An Offline And Online-Based Android Application "Travelhelp" To Assist The Travelers Visually And Verbally For Outing

F.M. Javed Mehedi Shamrat, A.K.M Sazzadur Rahman, Zarrin Tasnim, Syed Akhter Hossain

Abstract: "TravelHelp" is an android application that will be developed mainly to help tourists who are eager to visit 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 the 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 the 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. The map will consist of the regional main attractions, traveling 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, the foreigner can be easily able to communicate with the local people which will lead to a very convenient travel.

Keywords: Free Offline App, Mobile Application, Android Application, Point of Attraction, Voice Translator, AI.

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1. INTRODUCTION

INFORMATION technology (IT) has become the most important aspect of today's world. Increasing the assistance of mobile phone use is now the focus of lots of development projects. Even though several technical projects target assisting aid workers or providing group tools for whole communities, mobile phones have uniquely become easily accessible and useful for individual users.

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 the 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 areas of interest. Android is one such unique innovation made by Google. It has instantly dominated the mobile market. It is an open-source mobile platform that allows developers from around the world to develop applications for android supported mobile devices.

One of the major categories of mobile applications is the 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

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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 traveler satisfaction, it becomes essential to develop a mobile app for benefiting the people who love 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 traveling to 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 travelers can easily communicate with the local people. Also, it is planned to design an offline integrated map by which travelers can easily access their travel plan with a specific route along with the other amenities when they will have no internet in their mobile device. The app will show and navigate the traveler to their destination with an interactive offline map. The rest of the paper discusses the literature review in section 2, the proposed System Methodology and Implementation consist of section 3, and in section 3 briefly discussed the project strategy, and in section 4 short summary of proposed system.

2 LITERATURE REVIEW

In recent years some research papers have been published where developers and researchers have shown different types of travel applications. These applications help peoples to guide the tour accurately. Design and implementation of the traveling time- and energy-efficient android GPS navigation app with the VANET-based route planning [1]. 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. Solving the tourist trip planning problem via a simulated annealing algorithm [2]. This paper presents a simulated annealing algorithm that helps to solve tourist trip planning problem. Tourist trip planning problems mainly relate to the time and budget of

travelers. The algorithm can help to solve this problem. Tourism multilingual integrated Solution: A case study "EgyptTravel" [3]. 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 helps us as a guide in how to build a travel app. User experience evaluation of Chinese travel app software [4]. This paper presents the findings of research on the 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. In the prior researches done, there was no system suggested that could perfectly perform as travel application for inside Dhaka as well as both Bengali and English language.   From the research gap, an android application system based on an approach of travel help is proposed. This application is developed by using framework "Android Studio" with java programming language. A programmed voice responder dependent on AI (man-made consciousness) is likewise intended to be remembered for the application. By utilizing this device, outsider can be effectively ready to speak with the neighborhood individuals which will prompt a helpful journey.

3 METHODOLOGY AND IMPLEMENTATION

3.1. Specifications

The primary goal of this project is to develop an app that will provide a user-friendly interface and easy to use services for travelers. The android app markets have various well-developed apps for travelers. 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 travelers to easily access location and route data without the 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 an attractive place in the 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 the 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 the easy-to-use platform.

TABLE 1
SYSTEM SPECIFICATIONS

Specifications	
User friendly interface and interactive	• General terms for functions • Simple UI (user interface)
Offline App	• Native app • Database downloaded in device • No internet needed
Map	• Interactive • Offline support • Route plan
Trip Planner	• POI popularity • Tourist interest • POI details • Route planning • Automatic suggestion about trip details
Translator	• Voice translation • English to Bangla • Bangla to English

3.2. 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
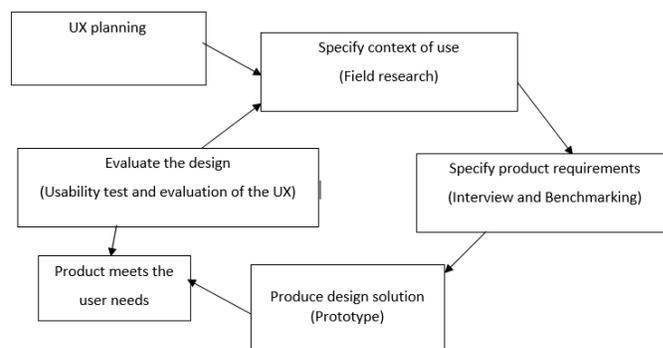

Fig. 1: Own illustration based on ISO 9241-210 standard (Sippola, 2017)

The proposed Travel is an application being built using an android framework for mobile platforms. 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. 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 of the 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

