“GOexp” - Landmark recognition, retrieval and predicting user preferred restaurants

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DECLARATION

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ABSTRACT

Tourist Industry in the World is at a standard stage now. There are trip planning sites, booking sites and all. But we are in lack of a dedicated online platform for the tourists to identify certain locations. They always in need of a tour guide to do that. To solve this problem of identifying landmarks, we came up with a mobile-based application. This “GOexp” helps to ease this task of identifying landmarks by studying the pixels of an image taken by any smartphone device. It doesn’t deal with the metadata of the image but it deals with pixel information by using the techniques like image querying. The overall app is providing the organizing image collection and more image retrievals, addition to this we are going to provide some accommodations and dining tracking the location and also through the profiling by connecting to the twitter account of the app user. Addition to this we are going to give the customers a ranking of the restaurant suggested from the profiling. Then they got a chance on selection the best one for the preferable accommodations or dining.

Keywords: GoExp, profiling, pixel, technological, mobile-based, Machine Learning

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LIST OF ABBREVIATIONS, DEFINITIONS, AND ACRONYMS

GOexp	Name of the developing system.
Stakeholder	Anyone who affected or influenced by the project.
LBS	Location Based Services.
IDE	Integrated Development Environment
UML	Unified Modeling Language
GUI	Graphical User Interface
SDK	Software Development Kit
RAM	Random Access Memory
API	Application Programming Interface
PC	Personal Computer
GHz	GigaHertz
HD	High Dimensional
Wi-Fi	Wireless Fidelity
HTTP	Hypertext Transfer T Protocol
HD	High Dimensional

1. INTRODUCTION

The touristic landmarks natural or artificial feature used for navigation, simply identified and recognizable places and buildings such as a monument, temple, statue etc. Picture recuperation is a focal issue in Computer vision: given a request picture, would you have the capacity to find similar pictures in a large database? This is especially basic for question pictures containing purposes of intrigue, which speaks to a colossal portion of what people get similar out of the opportunity to photograph.

Images in community photo collections have scaled to billions over the last few years. Searching into such huge collections traditionally depends on text and other community-generated data. State of the art visual image retrieval has not yet scaled to permit searching into such huge collections. On the other hand, a number of data mining and clustering approaches have emerged that exploit data such as location, time, the user (photographer) and tags.(Avrithis, Kalantidis, Tolias, & Spyrou, 2010)

The dataset contains more than two million images depicting 30 thousand unique landmarks from across the world.

With the huge measure of milestone pictures on the Internet, the time has wanted Computer vision to consider historic points all around, in particular, to assemble a point of interest acknowledgment system, on the size of the whole globe. This system isn't just to outwardly perceive the nearness of specific landmark points in a picture, yet in addition adds to an overall milestone database that sorts out and records historic points, regarding land areas, popularities, social esteems and social capacities, and so forth. Such an earth-scale point of interest acknowledgment motor is enormously helpful for some vision and mixed media applications.

1.1. Background Context

The present system does not have to recognize the landmark images by using pixels. They only compare that input image is the same as their database image and retrieve it. Also, they are not Consider several human features. From the survey that has to be filled by the user and predict the places according to that particular area. We mainly focused those issues and better solution for that system with high reliability, better accuracy.

Google Goggles

Google Goggles is a mobile visual search application currently available for Android mobile phones that lets a user submit a search query by taking a picture. [3] Google Goggles can identify some visual cues or "landmarks" in an image and generate relevant searches. This technology can also recognize barcodes and even some kinds of text in a photo, such as printed text on a captured page. This program can provide information about a photo taken with a handheld device and has been used in various commercial and educational projects. [4].

Bixby Vision

Bixby vision is a new feature on the Samsung galaxy s8 and s8+. You will need to be connected to a Wi-Fi or mobile network, and signed into your Samsung account on your device to use it.

❖ Shopping: Bixby vision can recognize products and search for information such as the product name and its price so you can find and purchase products even when you don't know what it is called.

❖ Nearby places: Bixby vision can recognize landmarks and share information about it and what's nearby.

❖ Text translation: need to know what a sign or menu says? Tap the translate icon to translate it.

❖ Wine information: Bixby vision can tell you a wine's vintage chart, food pairing and world ranking from the bottle's label.

❖ Similar images: search for images similar to the Bixby vision is looking at.

❖ QR codes: quickly view the information from QR codes. [5]

Trip Advisor

A popular tourist destination mobile software tool to plan and support the implementation of the trip is the mobile travel application ‘‘TripAdvisor’’, which contains information about the most popular tourist destinations, places of accommodation, food, entertainment, etc. Has a good travel community for users to store and share their trip stories? Some main advantage is Easy to search, Access the community forum and explore info about your next destination, Great UI, Maps, directions and even Street view. Some disadvantage it doesn’t always include off-the-beaten-track spots, only the most popular tourist spots, Can’t find anything new in a city.

