Mobile Travel Guide using Image Recognition and GPS/Geo Tagging

A Smart Way to Travel

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***Abstract*— In our current tourism system, whenever a tourist visits a monument or a famous spot, to know more about the place, he/she hires a guide. With the advancement in the technology, the role of the guide is being taken up by the different services and applications. The increase in the use of mobile phones has made it easier to provide different applications available to the tourists 'on the go'. In this project, we are making an android based mobile application that can be used as a guide by the tourists. The main function of this application is to recognize a monument or a famous spot from the picture clicked/uploaded by the user and to provide detailed information regarding it. This is achieved by using open-cv for image recognition. It then displays the information that is associated with that monument. The information is available in the JSON database. It will also be able to point the location of that monument on the map.**

Keywords—Geo Tagging, GPS, Image Recognition, JSON, API, Open-CV.

I. INTRODUCTION

Nowadays, mobile phones are a necessary part of people's life. There is a continuous rise in the number of mobile computing applications centred on people's daily life. One of the areas in which the user can benefit from smart phone applications is tourism & travelling. Tourism is the largest industry in the global world economy employing about 200 million people and serving 700 million tourists worldwide. By 2020, the number of tourist arrivals around the world is expected to increase by over 200%[1]. Tourism industry is also responsible for generating an estimated 11% of the global gross domestic product(GDP)[1]. Although, there is greatly enriched travel information provided to the tourists on the Internet and through the apps. However, there is no app for a tourist to directly get the history or any other information related with any monument or place by just its picture. To know more about any place or monument the tourists visiting that place have to employ guides.

Our project eliminates the importance of a guide in tourism as it provides information about the monument by processing its image. It is an android based mobile application that can click a new image or upload an image from the existing albums. It will then provide all the information present in the database regarding that monument. For this it has to recognize any monument or famous spot from that image and match it with the images present in the database so as to recognize the monument. It will also have the functionality to locate that monument or famous spot on the map. Using this feature our application should be able to point to the location of the image recognized by it, the present location of the user or any other location specified by the user.

II. TECHNOLOGIES USED

A. Android

Android is a Linux-based operating system widely used for mobile devices. It was developed by the Open Handset Alliance, led by Google and other companies. It is the largest growing operating system for mobile devices. When a developer develops an app for android, then the application can run on any of the android powered devices.

Our app is made for devices with Android operating system. The app requires an Android OS with an API 11, that is, v3.0 (Honeycomb) or higher. The device should have an inbuilt camera and an active internet connection.

B. JavaScript Object Notation (JSON)

JSON (JavaScript Object Notation) is a data-interchange format which is easy for humans to read and write and for machines to parse and generate[2]. JSON is a language independent text format that uses conventions of many programming languages making it an ideal data interchange language. It is built on universal data types supported by all modern programming languages making JSON an ideal data-interchange language[2].

JSON is the language used in this app for making the database. The JSON database is uploaded on a website named 'guideme.freevar.com'. We pass the URL of this website in the app and the app parses this database to get the results.

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C. *Google Positioning System (GPS)*

The GPS navigation system is a constellation of 27 navigation satellites out of which 24 are active and 3 act as backup. These satellites are used for providing the time and location information to any device. The devices have an inbuilt GPS receiver that communicates with the satellites through the use of radio waves. To provide the information, the device must be in unobstructed line of site to four or more GPS satellites. For finding out the location of the device the GPS receiver must determine the location of at least three satellites above it and the location of the device relative to these satellites. The exact location of the user is then determined by using trilateration.

D. *Google Maps API*

Maps can be added to any application by using Google Maps Android API. The API adds maps to the application based on Google Maps data. It handles everything required to display maps in the application from access to the Google Maps server to response to map gestures. To use the Google Maps Android API the developer must register his/her app project on the Google Developer Console and get a Google API key which can be added to the app. The API key is necessary to access the Google maps server.

To incorporate Google Maps in our app we have made use of the GoogleMapsActivity provided by Android Studio. Using this activity android studio automatically generates all the files required for integrating Google Maps. We have to put the API key for the project in the google_maps_api.xml file generated.

E. *Google Places API*

Location aware apps can be made by using the Google Places Android API. The API can be used to make apps that respond to local businesses and other places near the device according to the place. To implement Google Places API the developer will have to obtain an API key by registering the project on the Google Developer Console.