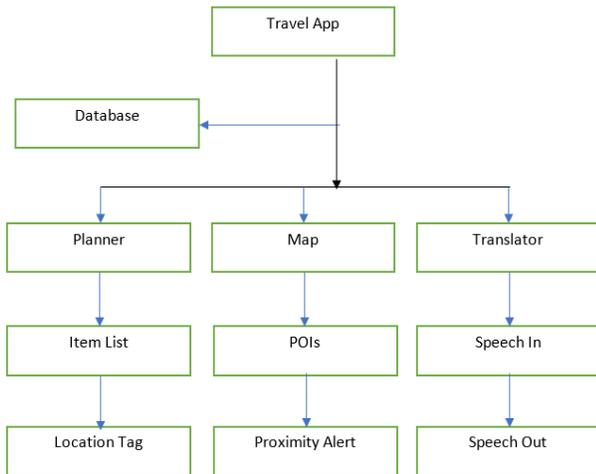finished, the past activities resume their actions. The activity lifecycle is demonstrated in Figure 3.

Fig. 2: *Activity Lifecycle is 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.
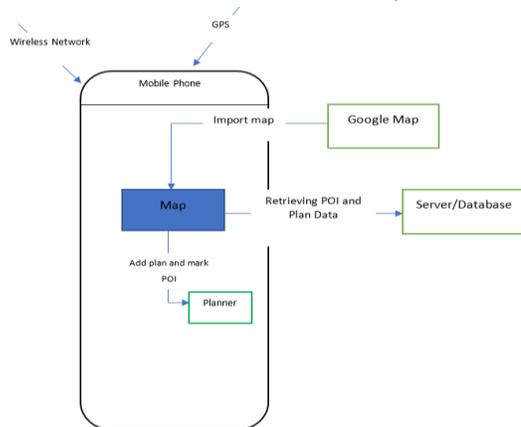

Fig. 3: *UML Diagram showing the application workflow*

3.3. User Interface (UI)

The android UI structure is composed around a model-view-controller design. It gives structure and devices to build 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.
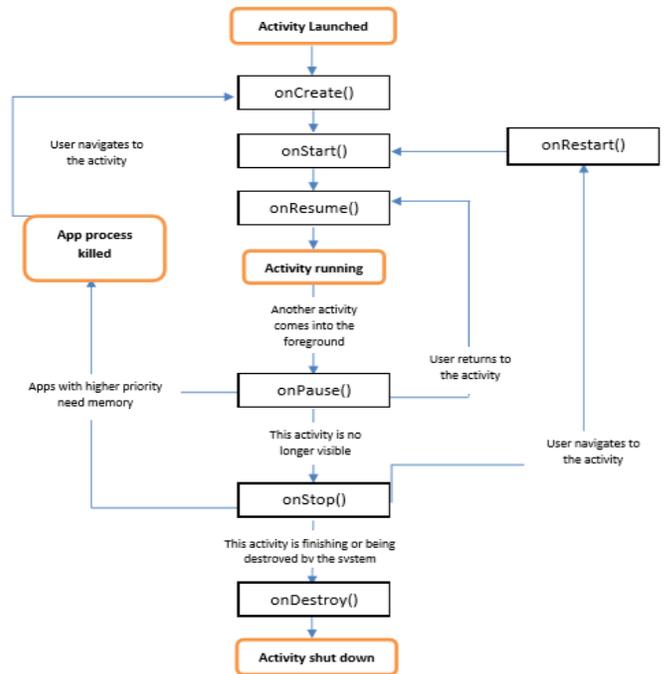

Fig. 4: *The app's model-view-controller design (Cs.ccsu.edu, 2017)*
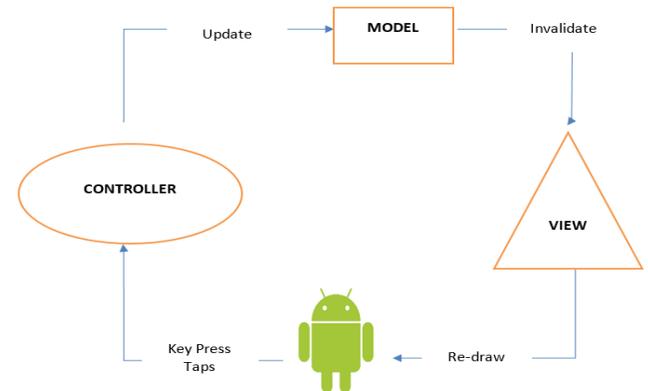
3.4. Location and Maps

Fig. 5: *Map Activity of Proposed Application.*

The project is being developed considering that users use their android phones with wireless network environments and having the ability to 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 the google map API, which will be implemented on the platform of android. Both android and google map is 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 a 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 view group. A map-view displays a map with data obtained from the google maps service. When the mapview has focus, it will capture keypresses and touch gestures to pan and zoom the map automatically; including handling network requests for additional maps tiles. It also provides all the UI elements necessary for users to control the map. A location listener is the interface implemented to receive location updates (Developer.android.com, 2017). To use Google maps in the application, a maps API key had to be obtained to register with the service and android system had to be notified that the application wishes to implement the add-on google APIs which are external to the base APIs. This was done by using the uses-library element in the android manifest file, informing android that the application used classes from the com.google.android.maps package. The proposed Travel application additionally utilizes map overlays to depict to the clients the different areas went to and a short portrayal of each. This is completed by making Mapmakers and layovers. This has been conceivable by utilizing itemized overlay class to deal with all the individual things set on the map. Map activity is the dividing action characterized to indicate Google maps. This is contained in the map activity. Using location and maps represent a big plan for this application since it utilizes high GPS action and more power utilization.