If a person visits a city for the first time and he/she just want the highlights, this is not the best app for the first use. [6]

Foursquare

“Foursquare” [7] [8] is a local search and discovery service mobile app which provides search results for its users. Foursquare provides recommendations of the places to go according to a user's current location. It has a defined list of "tastes" in particular food items, styles of cuisine or environmental aspects, which users may add to their profiles to let the service know what they like. New users are presented with a list of words and phrases describing recognized tastes and they may select the ones that appeal to them. Users can change their tastes at any time and can add and remove items from their profile. Foursquare uses natural language processing to match a user's tastes with the tips at nearby venues that mention them. It is then able to recommend nearby places to the user that match their tastes. “Swarm Foursquare”

City-Scale landmark identification on mobile devices

With recent advances in mobile computing, the demand for visual localization or landmark identification on mobile devices is gaining interest. We advance the state of the art in this area by fusing two popular representations of street-level image data—facade-aligned and viewpoint-aligned and show that they contain complementary information that can be exploited to significantly improve the recall rates on the city scale. We also improve feature detection in low contrast parts of the street-level data and discuss how to incorporate priors on a user's position (e.g. given by noisy GPS readings or network cells), which previous approaches often ignore. [2]

Trip Case

"TripCase" [11][12] is another application which is used by the tourists. It organizes all the trip details and travel plans into one streamlined itinerary. TripCase lets you manage flight itineraries, hotel bookings, and rental car reservations in one app. Get airport terminal and gate information in one glance on your phone, and receive notifications on your phone, tablet or smartwatch if there is a change to your flight. Great for business travelers and frequent fliers. Before your trip, you can add reservation details to your account so you can access your itinerary from anywhere and can share your trip with others and TripCase will keep them updated on your behalf. You can view flight information and receive notifications if anything changes and locate your seat on the plane or check out what's available with real-time seat maps and search alternate flights when you need to make adjustments you can quickly access directions.

Features	GOexp	Google goggles	Camfind-Visual Search Engine	Bixby Vision
Recognize landmarks of the images	✓	✓	✓	✓
Recognize various objects of	X	✓	✓	✓

the images. (Such as products, letters)				
Mainly focused on identification of the landmark of the images.	✓	X	X	X
Use dataset that contains around 30,000 unique landmarks.	✓	X	X	X
Retrieve the similar kind of images based on the given image.	✓	X	✓	X
Suggest Accommodations options based on the area that landmark located.	✓	X	X	✓
suggest accommodation based on user preferences.	✓	X	X	X

Table 1: comparison of similar mobile applications

1.2. Research Gap

We are in need of a well-designed solution that would allow us to use a single standardized System for Landmark recognition and Retrieval in World. In the currently available system can identify and give the location. They used Google Map by using mobile devices for this purpose. Also, they divide segments in input image compare their database and show them what that landmark is.

Existing studies [4,5,6,7,8,9,10] does not have recognized the landmark images by using pixels. They only compare that input image is the same as their database image and retrieve it. Also, they are not Consider several human features. From the survey that has to be filled by the user and predict the places according to that particular area. We mainly focused on those issues and came up with a better solution for that system with high reliability, better accuracy.

1.3. Research Problem

As mentioned earlier, there are major problems with the current system. When we see some images of a place that we are the interest of visiting or go for some more images on that same landmark but the image retrieval is a fundamental problem in computer vision make a barrier to retrieve the image with the correct landmark from large databases.

There are many applications which are used by the Picture recuperation is a focal issue in Computer vision: given a request picture, would you have the capacity to find similar pictures in a large database? This is especially basic for question pictures containing purposes of intrigue, which speaks to a colossal portion of what people get similar out of the opportunity to photograph.

With the huge measure of milestone pictures on the Internet, the time has wanted Computer vision to consider historic points all around, in particular, to assemble a point of interest acknowledgment system, on the size of the whole globe. This system isn't just to outwardly perceive the nearness of specific landmark points in a picture,

yet in addition adds to an overall milestone database that sorts out and records historic points, regarding land areas, popularities, social esteems and social capacities, and so forth. Such an earth-scale point of interest acknowledgment motor is enormously helpful for some vision and mixed media applications.

Although there is some review system in landmark applications, they are no perfect analyzing system. So the travelers are facing difficulties in choosing suitable places for their traveling. Most importantly sometimes the travelers do not expect an occurrence of a natural catastrophe so they may face some difficulties. Because of these problems they are not satisfied with their visit most of the time. The Goexp has the feature of prioritizing the user reviews by using twitter account and rating according to the user levels based user contribution, suggesting suitable places to visit and providing what are the highest rating locations to users stay.

1.4. Research Objectives

1.4.1. Main Objective

Provides a systematic solution to predict the landmark details of the images and a way to find (query) images containing the same landmarks to help people better understand and organize their photo collections. [3]

Also, the system predicts the accommodations and dining suitable for the customer by his preferences and the real-time update of the place they are willing to explore.

1.4.2. Specific Objectives

- Investigate existing problems in landmark recognition and landmark retrieval in computer vision Retrieval.
- Determine the possible solution or best methods to address those challenges.
- Build a model (algorithm) to recognize the correct landmark of an image
- Build a model (algorithm) to find similar images in a large database

- Concurrently access and view particular images recently updated.
- Generate the rating Landmarks & Countries.
- Improve the user experience by user profiling
- Provide user-friendly interfaces and easy access to the system.

2. METHODOLOGY

The methodology is the process we are following to develop a solution to a specific situation. The whole software development process like a feasibility study, requirement gathering, designs and implementation and testing fall under this category. To deliver a successful outcome of a research, following a properly organized methodology can be identified as a major section after identifying the problem, research gap and done all the literature survey related to the research area. So in this section, we have discussed the techniques, frameworks, libraries, and process we followed to achieve the objective of detecting Predict accommodations based on rating and review.

