Augmented Reality (AR) Search for Tourist Destinations

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Abstract

Augmented Reality (AR) is a technology that combines the real world with a virtual object, be it a two-dimensional object (2D) or three dimensions (3D) in real time. The development of AR technology has contributed a lot in various fields, one of those areas is tourism. AR in tourism can help tourists to explore objects in real terms. AR search for tourist destinations is an android application developed using Unity 3D and android studio. A person who wishes to go to a popular tourist destination in India can give a voice command to the application and that voice command will be converted into text using IBM Watson and then that text will be searched in the database and match the image of the tourist destination. The database contains the 3D images of the popular tourist destination in India. The 3D image will be displayed in Augmented Reality over a real environment. This paper focuses on the work carried out by other researchers in this domain.
Keywords— Augmented Reality, Unity 3D, IBM Watson, Tourism

I. INTRODUCTION

Tourism is one of the important factors for economic and social development of the cities today. It is important that local and foreign tourists get information about the touristic areas, activities and the regions and how to reach those places. If this information can be retrieved up-to-date, instantaneous and also integrated with social media, this will significantly increase the satisfaction of the tourists. AR technology allows adding text, pictures, animations and such information to the camera view with the help of a mobile device such as a phone, a computer. The information is transferred to the users interactively in this way. AR technology has gained popularity in the past few years and has begun to be implemented in many areas of daily life.

II. MOTIVATION

The primary motivation behind selecting this area is to work for simplifying the complexities and providing a clear vision and perspective of things in 3D AR. The field lagging in digitization is tourism. Tourism works only on mouth publicity, this application provides a three-dimensional model of tourist destinations in India. This technique can be applied in many other fields for enhancement.

III. RELATED WORK

This section gives a brief summary about the work carried out by previous researchers in the field of AR, IBM Watson and Tourism.

Steffen Hasier et.al.[1] proposed that Amazon Alexa offer a natural form of interaction for humans with the devices. In this paper Alexa is used for communicating with the IOT devices. Amazon Alexa, Google Assistant, or IBM Watson Assistant are Intelligent Virtual Assistants which have become popular technologies for verbal communication with computers in our daily lives, mimicking social interactions among real humans using advanced artificial intelligence technology. Alexa is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audiobooks, and providing weather, traffic, sports, and other real-time information, such as news. Alexa can also control several smart devices using itself as a home automation system. Users are able to extend the Alexa capabilities by installing skills (additional functionality developed by third-party vendors, in other settings more commonly called applications such as weather programs and audio features). However, it's a device, so to use Alexa Voice Search (AVS) to perform actions posed in natural language we need to buy Alexa which can affect the cost. It only responds to the inbuilt skills which it has by default. If the proposed system requires it to perform actions other than that the user needs to implement the skills according to the needs, so to overcome this scenario IBM Watson is used. Watson is a question-answering computer system capable of answering questions posed in natural language, developed in IBM. Watson was created as a question answering (QA) computing system that IBM built to apply advanced natural language processing, information retrieval, knowledge representation, automated reasoning, and machine learning technologies to the field of open domain question answering.

Mehdi Mekni et. al. proposed an idea about the challenges and future scope of AR in different applications like Medical, Military, Games, Education, Tourism, etc. As mentioned, about enhancement of the Tourism using AR provides information of a particular site to the users [2]. An interacting visualization system based AR technologies are developed to enhance the tourism experiences. To make the system more interactive from the user's point of view, system must include some hardware components like Head Mounted Display (HMD). However, the main problem of using HMD that it is not easy to handle and quite heavy to wear it. All wearable tools are need to be developed smaller, lighter, faster and more portable enough to display graphics and also easier to work with user. SAR, AR glasses can be the best option to avoid use of tools like HMD. SAR make use of digital projectors to display graphical information onto physical objects there is no need to carry equipment or wear the display over the eyes. It supports both graphical visualization and passive sensation. AR glasses are nothing but the Optical Head Mounted Display (OHMD) which has capability of reflecting projected digital images.

Xiaodong Wei et.al [3] presented that a game-based system called Magic-Eyes, which can help the tourists immerse themselves in the magical place. It makes use of patterns of buildings geographical location information, which is then combined with AR based interactive game to complete the guided tour. During the touring process tourists can become familiar with the geographical environment and learn more. As the user opens the camera in front of the monument or place the application/game produces a model of that place in past or some information about it. However, this game can be completed by physically visiting all the places and learning about that geographical location. User cannot get information from locations other than that geographical location. It also fails to provide a three-dimensional perspective to the user about that location. Also, the game uses complicated calculations to test the output for the users.

Hirokazu Kato et.al.[4] shows a system based on city-planning using AR. Miniature three dimensional models of objects are deployed in Augmented Reality to get an idea about the actual scenario in

future. They proposed it as a tangible interface. This system uses 2 cameras mounted on a HMD at eye positions. The system also allows to manipulate the position of the model deployed in the environment. However, AR glasses are lighter and easy to use as compared to HMD. Thus, the proposed system makes use of AR glasses in the system to view 3D models.