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 $I = (p_1, \ldots, p_n)$ that,

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

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

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

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

Equation 1 attempts to maximize both popularity of the point of interest 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:

- 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 solve.
- 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 interest are connected to one another). It also ensures that in a suggested tour plan one specific point of interest is not visited again.
- 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 the user's duration of visit and the time it takes to travel from one POI to another (Constraint 4).

The app will be able to consider tourist trip constraints such as starting and ending at specific locations (e.g., near the tourist's hotel) and having limited time for touring.

It will utilize GPS coordinates and a 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.

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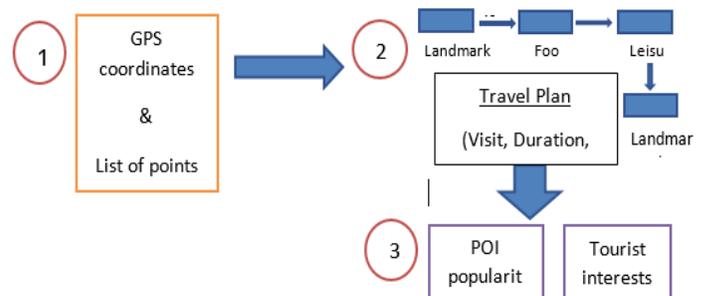

Fig. 6: *Planner Overview (Tour Recommendation Framework)*

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

- 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.
- Create the traveler's visit history by associating point of interest visits (acquired from Step 1) of the same traveler. In particular, the 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.
- Compute the popularity of the point of interest 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 in popularity. Whereas the amount of time spent at the point of interest will generate tourist interests.

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

The main contribution is in developing the system that can recommend POIs that are interesting to the tourist and plan these POIs in the form of a tour itinerary. The key features of this system are as follows:

- Able to recommend tours based on either POI popularity or tourist interest preferences. In addition, recommended POI visit durations are tailored based on the interest levels of the tourist, i.e., a longer visit duration for POIs that are interesting to the tourist.
- For the tour recommendation, a modified ant colony optimization algorithm has been used.
- Usually, recommendation results are displayed in textual and intuitive graphical form. The graphical form gives an 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.

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, the average duration of visits at POI and categories of POI.
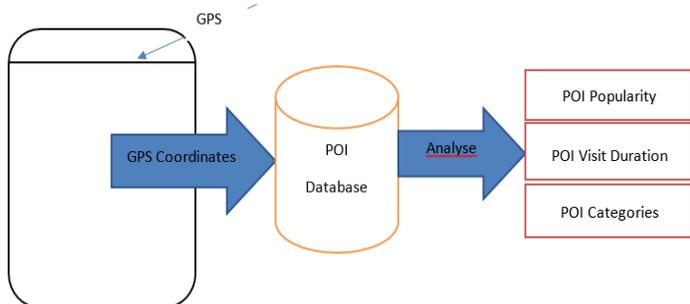

Fig. 7: Data collection and analysis component.

- 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.
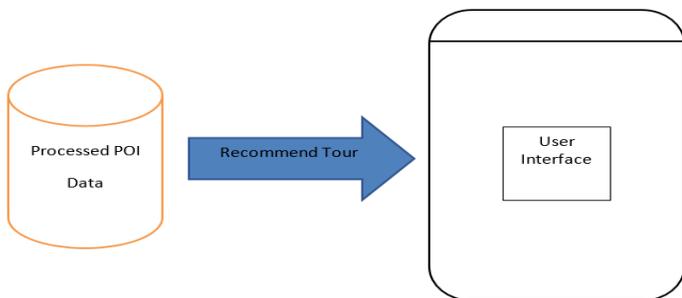

Fig. 8: Tour Recommendation Component.

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.
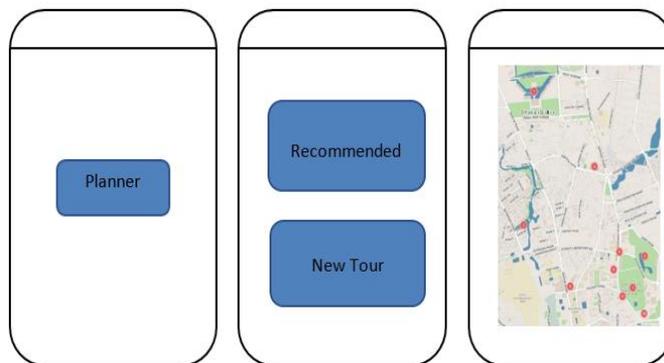

Fig. 9: User Interface Component.