“GOexp” contains an android mobile application to interact with the users. We use the prototyping model to proceed with our project, as it enables to understand customer requirements at an early stage of development and change the solution according to them. Since this is a research-based product, all the requirements are not identified properly in the beginning. So prototyping model is the best process to follow when developing these type of solutions. It helps to get feedback from the client and the software designers and developers can understand about what exactly is expected from the product under development and deliver a successful product to the customer.

2.1. Methodology

The goal of implementing this mobile application is to give a comfortable experience for the people who are interested in traveling. It makes their life easy.

Main components of the app are to recognize the landmark in the photo and give the details relevant, retrieve large database to find duplicates and other images with the same landmark. This will help to have the organized memories and future travel plans. The people who are traveled to other countries or the hope to travel and if they were so worried about their accommodations and dining, here is the ideal app for their mobile phones. We suggest the preferable accommodations and dining for the particular user. Also, we suggest the best-ranked selection and also the app users most desired places as well.

The main operations

- Identify the landmark.
- Identify the matching images contain similar landmark.
- Identify the user preferences and reviews
- Provide suitable accommodations by matching user preferences and reviews User operation

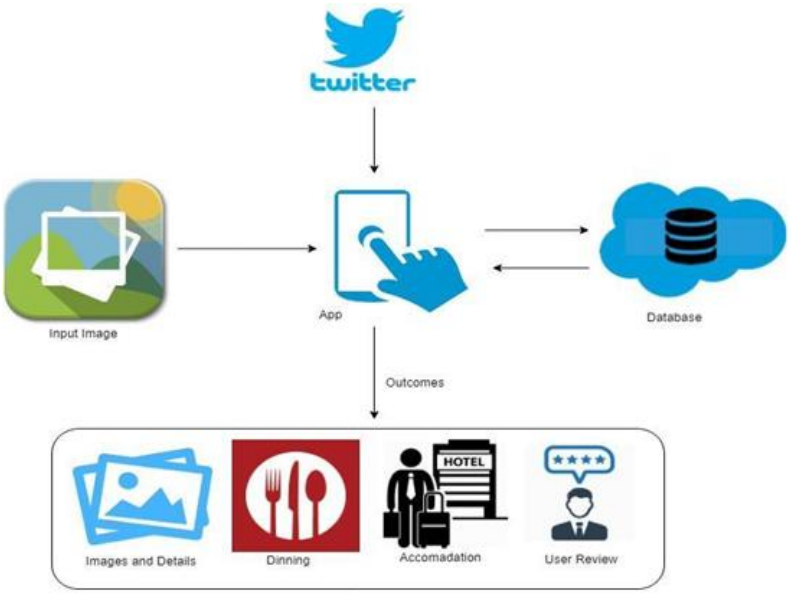

Figure 1: High-level diagram of System Overview

2.1.1. Requirements Gathering and Analysis

As the target users of “GOexp” mobile application are who are interested in worldwide traveling and most of them are willing to maintain memories of the past traveled places. We need to implement higher user-friendly, efficient and accurate landmark recognition and retrieval system. To develop the sub-component which is known as Provide suitable accommodations by matching user preferences and reviews User operation we collected some useful information using different methods. In order to collect the relevant information regarding requirements and functionalities, the team used the following methods.

- Read and analyze the research papers, journal articles and books which are relevant to the research domain Provide suitable accommodations by matching user preferences and reviews User operation:

The main goal was to identify the existing solutions for the problem and gain a broad knowledge of the research domain. Then the team discussed the suitable technologies required to develop the solution for the identified research problem.

- Browse through websites and web forums related to Provide suitable accommodations by matching user preferences and reviews User operation.

The Internet is a place where we can find lots of information and gain lots of knowledge about almost any research area. So our team browsed through trusted websites and blogs related to user rating and prediction which are conducted by researchers, authors etc.: -. And using those websites we gathered information about user profiling, provide suitable accommodations by matching user preferences and reviews User operation like that and many more. Not only that but also we gathered information about current products also. Technical information also gathered using the internet.

2.1.2. Design

System design is the process of defining the architecture, modules, interfaces, and data for the application required to satisfy specified requirements. For designing, I used Unified Modeling Language (UML) for designing the system. Use case diagrams [Appendix B] and the use of case scenarios (Appendix C) were to help developers to determine which features to implement. The activity diagram [Appendix A] describes the activities of the system by presenting the system’s users, their attributes, operations and the relationships among the users. In application level system design is divided into three parts as below.

- User interface design:

  This section was used to design a simple and user-friendly Graphical User Interface which allows the user to easily understand the navigation of the system. When designing the GUI, we considered mainly about the colors, content in a single page and themes. simple and quick to start the detection since the users are travelers, tourists. The mobile application consists of the login page, configuration pages and then a page which allows the user to start

detection. It gets a notification and shows reports in a meaningful manner. To do those tasks, we designed a login page, settings page, home page, user profile page and a report page. The home path contains icons which represent profile reports and notification sections and the user can easily navigate to those pages using the home page.

- Database design:

  Firebase cloud database was used to store the notifications generated from the desktop application and also using firebase cloud messaging notification store, retrieve through the mobile application. The mobile application accesses the Firebase and retrieves notifications stored there and also it stores the details of restaurants as well. Report generation is also done by using this database.

- Detection methods design:
  Four Feature detection methods were designed for feature extraction using machine learning techniques. In this document under implementation section, I have described the module detecting user.

