

Implementing Portable Tourist Captain

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Abstract - Tourism is travel for pleasure and for business as well. The tourism industry has become the largest and fastest growing industry in the world. These days, more and more people travel on vacation for the purpose of recreation, accommodation, and entertainment. The main goal of this project is to help tourists understand all of the information about specific tourist spots and glorious places. This will enable them to make full use of their visit without omitting critical information. There are lots of apps out there to guide tourists towards the places they should visit. They're paper-based and mobile-based, but they lack interactive features. Considering the limitations of existing applications, this system application provides a portable tour guide mobile application replacing the old tour guide booklet. The application was produced based on the Android platform with augmented reality technology, and delivered as a mobile application.

Key Words: Tourism; Technology; Mobile; Guide; Landmark;

1. Introduction

According to The World Tourism Organization, approximately 448 million tourists were visiting various places for entertainment and recreational purposes. This number is only increasing after COVID has reduced. Every year, there are more and more tourists coming from different regions of the world. For these 448 million tourists, there are only 400 Thousand tourist guides currently registered who are working at various tourist sites. They are the main and only source of knowledge about the place in most cases. Because of this, not every tourist has easy access to the information. The costs associated with the guides are also high in some cases. The tourists are English speaking in most places, however, for tourists coming from different language speaking regions, there is a language barrier. The second solution a lot of tourist places have is paper-based navigation and guide systems. These are simple banners and info graphics which are used to convey the information. Despite being available in most places, they are often outdated or inaccurate. The language barrier problem is also faced by such systems. The maintenance and installation of such systems in all of the tourist sites will be very cost intensive.

Because of all these issues, a lot of tourists coming to visit a site often remain unaware about the history and importance of the place they are visiting. This includes the historical as well as cultural value. For places like temples and ancient landmarks, knowing the history is very crucial to truly understand the value of the monument.

With the growing use of smartphones and advances in smartphone cameras, along with the improvements in the Machine Learning models, an interactive solution can be quite helpful. [5.2.1] will not only make the information freely available at fingertips, but it will also act as a way to promote tourism across various regions by suggesting places of similar value and history. The interactivity of [5] will keep the tourist engaged while reducing the need of traditional guide systems.

1.1 Problem Statement

This Mobile Application "VIRTUAL TOURIST GUIDE", aims to help the tourist to know more about the place to be visited.

Paper based tour guide system presents static photo copied images with limited information, so they have limitations of intelligent representation and precise navigation and it is a traditional one. With a mobile application, we aim to solve the problem by allowing the user to identify and access information about tourist places just by capturing an image.

1.2 Need

- Increasing number of tourists coming from various parts of the world who speak different languages
- Lack of interactive system for providing information about tourist places
- Loss of history & importance of landmarks because of unawareness regarding the place
- Issues and limitations of traditional, paper-based guiding systems

2. Literature Survey

In the previous publication, related to the considered topic, the authors provided the description of related work

in the area of tourist guides. There are many state-of-the-art papers that evaluate different mobile tourist guides. At the present the following developed systems have been considered:

Paper Title	Author & Year	Methodology	Image Identification method	Proposed Solution Summary
Virtual Tourist Guide	Harini B, Ashmitha K, Deepan Raj K R, Janani S R Published Date - March 2021	Information about landmarks is displayed using Augmented Reality Videos and voice overs.	-	An Augmented Reality tour that makes use of location-aware technology. It Scans the tourist place images and conveys the information and history by voice over and how the place is in the video format using AR.
Android Mobile Based Tour Guide System using Augmented Reality	Akil. H. Sayyad , Santosh. A. Shinde Published Date - July 2016	Using Symmetric and combinatorial matching Algorithm, key points in Query Image are computed. An image with highest matching score is considered and Landmark information is retrieved from the labeled dataset.	BRISK & FREAK	Binary Robust Invariant Scalable Key-points (BRISK) and Fast Retina Key-points (FREAK), two state of the art binary feature descriptors, are connected for recognizing/tracking target images with low computational force and high level of accuracy.
Smart Booklet: Tour Guide System with Mobile Augmented Reality	Heeseung Choi, Gyu Chul Han, and Ig-Jae Kim Published Date - January 2014	Symmetric and combinatorial matching is applied to find nearest neighbors based on key points. Image with the highest score is retrieved. For 3D video tracking, tracking-by-detection approach is used on a per frame basis.	BRISK & FREAK	A mobile tour guide system based on AR for tourists usable anywhere if they possess an off-line tour booklet. 3D virtual models are rendered on the images in the off-line booklet.