Google Play Services must be included in the app's development project in order to access the Google Places API. Android Studio provides a GooglePlayServicesActivity which can be used to implement Google Places.

F. *Open-CV*

Open-CV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library[3]. It has more than 2500 optimized algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc[3].

OpenCV is used in our app for image recognition. The image clicked by the camera will be compared with the images present in the database using open-cv to identify the monument. The app uses histogram comparison along with feature detection using ORB algorithm to compare two images. OpenCV Manager is an android app present in Google Play Store that should be installed in the device for our app to work.

III. COMPARISION WITH EXISTING WORK

Some of the already existing apps or websites similar to our proposed application are listed below. Here we show what is special in our app as compared to the existing applications.

A. *Google Goggles*

Google goggles is a mobile app developed by google. It uses image recognition to search for pictures clicked by the mobile device[4]. Although it is a very good app it does not provide specific information related to the object. It gives the user the result of the image recognition. Any other information regarding the image is provides in the form of result list of search query.

B. *Panoramio*

Panoramio is a geolocation oriented photo sharing mashup owned by Google[5]. In this the users can know more about any area by looking at the pictures clicked by the other users that area. It is basically a website that allows users to search for certain topics such as place name or subject matter. It does not provide any other information related to that place such as its history or its importance.

C. *CamFind*

CamFind is a mobile visual search engine that allows the user to search for anything by clicking its picture from the mobile. It is an image recognition app developed by Image Searcher, Inc[6]. It correctly provides a lot of information about any object but it cannot provide the history related with any place or pin point its location on the map.

	Google Goggles	CamFind	Our App (GuideMe)
Input Type	Image	Image	Image/Text
Output	Recognize image Give Name Web Search Results	Recognize image Give Color Give Name	Recognize image Give Name Give Details
Image Type	Any Image	Any Image	Images of Monuments or famous buildings

Table 1. Comparison between similar apps

IV. WORKING

In this section we will describe the working of our app. This section shows all the functionalities provided by this app.

A. The Splash Screen

Fig.1 Splash Screen

Splash Screen (Fig. 1) is the first screen displayed when the user opens an application. It is a graphical window containing an image, a logo or the current version of the software. It is used to notify the user that the program is in the process of loading. It disappears when the application's main window appears. The splash screen of our application contains an image. It will be displayed for just 2 seconds before the application's main page is opened.

B. The Home Screen

A main screen or home screen (Fig. 2) is the first screen of any application. This is a window which is opened after the splash screen. This screen gives the main feature and functionalities of the application. The main screen of our application contains buttons for each of the functionalities provided by the application. These buttons are:

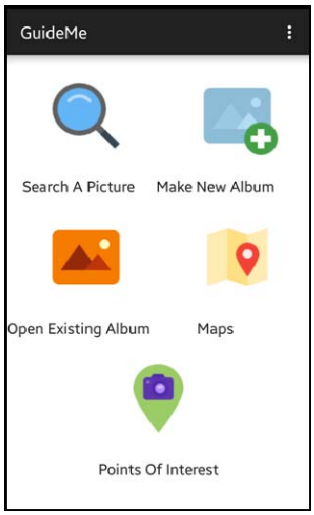

Fig.2 Home Screen

- Search a picture button: This button is used for searching for any image in the database.
- Make a new album button: The name of a new album is entered and a new album is made with the given name.
- Add picture in an existing album button: It gives the list of existing albums from which one is selected.
- Maps button: This buttons opens the map using the Google Maps API.
- Points of Interest button: This button gives the list of nearby places and displays them on the map using the Google Places API.