2.1.3. Implementation

- **The identification of the landmarks of the given images and retrieve the details of that landmarks.**

Landmark recognition uses an algorithm to identify the landmark as a landmark object. This identification process is mainly focused on people who need to find places by using images. So this landmark recognition technology will be very supportive of the people who love to travel over the world without knowing the places. In this system identify images, and provide information on any landmark, at any angle. It enables people to get the information they want, by taking a picture and avoiding typing queries into the browser.

The solution overview is mainly based on the accuracy of the model that is trained by using a dataset which consists of 15K classes. This solution is a model for machine learning that can be used to identify the landmarks. To do that we use tenser

flow for image recognition. In this solution, ResNet50 is used to train the 15 classes. As training time augmentation this solution used random resized crops, color jittering, rotates, flips, scales and this CNN were trained on 224x224 crops. The outcome of This should be able to identify the correct landmark of the images once the image analyzed. In the testing part, it should need to identify the Non-landmark images in the test dataset. For that, another binary classifier is train based on ResNet50.

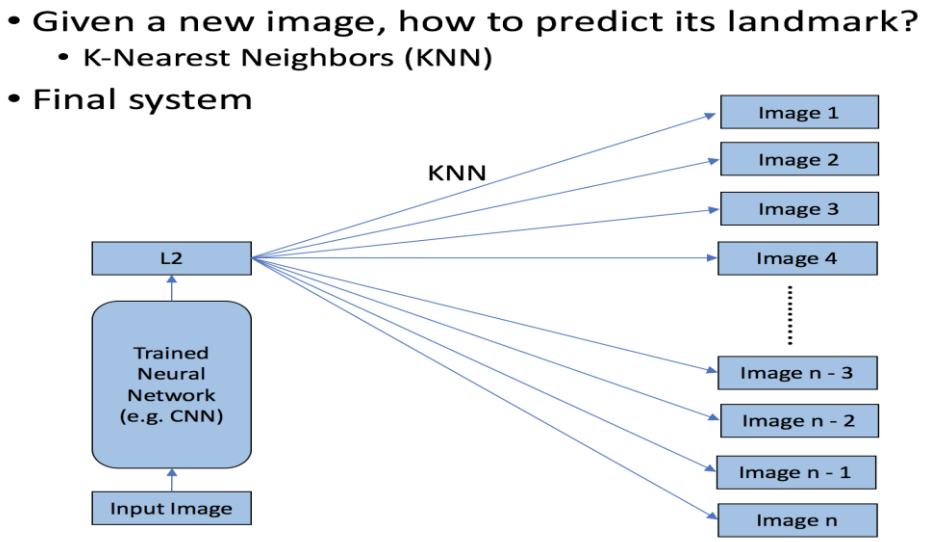

Figure 2: Prediction

In the technological aspect of computer vision and affective computing massively facilitate for the real-time processing of videos and extracting high dimensional data in the domestic environment. So python is used as the programming language for machine learning purposes. In developing machine learning algorithms using Tenserflow and Azure Machine Learning services. Visual Code, NodeJS, and Ionic3, angular 5 are used to develop the mobile application.

Figure 3: Technology Stack

2.1.4. Testing

2.1.5.1. Unit Testing

The unit testing is carried out by dividing the designing process into smaller parts known as units. Each and every individual unit should be tested under unit testing. When the system design documents are received, the work is divided into modules/units and actual coding is started. The system was first developed in small programs called units, which are integrated into the later phase. Each unit is developed and tested for its functionality. Unit testing mainly verifies if the modules/units meet their specifications. When testing the module flapping hand behavior detection, first I tested it after implementing hand detection section. Then tested hand movement, next to the finger movement and finally tested altogether and tested whether the required output is generated or not.

2.1.5.2. Integration Testing

In integration testing, the individual modules are combined and tested. The objective of this testing was to make sure that the interaction of two or more components Produces results that satisfy the functional requirement.

2.1.5.3. System Testing

Testing the whole system against the specification was called as system testing. Once the tested units are integrated into the final system, the system needed to be tested to ensure that the proper integration and compatibility between the various units. Waterfall model in testing can only be done by dividing up the coded program into various manageable units. Then those units are integrated into a complete system during integration phase and tested to check if all modules/units coordinate with each other and the system as a whole behaves as per the specifications.

