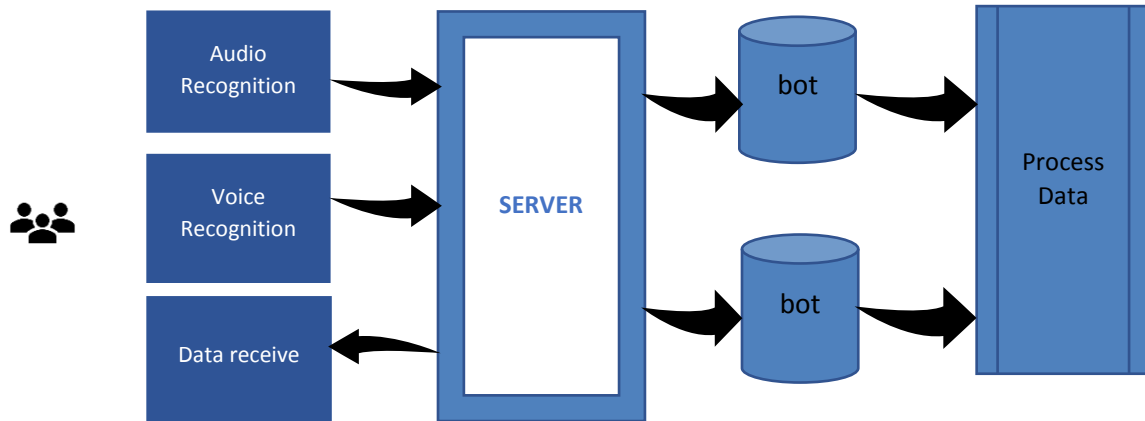


Figure 5.8: AI integration

Data Collection and Analysis Component

The data collection and analysis component perform two main tasks, which are: (i) the gathering of the time-stamped GPS coordinates of user's mobile device; and (ii) the analysis of these coordinates to infer the popularity of POIs, average POI visit duration and the interest categories associated with each POI.

Data collection

For the first task, we are interested in all photos taken within a specific city of interest, particularly the associated meta-data such as the co-ordinates, and the GPS co-ordinates' time-stamp.

Data analysis

For the second task, the meta-information of each GPS time stamps is analyzed to determine the popularity of each POI based on the duration a mobile device stays at the same coordinate. Lastly, POI database list can help to derive the category (e.g., Shopping,

Entertainment, Cultural, Structures, Parks, and Sports) that the point of interests can be categorized as.

Tour Recommendation Component

Utilizing the POI-related data given by the information accumulation and investigation segment, the visit proposal segment suggests and designs a visit agenda as indicated by the premium inclinations and excursion requirements of the traveler. The intrigue inclinations relate to the POI classifications in the city, while trip requirements are regarding the vacationer's favored beginning/finishing area and accessible visiting time.

“The back-end tour recommendation algorithm is based on a modified version of the ant colony optimization algorithm” (Dorigo, Birattari and Stutzle, 2006). The essential insect settlement enhancement calculation uses a few specialists (ants) that begin from an explicit POI with the intend to finding the best way to an ideal goal. This algorithm works in the following main steps:

1. “At the start of the algorithm, all agents initially select the next POI to visit (based on the utility of visiting that POI), until they reach the destination”.
2. “At the end of step 1, the best path taken among all agents is selected and remembered for a period, before being gradually forgotten”.
3. “Steps 1 and 2 are then repeated for a fixed number of iterations. The main difference is that the selection of the next POI to visit (i.e., Step 1) will be biased towards paths that have been taken recently”.

The instinct behind the subterranean insect settlement advancement calculation is that specialists are bound to pursue a way that is "better" and has been taken as of late. This inclination therefore prompts the uplifting feedback of picking a solitary way after some time, bringing about that way being chosen as the best arrangement. The modifications to the ant colony optimization algorithm include the following: (i) “the utility of each POI is based on a combined POI popularity score and tourist interest. Only publicly available data is used for information in the subsequent recommendations”; and (ii) “the cost of

travelling from one POI to another is based on a fixed travelling cost and dynamic POI visit duration (personalized based on tourist interest levels”).