Omer Faruk Demir et.al focuses on the concept of Smart Tourism with the help of AR. The use of social media data and GPS data is used for generating outputs [5]. Virtual objects are suggested if the objects in the environment match with the predefined objects. Information can be obtained by clicking on the virtual objects. Different algorithms are used for predicting the final information of the area using the data obtained from the comments on social media and geographical sensor. Thus, the proposed system makes use of AR to promote Tourism in an interactive and creative manner.

Pavan Kumar Katkuri et.al [6] proposed an idea about innovation and development in the field of tourism using AR and VR. AR is the technology with high capability to change the experience in tourism industry. VR/AR mobile applications used by tourists and tourist professionals, application can be used as interactive and real time guide by the tourists to enhance their experience. Based on the user's area or location application can check the places to visit near to user. Tuscany+, Urban sleth are tourism-based applications uses AR.

Dwi Ely Kurniawan et.al developed an AR application which enhances the tourism field in Batam island. The application uses marker-based AR technique [7] . In this technique application requires the GPS feature of mobile phone to access the map of island. The application then scans the marker on the map and when the user clicks on a particular marker it turns out into 3D model of that location. User can get a view of that location in AR environment from any location. The other feature of app is to provide the location to the selected place in the map. This application can be useful if the user's location is Batam island.

Ching-Sheng Wang et.al [8] proposed implementation of AR with marker less AR display. Most systems are operated only when a special marker or image is shot at a close distance, and only one target can be recognized and displayed at a time, the function is limited. In particular, such systems cannot work effectively when there are many visitors. In this paper, presented a mobile navigation system that supports multiple targets marker less AR display function. Thus, this system applies marker less image target with high recognition rating as the main basis to complete targets clustering. In order to simultaneously recognize multiple images from long distances, and successfully display corresponding 3D and multimedia navigation information, which can effectively improve the efficiency and practicality of AR mobile navigation system.

Table 1 gives a brief about the survey of the reference papers studied. The highlights are the overview of the referred papers and the proposed system focuses to work on the observations.

Table 1 Literature Survey

Reference Number	Highlights	Observation
[1]	Alexa is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audio books, and providing	It's a device, so to use Alexa Voice Search (AVS) to perform actions posed in natural language the user need to buy Alexa which can affect

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	weather. Alexa can also control several smart devices using itself as a home automation system.	the cost.
[2]	Enhancement of tourism using AR provides information about particular site.	Require equipment to show the site images.
[3]	Authentic learning environments to realize virtual scenarios.	Complicated calculations to test the output for the users.
[4]	To get an actual idea about the structure in reality.	HMD is heavier and not flexible to use.
[5]	A detailed information about a geographical area is displayed in AR using Global Positioning System (GPS) and Social Media in an interactive mode.	False data may lead to wrong interpretation of information and fail to please the user.
[6]	AR application can give valuable experience to the tourists, without using guides. AR applications make huge impact on tourism industry and will enhances the profits for tourism professionals.	Applications supports specific platform. Applications either focusing on specific region or displaying information in specific language.
[7]	It uses map of Batam island so that user can get the location of any place as the end result.	Marker based AR scans the marker first and the problem arises if there is an issue with a marker in the map
[8]	Multiple targets can be recognized using marker less AR display function.	Targets if not effectively scanned can lead to ambiguity in the output.

Based on the observations noted in the table 1, the authors propose a problem statement-

To search and view images of popular tourist destinations of India in a 3D environment in AR.

The problem statement can be achieved through following objectives –

- To convert a given voice command to text using IBM Watson.
- To create a database of 2D images for 1 city. (PNG)
- To convert 2D images into 3D using Unity 3D.
- To provide clear view of 2D images in 3D using Augmented Reality in AR lens.
- To test implemented system with 50 users.

IV. PROPOSED SYSTEM

The system architecture is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviour of the system. System architecture of AR search system consists of 6 components as shown in figure 1.
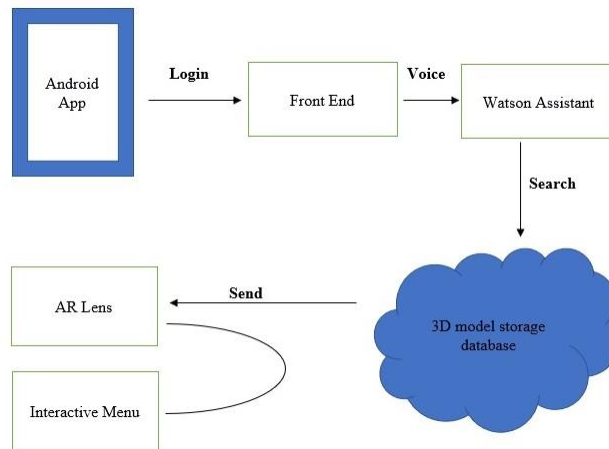