2.2. User Interfaces

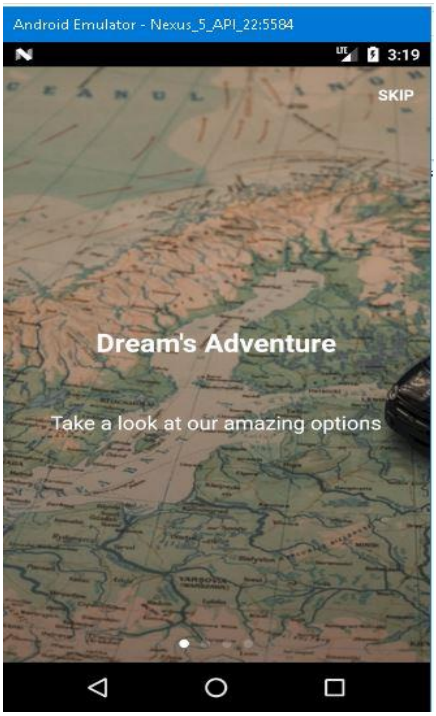

Figure 7: Tutorial Page 1

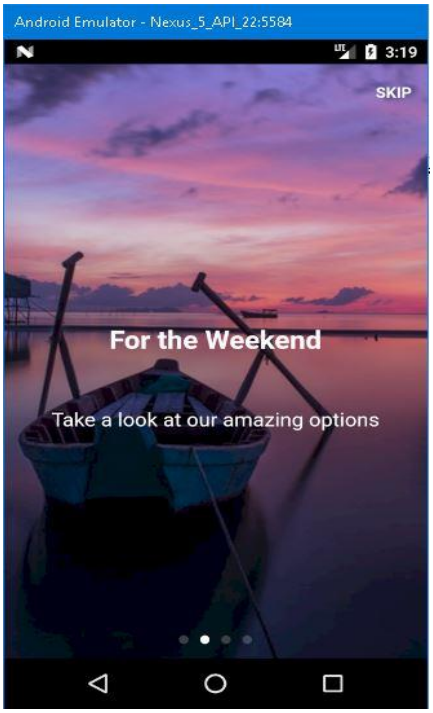

Figure 8: Tutorial Page 2

Figure 8: Tutorial Page 3

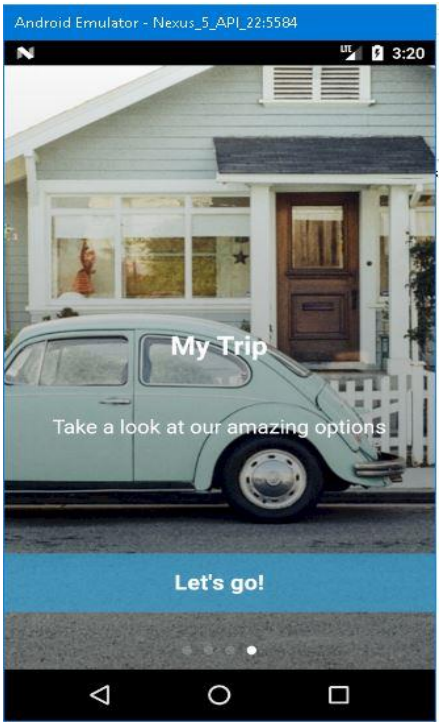

Figure 8: Tutorial Page 4

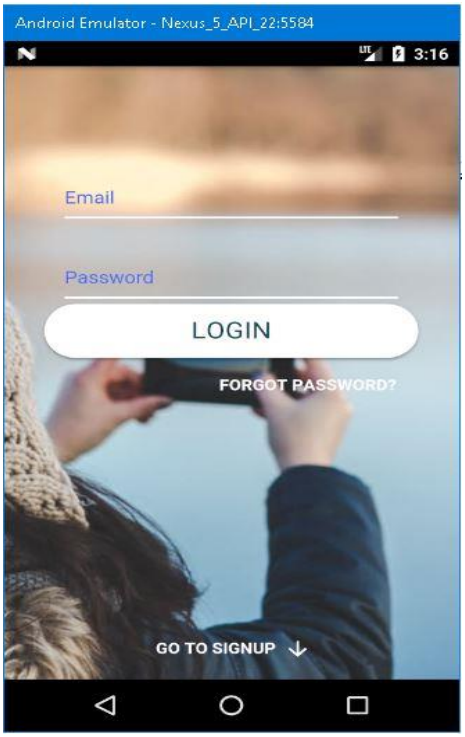

Figure 8: Login Page

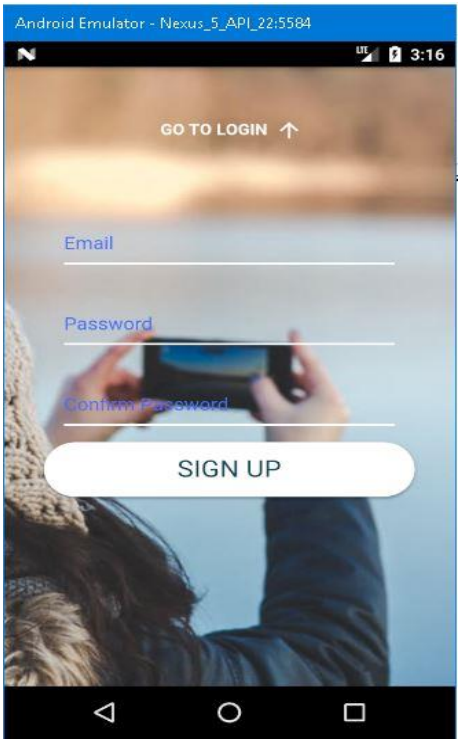

Figure 8: Sign Up Page 3

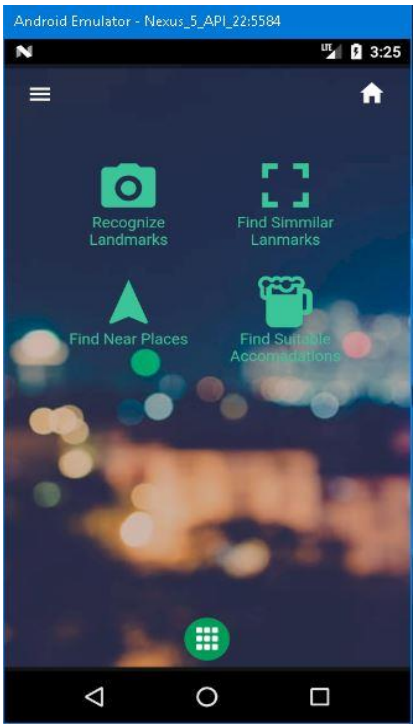

Figure 8: Home

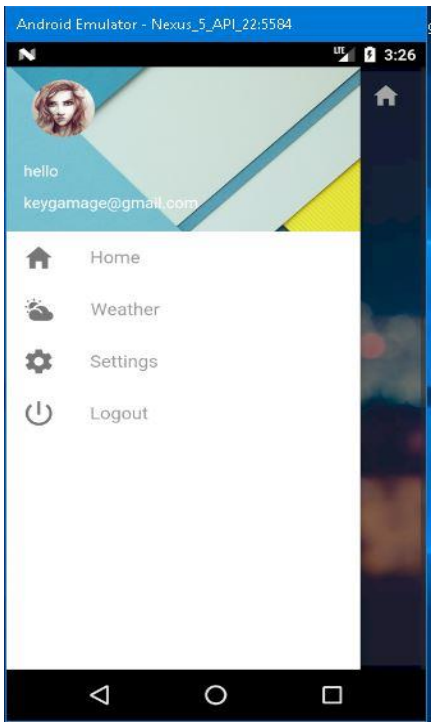

Figure 8: Sign Menu

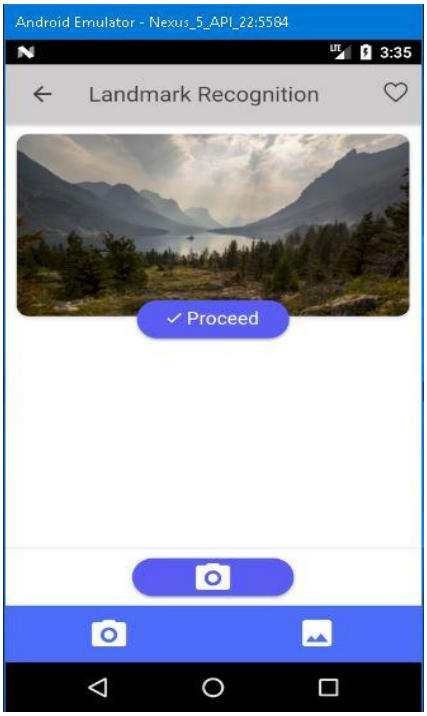

Figure 8: Image Upload/capture

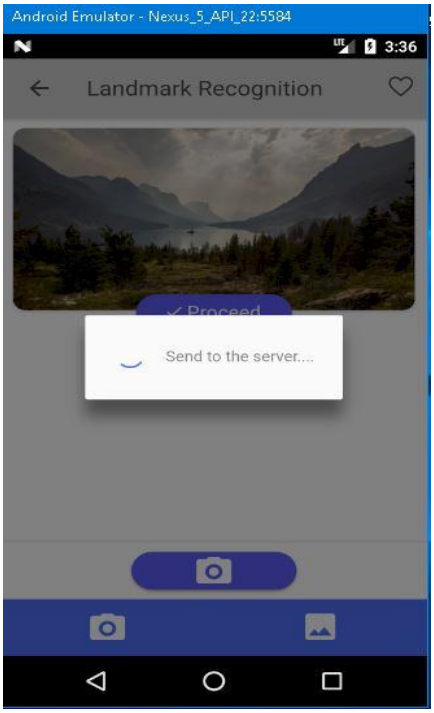