User Interface Component

The user interface component serves three main responsibilities, namely: (i) “obtaining user inputs in the form of the tourist’s trip constraints (starting/ending location and available touring time) and their interest preferences”; (ii) “communicating with the tour recommendation component by providing the tourist’s trip constraints and interest preferences, and retrieving the recommended tour itinerary”; (iii) “displaying the recommended tour itinerary in an easy to understand visual and textual format”.

5.3.7 Obtaining user input

For the main errand, a traveler can pick a favored beginning and completion area by just tapping on any point on the guide. Additionally, the traveler can enter an ideal visit begin time and select favored visit length.

For an increasingly customized visit, the visitor is additionally ready to demonstrate their advantage inclinations in the six POI classes (Shopping, Stimulation, Social, Structures, Sports, and Stops).

5.3.8 Communication between components

The second errand begins when the visitor taps on the "Plan Visit Schedule" catch. After clicking, the UI segment makes a call to the visit suggestion segment, alongside the different excursion imperatives and intrigue inclinations gave. Thus, the visit proposal part conjures its suggestion calculation to design a customized visit dependent on the gave parameters.

5.3.9 Displaying recommendation results

For the third task, the user interface component displays the personalized tour information in a visual and textual format. Using the google maps Programming interface, the visual portrayal is as waypoints (POIs) that are plotted on a guide and associated lines that show the course to take between POIs. The literary portrayal gives more data on the suggested visit, showing an opportunity to touch base at and leave every POI, alongside the name and class of every POI.

5.3.10 Translation

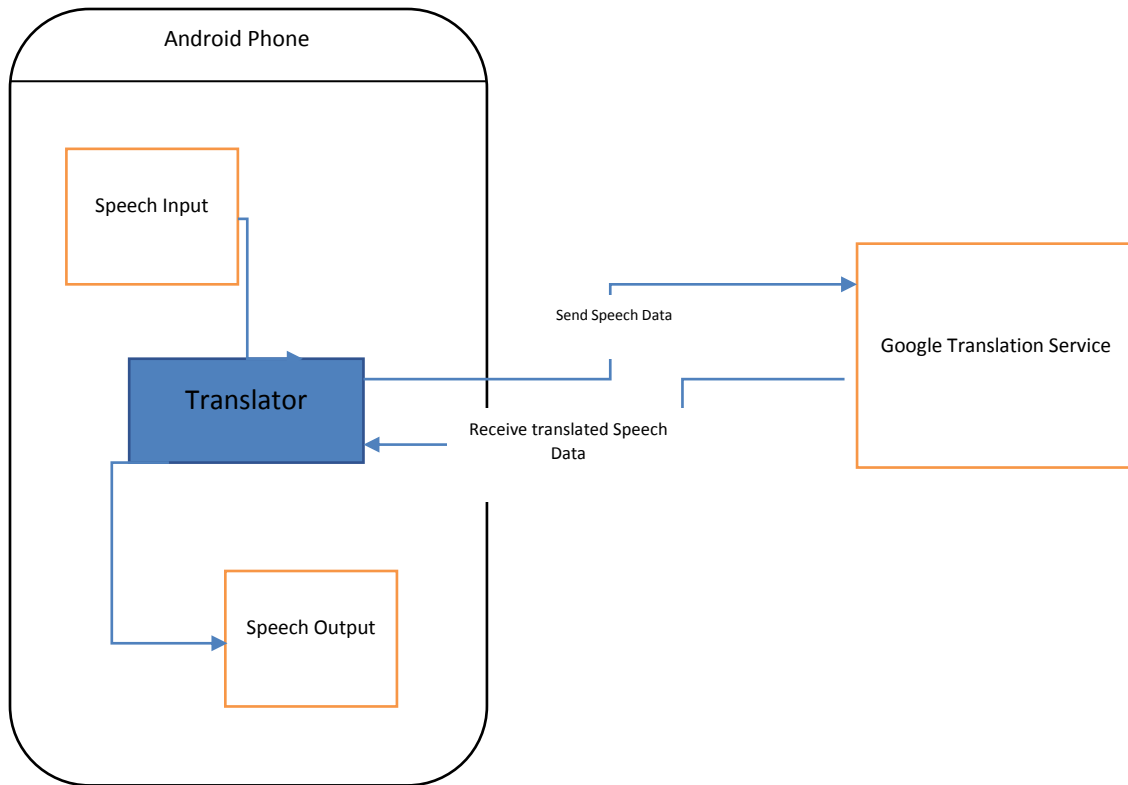


Figure 5.9: Translator activity

The translation feature of the application will help users to communicate with the local people. This translation process is shown in the following diagram.