Figure 1. System Architecture :AR Search for Tourist Destination

    i.   **Android App:**

It is mainly an android application from which user can access the functionality of the system. It is built using android studio development tool which can accept the input from user and accordingly provide the output

    ii.   **Front End:**

It is the user interface of the application. As soon as user opens the application, login page will appear and if user doesn't have account before he/she can register. After the successful login, user can give the voice command as an input.

    iii.   **Watson Assistant:**

The IBM product which is used to convert voice to text is Watson Assistant. It is used in the system to get the user required place in voice format and then convert it into text to match it with the database. Thus, IBM Watson is used in the system.

    iv.   **Vuforia Database:**

Vuforia Database: The database which contains the 3D models of famous places is Vuforia. The text will be matched in this database and user can get appropriate model.

    v.   **AR Headset:**

To view the model in AR environment user will require a headset to fit the mobile and experience the 3D view of the place. Thus, to overcome the difficulty of physically visiting the places at their geographical location the system enables the user to view the exact location anywhere in the world using AR.

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vi.   Interactive Menu:

User can interact with the model using functions like zoom, rotate, play audio etc. This can give an advanced experience of the place from different angles.
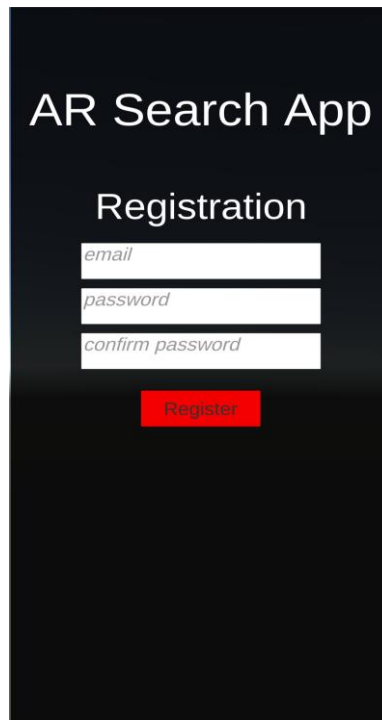
V. RESULTS

The proposed system was successfully implemented using Unity, IBM Watson and Firebase. The initial stage of an application is user log in , where login credentials like email id and password are used. If the user is new to the application, user have to register first to access it. In the registration field user needs to give email id as username and password with minimum length of 6 characters. After successful login main page of the application is opened, where user have to give voice command of any model he/she wants to see. User can give voice commands like "Zoom in " which scale up the size of model to see model more clearly. "Zoom out " command scale down the model's size to regular size. "Rotate " command rotates model in clockwise direction. "Play audio " command starts an audio clip which gives an information about the respective model.

1.   The first page after opening the application will be the login page. New users can register before logging in.
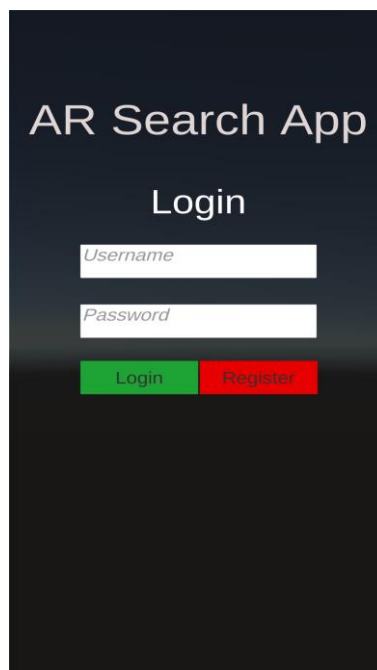
2. To register successfully, the user has to mention his/her username and password.

3. After successful login, main page will be opened after camera and microphone permissions are given.

4. As the main page opened user has to give voice command of model name user wants to see. Example "Taj Mahal".

5. As the model is spawned user can give voice commands like "Zoom in", "Zoom out", "Rotate" and "Play audio".

Above pictures are showing functionalities "zoom in" and "zoom out".

The target audience for the application can be the people who are planning a tour of India or the tourist companies to enhance their customer interaction.

VI. FUTURE SCOPE

A creative and innovative approach was always needed in the tourism sector. This paper focuses on this creative approach with the help of AR. In near future, application can be advanced by designing more tourist destinations. Interactive features can also be increased to attract more customers. The application can be customized for the fields like education, military and many other for virtual training of candidates.

VII. CONCLUSIONS

This paper introduces a creative and interactive approach of searching and viewing tourist destinations. This method is enough reliable and efficient. There is no need for specialized hardware for installing the system in the environment other than AR glasses. The world can be visualized with 3D models with the help AR glasses.

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