Figure 8: Landmark identification process

Figure 8: Landmark Details

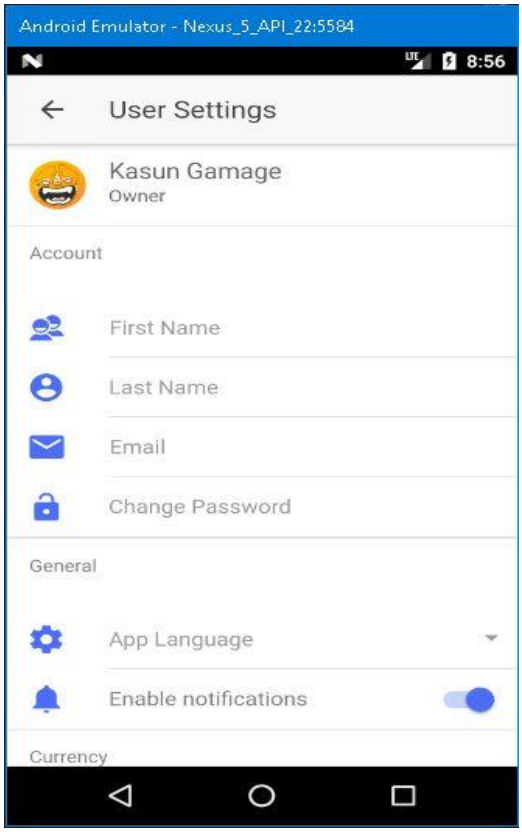

Figure 8: Account Settings

2.3. Research Findings

. In our research, we mainly focused on Landmark recognition, retrieval and predicting user preferred restaurants and notify the landmarks, nearest places, accommodations. They are, by analyzing the rating and reviews given by the friends and other users, by analyzing the places mostly visited by their friends and by referring the personal likes and dislikes of the user. also analyzing rating and reviews and provide the best accommodations by matching these two sections.