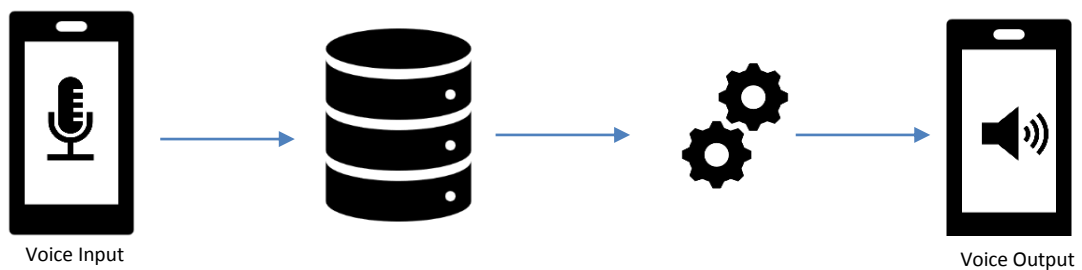


Figure 5.10: Translator process

First user should open the translation feature of the application. Then the user will have to tap on the voice input button which will allow the user to record their voice. The recorded

voice will then be sent to the database where it will be processed to match the equivalent words of the language that it is being translated to. When the full translation process is completed it will play the translated speech. This translation feature will be processed using google translation API.

CHAPTER 6

CONCLUSION

This thesis was conducted to develop an offline travel application. This paper shows how the proposed application has been able to achieve the required objectives. The application has been developed using android SDK and java, which allows the user to help track their point of interest in offline mode. The user is also able to voice translate within the app.

6.1 Critical Review

In order to get ideas for creating the travel app, research on the related topic was conducted. Various notable articles and papers were studied to understand how such apps work. Also, many travel apps that are already on the market was studied to find out what features these apps are providing and what features they are lacking. Interviews were also conducted to learn what users wanted in a travel app and whether the ideas presented for the proposed Travel were wanted or not.

After considering all the above the application development was started. Agile methodology was chosen for the development of the application. The travel app was built as a native app, due to its various advantages. During the design phase the main three activities of the app was determined: user interface, location and maps, and translator. User interface as the name means is the view of the app, location and maps deals with the functions related to POIs and translator will allow speech translation. A tour planner was built in the app, which uses an algorithm that allows it to recommend tour plans to the users. The tour recommendation can be based on POI popularity or interest of the tourist. The various modules are then implemented to create the app.

After the app had been built it was time for testing. For this purpose, black box testing and usability testing was implemented for the application. Using black box testing various test cases were run to find out whether their discrepancies between the expected and the actual results. The black box helped to find out some problems with in app. The usability testing was conducted using real participants and them completing a SUS form. From the usability testing the features that are most liked and helpful were distinguished.

Also, which aspects the app need improve on was also identified. The SUS forms also helped the find out average SUS score of the app, which are 70. This score shows that the app is just above the industry average and improvements can be made to better this score.

The proposed Travel mobile application will help travelers to find out the various points of interests within the Dhaka city such as restaurants, hotel, parks, historical places, etc. on a map. It also has brief descriptions about the POIs. The app also has planner option which allows the users to plan a travel. The voice translator within the app will allow foreigners to interact with local people more easily.

6.2 Future Recommendations

The app has lots of further potential for enhancement. Addition of more cities within the app can help broaden the scope of travelers of visiting other cities of Bangladesh.

Ride sharing app integration can also be implanted within the proposed Travel app to further enhance the app user's satisfaction. The users would easily avail vehicles to travel from one destination to another without needing to close the travel app.

AI integration would be done in future version. By which user can book hotel, plane ticket, plan a trip with bot. Now a day's different bot is available for integration with many apps. It will be possible to integrate a chatbot which will help user find their required answer for their question within few seconds.

The user interface design of the app needs to be further beautified to present the users with a pleasant and easy interface.

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