C. 'Search a Picture' Button

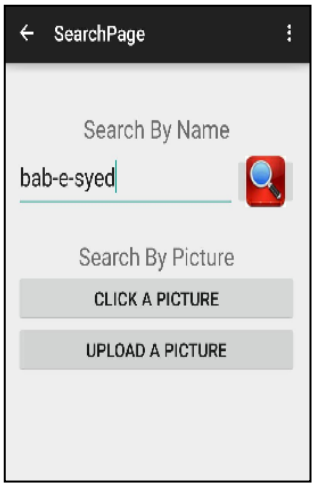

Fig. 3 Search Page

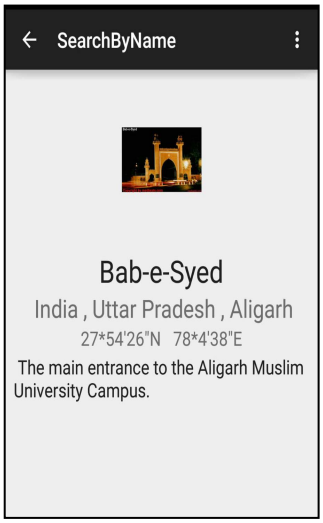

Fig. 4 Result Page

This button is used for searching any image in the database. The screen shown (Fig. 3) will be displayed when this button is clicked. This screen provides two functionalities:

- To search for a monument by name.
- To search for a monument by a picture.

In search by name, the name of the monument has to be entered in the space provided (Fig.3). This name will be searched in the database and result will be displayed in the result page (Fig. 4).

In search by picture, the user is given two options. They can either click a new picture of the monument and search for it in the database, or they can upload an already existing picture of the monument (Fig.3). For clicking a new picture the app opens up the device's camera and for uploading a picture the gallery of the device is opened up. This picture is matched with the pictures in the database and the result is shown in the result page (Fig. 4).

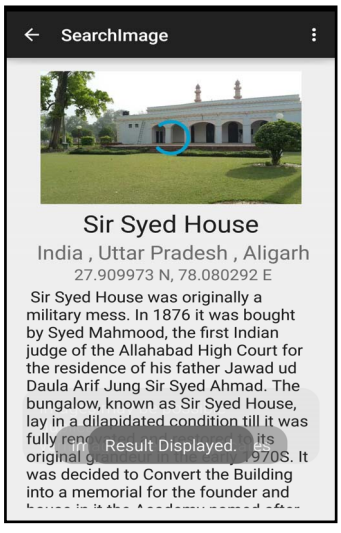

Fig. 5 Picture found in database

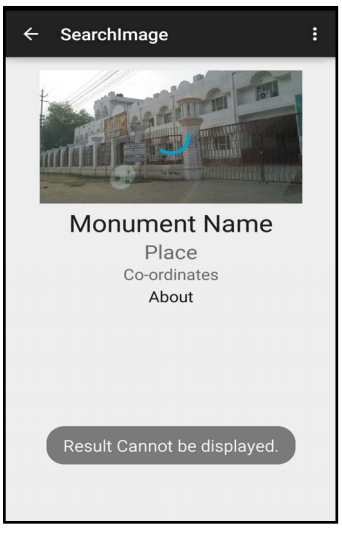

Fig. 6 Picture not in database

Fig. 5 shows the result page shown when the details of the monument are found in the database. Fig. 6 shows the result page when the monument is not present in the database.

D. 'New Album' Button

The 'New Album' button is used for making a new album in the app's folder. The user can maintain different albums for different places using this button.When the user clicks this button a dialog box appears (Fig. 7) asking for the name of the new album he/she wants to create. When the user enters the name of the album and clicks on the 'OK' button, a new album is created and the app opens the device's camera. The picture clicked is then stored in the new album created.

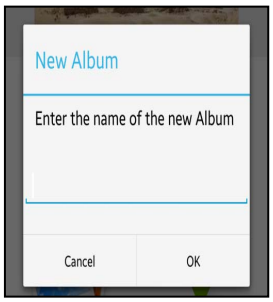

Fig.7 Dialog Box

E. 'Existing Album' Button

The 'Existing Albums' button is used for storing the pictures in the albums already existing in the device. When this button is clicked a dialog box is displayed (Fig. 8) which gives the list of all the existing albums. Here only those albums are displayed which have been created by the user using this application. When the user selects an album fromthe list and clicks the 'OK' button the camera of the device is invoked. The picture then clicked is stored in the album selected by the user.

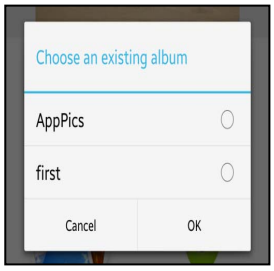

Fig.8 Dialog Box

F. 'Maps' Button

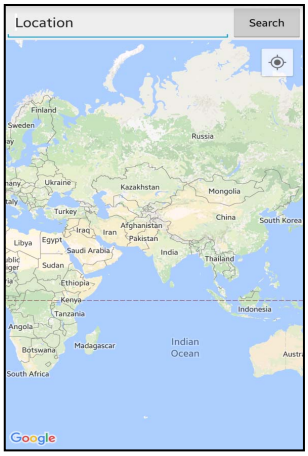

Fig.9 Maps

The Google Maps API is used to integrate maps in our application. When the 'Maps' button is clicked the application opens up the maps (Fig. 9).