- 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. Users will provide voice/audio input through a microphone or can input text for specific purposes. 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 the route, etc.
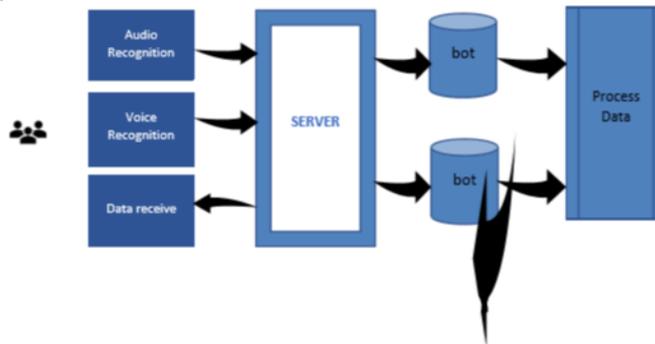

Fig. 10: AI Integration.

3.7. Data Collection and Analysis
The data collection and analysis component performs 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 coordinates, and the GPS co-ordinates' time-stamp.

- Data Analysis

For the second task, the meta-information of each GPS timestamps 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 interest can be categorized as.

3.7. Tour Recommendation Component
Using the POI-related information provided by the data collection and analysis component, the tour recommendation component recommends and plans a tour itinerary according to the interest preferences and trip constraints of the tourist.

The interest preferences correspond to the POI categories in the city, while trip constraints are in terms of the tourist's preferred starting/ending location and available touring 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 basic ant colony optimization algorithm utilizes several agents (ants) that start from a specific POI with the aim to find the best path to a desired destination. 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 intuition behind the ant colony optimization algorithm is that agents are more likely to follow a path that is "better" and has been taken recently. This preference subsequently leads to the positive reinforcement of choosing a single path over time, resulting in that path being selected as the best solution. 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 traveling from one POI to another is based on a fixed traveling cost and dynamic POI visit duration (personalized based on tourist interest levels).

3.8. 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.

3.9. Obtaining User Input

For the first task, a tourist can pick a preferred starting and ending location by simply clicking on any point on the map. Similarly, the tourist can enter a desired tour start time and select a preferred tour duration. For a more personalized tour, the tourist is also able to indicate their interest preferences in the six POI categories (Shopping, Entertainment, Cultural, Structures, Sports, and Parks).

3.10. Communication Between Components

The second task commences when the tourist clicks on the "Plan Tour Itinerary" button. Upon clicking, the user interface component makes a call to the tour recommendation component, along with the various trip constraints and interest preferences provided. In turn, the tour recommendation component invokes its recommendation algorithm to plan a personalized tour based on the provided parameters.

This personalized tour is then returned to the user interface component, containing the recommended POIs and the time to spend at each POI.

3.11. Displaying Recommendation Results

For the third task, the user interface component displays the personalized tour information in a visual and textual format. Utilizing the google maps API, the visual representation is in the form of waypoints (POIs) that are plotted on a map and connected lines that indicate the route to take between POIs. The textual representation provides more information on the recommended tour, indicating the time to arrive at and depart each POI, along with the name and category of each POI.
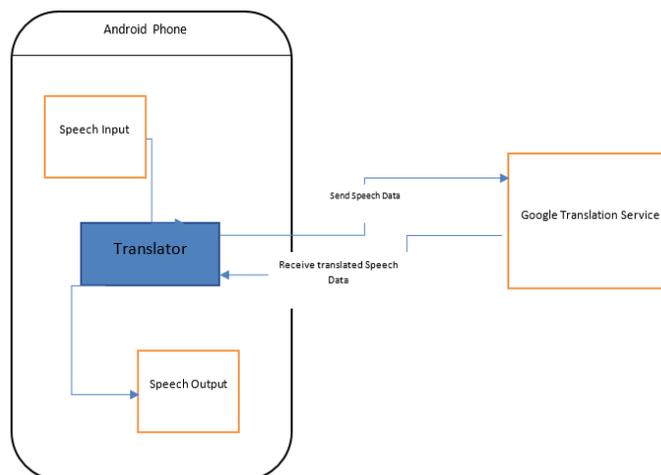
3.12. Translation

Fig. 11: 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.

Fig. 12: Translator Process.

The 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.

4   CONCLUSION

The app has lots of further potential for enhancement. The addition of more cities within the app can help broaden the scope of travelers to visiting other cities in Bangladesh. Ridesharing 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 versions. By which user can book a 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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