<p>A Mobile Application based on Global Positioning System and Object Recognition Towards a Digital Tourist Guide</p>	<p>Wadii Boulila, Anmar Abuhamdah, Maha Driss, Slim Kammoun, Slim Kammoun Published Date - April 2014</p>	<p>The image is processed in on device DL model provided by Firebase Vision. The result will be an array that contains place names and confidence of each place.</p>	<p>Firestore ML kit SDK, GPS - Haversine Formula</p>	<p>An application that provides 3 ways of identifying and retrieving landmarks: Image based, GPS Location Based and Manual search for retrieving list of monuments for pilgrims.</p>
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3. Features of the project

- User-friendly android application.
- Multiple modules are combined into one application.
- Portable, as it will be available in android phones.
- Provides reusability and scalability.
- Multiple language support
- Lightweight, works on all smartphones
- Search feature for finding landmarks of choice
- Landmark Information can be downloaded for later use, in case of no network connectivity
- Crowdsourced feedback for reporting false or incorrect information about a landmark

4. Methodology

The application uses technologies like Machine Learning(ML) and Image Processing algorithm to get the place details like name and location .

-Google’s Places [13] and Vision APIs [12] are used to further identify the place based on geo-coordinates and provide appropriate details.

-Based on the location[13], a list of related tourist places around the vicinity will be shown to the user.

-A blog-like system for allowing the users to add/edit new tourist places not identified by the system, as well as share their opinions regarding the same will also be implemented.

A middleware cache will also be implemented. Landmark information retrieved from Google Vision API will be stored in a server database. Subsequent requests from nearby coordinates can be answered with this information without having to call Google Vision API. This will further

reduce the response times as well as the costs required for operation.

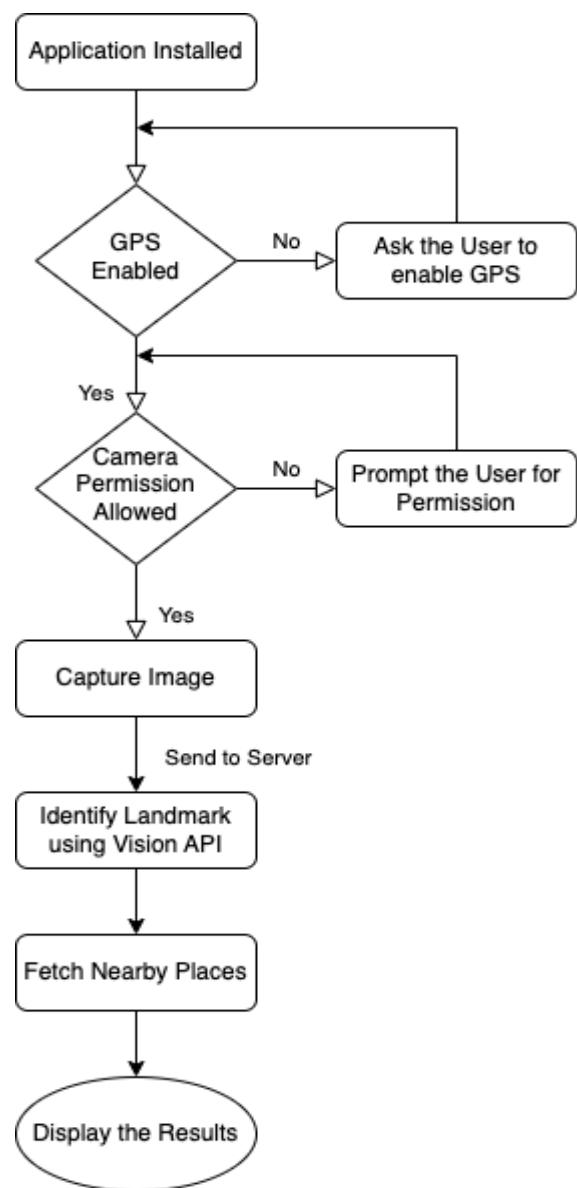


Fig 4.1: Flow chart

5. System Implementation

5.1 System Architecture

There are currently 4.78 billion mobile phone users worldwide, of which 3.5 billion use smartphones. Users can now easily purchase a smartphone with a built-in digital camera and internet connectivity for a low price. Based on this, the suggested approach will enable end users to utilize their phones as equipment to identify landmarks and get information about them. The consumer can photograph a tourist place, in order to discover relevant information. These images will be processed and verified by the server after being included in a request. After that, the end-user will receive the results along with a list of nearby places that might be of interest to the user.

An overall architecture of this solution is shown in figure below.