Therefore we have developed an application which supports identifying landmark recognition, landmark retrieval, user profiling based on Twitter API and analyzing rating and reviews based on public reviews. This is a unique product, which identifies the user and maintains reports, details, and profiles. This application would be very easy to use and also it would be simple and very much understandable to any level of the primary user. It provides all the functionalities via user-friendly and attractive graphical user interface. For an example, System has a “Go to Landmark” button and contains a proper navigation system that enables the user to access the required functionalities easily and quickly.

3. RESULTS AND DISCUSSION

3.1. Results

4. CONCLUSION

In this document, we are proposing a trip guidance app which facilitates the user to get the feeling that the app is made for him/her. We are allowing the user to upload an image of a landmark and get relevant information about that place. For example, what makes that place special? Who builds the place? etc… and also when the user selects a place that they wish to travel, the app suggests some other nearest landmarks they can visit too. By the image retrieval, the user can see those landmark images from different angles and views before they visit a particular place. So it helps them to decide whether it is an interesting place to visit or not. Plus, the app is maintaining a user profiling part as well which will improve the user experience of using the app.

We use Twitter stream APIs to collect data and profile each user with the data collected. That data will be tweets, hashtags etc. The people who are traveling experience many problems in finding accommodations and dining places according to their preferences, especially when they are in different countries. This app solves those problems by suggesting their preferable places by using the predictions done with their own Twitter profiles using user profiling techniques. Addition to this the app is going to rank those preferable places according to a public opinion. By doing so, the user can get an idea about where those places stand among the general public. Ultimately, the user will be benefited with the best accommodation and dining around the area that he/she visits

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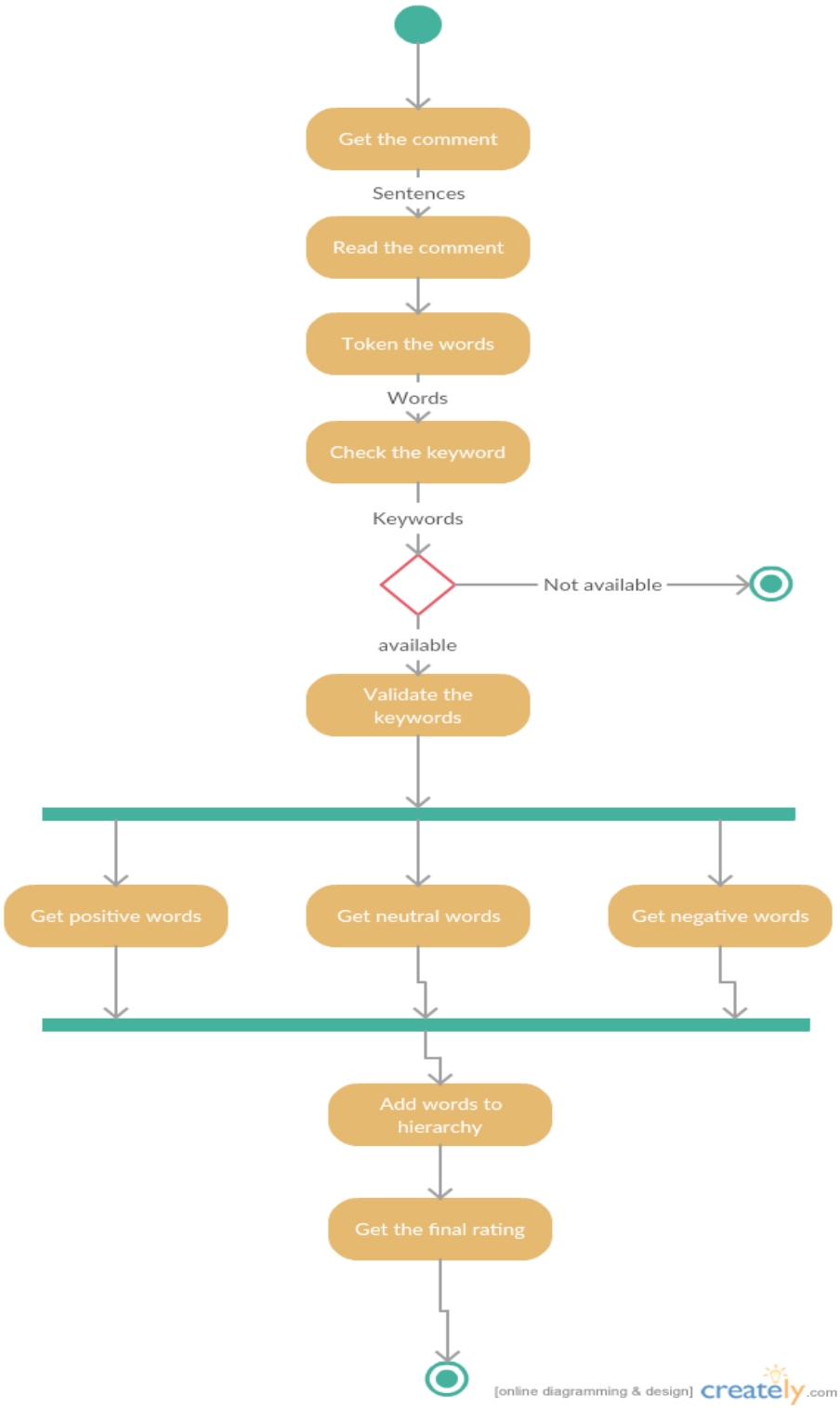
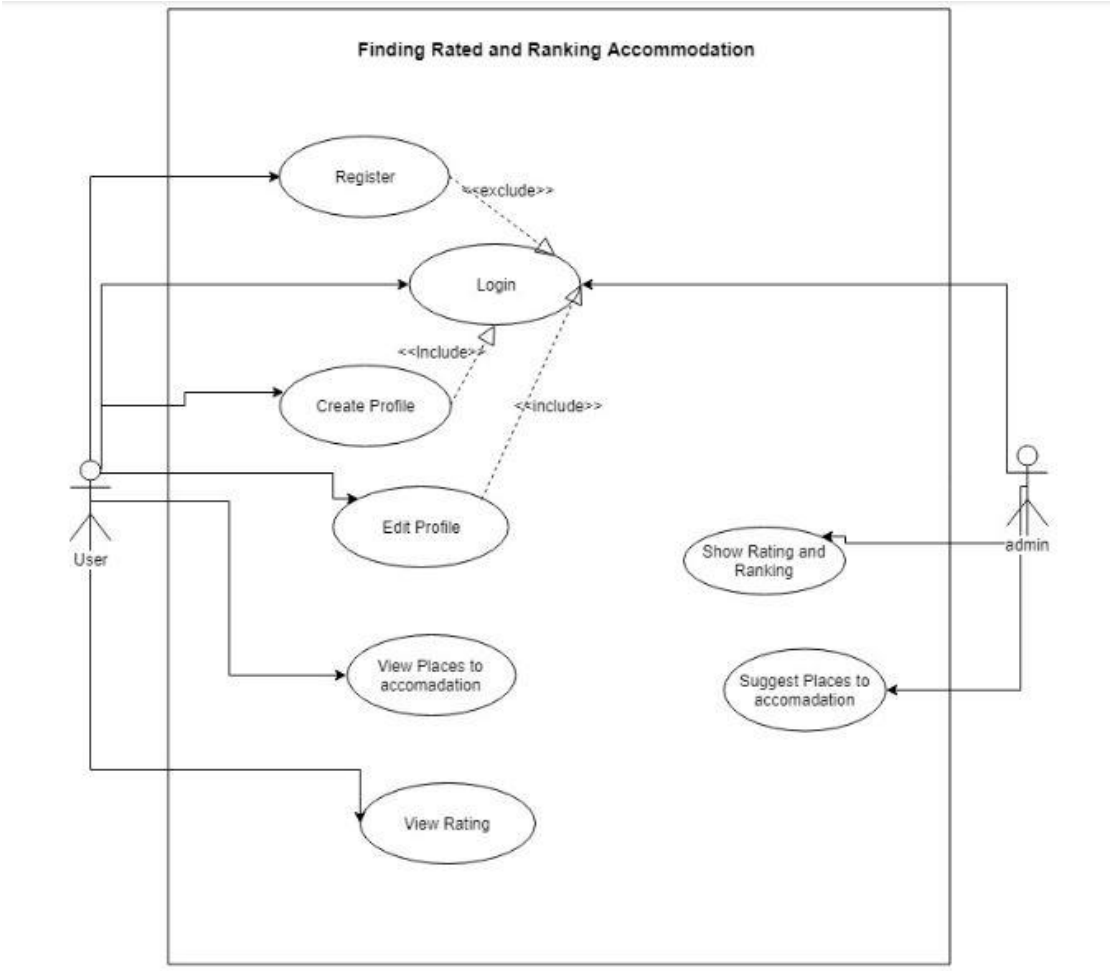
5. APPENDICES