There is a small button on the top-right corner of the maps screen. When this button is clicked the screen moves to show the current location of the user on the map (Fig. 10).

There is a text box at the top of the screen which is used to search for any location in the world. When we write the name of any place in that box and click the 'Search' button, the screen moves so as to focus on the location of the place mentioned in the box (Fig. 11). Our application also has a 'change map type' option. It is used to change the type of the map displayed from 'normal' to 'satellite' and vice versa. This option can be opened by touching the menu option on the device. The satellite view is shown in Fig. 12.

Fig. 10 Current Location

Fig. 11 'Normal' View

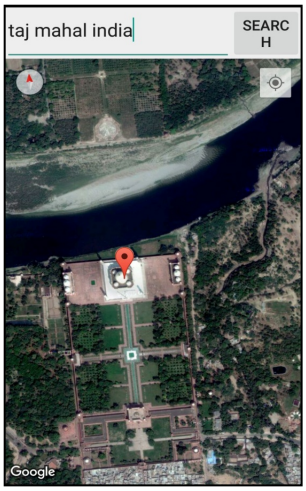

Fig. 12 'Satellite' View

G. 'Points of Interest' Button

The Google Places API is integrated with this button. By clicking this button the user can get a list of all the nearby places. Also the places shown in the list are marked in the map displayed in half of the screen (Fig. 13).

The user can get additional information about any place by clicking that place in the list. It provides information like name of the place, its coordinates, address and phone number (Fig. 14).

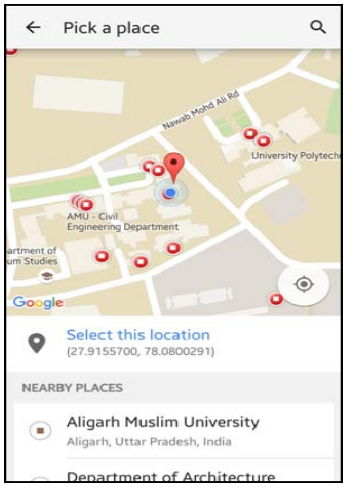

Fig.13 Place Picker

Fig. 14 Place Details

V. FUTURE WORK

The implementation and use of the proposed app will replace the current guides with 'electronic guides'. These 'electronic guides' can act as universal travel guides and tourists do not need to hire a new one at every new place. Some enhancements that can be carried out in the future in this app are:

- The database used in this app is not an open source database. It is just a prototype database made in JSON used for testing the app. This database will have to be extended in the future to contain information about monuments for different cities around the country/ world.
- A feature for faster searching in the database can also be provided. This can be achieved by dividing the database according to country, state and city. The user can be asked to provide the country or state or city they are visiting to improve the speed and accuracy of results.
- A feature for providing detailed information about the region the user is currently in, and not just any monument can also be provided.
- A feature for translating any text written by the user into local language and converting the translated text to voice can be introduced. Also, taking a voice input in the native language it can be converted to text in the user's language. This feature will allow tourists to communicate easily and effectively with the local people.

The use of this app during travelling will make it an even more wonderful experience as tourist will not have to go through the hassle of hiring a guide at every place they visit.

VI. CONCLUSION

The main purpose of this project is to eliminate the need of a hired guide. The app we are proposing can identify a monument or a famous spot based on a picture that is either clicked or uploaded. Also, information can be retrieved about a monument by just entering its name. Our app can also locate that place on the map. Aside from this, it also has many varied features such as that of maintaining different albums for different locations. It can also give the location of the user and other places nearby which are worth seeing. The app can also provide information about nearby restaurants, cafes, etc. This application is particularly useful for tourists who are visiting any place for the first time. It can help them to know more about any place they are visiting and the history related with that place. It can also be useful to people in general by giving information about the nearby attractions. It can also be used by locals to know more about the famous buildings near their homes. They can find out the history about any famous buildings nearby.

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