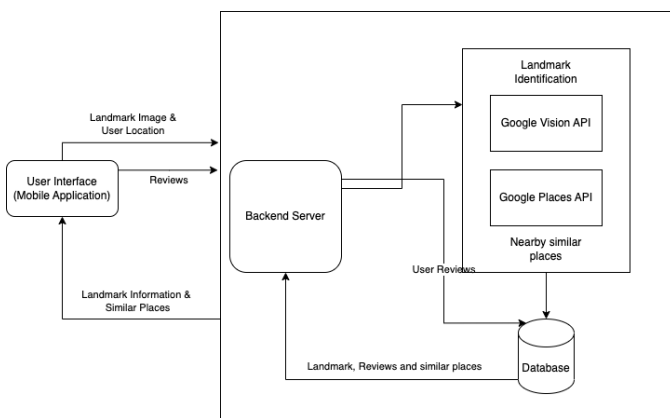


Fig 5.1: System Architecture Diagram

5.2 Modules

5.2.1 Mobile Application:

The mobile application will be the user facing part of the system. It will include a screen for the user to capture an image of a landmark. After clicking a picture, it will be sent to the server. The mobile application will also make use of GPS location to further provide a list of tourist attractions around the user's location. The user can then browse through the list and get any information about them. Navigational functionality will also be a part of the system so that user's can identify the distance and potential roads, routes to the destination place.

React Native, which is a framework for developing cross platform mobile applications, is used on the client side application. The framework is robust despite being easy to develop in. It is based on the React.js framework for the

Web. Using React Native, we can code once and develop an application for both iOS and Android operating systems.

5.2.2 Server

The server will handle all the complex processing and data storage required for the system. Requests from the mobile application will be first handled by the server. These requests will include images of the landmark along with GPS Coordinates. The server will forward the data to Google Vision API & Google Places API. The results will be stored in a database for faster access in consecutive requests. Reviews and suggestions about landmark information will also be stored in the database through the server.

The server will be connected to the mobile application over a REST API. The technologies used for development will consist of Javascript, Express.js, Node.js.

5.2.3 Identification

The Google Vision API takes an Image as an input and can identify objects[12] in it based on provided criteria. Landmarks and monuments can be identified using that, which will be returned to the server, which will store them first in the database. It will also retrieve any reviews for the tourist place and then in turn send the information back to the client application.

The results from popular tourist places will be cached to send the data faster to the users without having to run the Google Vision identification pipeline again. For eg. For multiple user requests that are coming from very specific GPS coordinates around a small region, we can safely assume they all are at a single tourist location. Thus we can identify the tourist place for the first request and cache it in our database. For any consecutive requests coming from that region, we can send the cached data very quickly.

5.2.4 Suggestions:

The Google Places API provides features like Geocoding, Reverse[10] location search, Search related functionality. It will provide the ability to search any tourist place and return its GPS Location, along with the navigational data. This data will be parsed by the mobile application and displayed appropriately. The Google Places API also allows retrieving a list of items based on a given filter around a specific coordinate. We will provide the user's location as the origin and retrieve a list of tourist places around it.

Using the Reverse Geocoding functionality, more accurate identification of a landmark can be done. We can use the

user's current location to pinpoint the exact place along with using the Landmark identification from the image. This will provide more accurate identification to the user.

6. Results



Fig 6.1: Landmark capture screen

The above is a representation of the landmark capturing screen in the application. Once the user captures an image, the image along with the user's GPS coordinates will be sent to the server for landmark identification. After the identification process is completed, the user will get a response with the details. This response will be displayed on a separate screen which will include details like Landmark name, information such as monuments, historic data, Fees and other charges related to the landmark. The location of the landmark will also be available to the user along with a button to get directions for navigation.

Lastly, the user will have a list of related landmarks or tourist attractions that are nearby the user's current location. The user can scroll through these and plan their trip accordingly.

7. Conclusion

The major issue with traditional tourist-based guide systems is that they present static photo-copied images with limited information, so they have limitations in intelligent representation and precise navigation. Secondly, the information that is present is available in the regional language of that particular area which can not be understood by the tourists visiting the landmark, and most of the time the in-person guide is also not available at every landmark to guide and inform about the place to the visiting tourists.

This Mobile Application "VIRTUAL TOURIST GUIDE", overcomes these challenges by allowing the user to identify and access information about tourist places in the language they understand, just by capturing an image. With this app, one gets to know the history of a place, the intricacies involved in the art or monument, and provide any additional information and opinions about it. Also, the app provides a list of tourist places in the vicinity of the user's current location. Henceforth enhancing the overall traveling experience of the tourist.

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