Appendix – A: **Activity diagram for rating system**



Appendix – B: **Finding Rated and Ranking Accommodation**



Appendix – C: Use case Scenarios

Register

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

Table 6: Use case scenario 1

Login

Use case	Login
Preconditions	The user must be registered in the system.
Actors	User
Flow of Events	1. Use case starts when the user launches the app. 2. The system displays Login interface. 3. The user enters username and password. 4. User clicks on the 'Login' button. 5. The user is validated.

	6. The use case ends.
Extensions	5. A. User is not validated. 5. A.1. The system displays an error message.

Table 7: Use case scenario 2

View Profile

Use case	View profile
Preconditions	The user should be logged into the system.
Actors	User
Flow of events	1. Use case starts when the user clicks on the profile icon. 2. The system lists the user's friends' activities. 3. The system suggests other users be the user's friends. 4. User clicks on add friend icon to add other users as his friends. 5. Upload the image and view the ratings 6. The use case ends.

Table 8: Use case scenario 3

Rating and Review

Use case	Rate the Review
Goal	Get the rating via user's comments
Scope and Level	General

Primary Actors	Customer, Admin
Pre-Condition	The comment should be in English
Main success scenario steps	1. Use case starts when the user enters a comment for the place. 2. The system analyses the comment and token the words 3. System find the keywords of comment 4. System checks the keyword. 5.validate the keywords 6.Divide positive, Neutral and negative keywords 7. Add to keywords to the system hierarchy 8. System retrieves the final rating 9. Use case ends
Extensions	4. A. Not available keywords 4.A.1 System ignore the comment

Table 9: Use case scenario 4

Suggesting Ranking Accommodations

Use case	Suggesting Ranking Accommodations

Actors	Admin
Pre-Condition	The user should be logged in to the system
Flow of events	1. the user enters starting place 2. click search button 3. The system refers user's likes and dislikes and other users' ratings 4. Display what are the higher ranked places 5. The user selects places to accommodation. 6. The use case ends.

Table 10: Use case scenario 5