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A Survey- Instore Map Navigation System using Augmented Reality

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ABSTRACT

In real world augmented reality (AR) is the combination of digital information with the user's environment. Unlike virtual reality, which creates a completely artificial environment, augmented reality uses the existing natural environment and simply overlays new information on top of it. Similarly, for augmented reality we are able to distinguish between the real and virtual objects but in Virtual reality we can't distinguish between them. The AR technique can be used by using the smartphones whereas VR is achieved by the use of head mounted devices like goggles, helmets, lens etc. Now a day AR application is widely used in field of military, gaming, education, navigation and medical. AR can be used to transform in-store shopping experience. The proposed system aims to designed in-Store map navigation application which will be more efficient and fun to search for products, add them to a shopping list and locate the product within the store using augmented reality.

Keyword: - Augmented Reality, in-store navigation, shopping, mobile device, android platform etc.

1. INTRODUCTION

In recent years augmented reality is one of the highly embryonic topics. Augmented Reality is direct or indirect view of a physical, real world environment whose elements are augmented by computer generated sensory input such as video, audio, graphics or GPS data. Augmented Reality is appropriate for location based services. It is a technology that which augments sound, video, graphics and inputs obtained from sensors of real world objects using the camera of a device [1, 2]. Through Pokémon GO and other educational technology domain AR has received lot of attention [3]. Augmented reality is basically used in super imposing virtual objects in real environment but in case of virtual reality is used in developing whole virtual environment. By the use of augmented reality we can develop an elegant and interactive application whereas with virtual reality we can generate animated applications. Augmented reality is achieved by keep the smartphone in front of you whereas for virtual reality we require head mounted devices. So, AR is one of the best ways to collect and render real world information and make it presentable in an interactive way.

Indoor navigation is one of the most understandably beneficial use cases for AR, and it has the market advantage of being extremely localized. The goal of proposed system is to design and develop a robust AR application which will provide customers an interactive experience of shopping with augmented visualization of product, add them to a shopping list and locate the product within the store. This android application will be available to anyone is willing of doing shopping in huge supermarkets. It makes shopping experiences easier by improving interaction between user and real world. [4, 5]. The functionalities of the application will be executed by means of object recognition, object tracking and using augmented reality tools. The application will be totally an independent and thus there is no functionality difference between users. That's why; the application only has one type of user interface. The interface of the application has a starting menu, which consists of a list of predefined products that the supermarket provides.

2. RELATED WORK

AR with inertial tracking for localization and navigation has gained remarkable attention. Ching-Sheng Wang1a [6] presented a mobile navigation system that supports multiple targets markerless AR display function. This system applies markerless image target with high recognition rating, 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. Based on K-means algorithm this system applies markerless image target with high recognition rating in order to simultaneously recognize multiple images from long distances.

Fuguo Peng [7] realizes the proto-system of exhibition hall augmented reality based on Vuforia. It also designs and realizes the MAR system of the exhibition hall based on Vuforia, explains the systematic structure, recognition of the creating method of the target library and working process of the system, conducts application experiments on the system and then makes summarizations and analysis on the system effects. In this Mobile

augmented reality (MAR) is used which covers the real scene with virtual information by utilizing the mobile terminal and thus enables users to have better interaction with real world.

Meenakshi sundaram V [8] stated how location based AR application can be used in tourism and navigation for finding nearby places of interest. Here constant internet access is necessary as it needs cloud for communicating to the dataset for navigation or tracing the current location. They also used many sensors in the mobile phones to create a picture of the surrounding and to find out what digital content can be related to the current context by using various tracking methods ranging from GPS, Mobile Network and Wi-Fi connection. This system provides digital information to the user based on the user's geographical location and is both compatible with Ios and android.

Misbachul Huda [9] proposed a real time application for the railway monitoring system where they have used the AR system for the passengers who has difficulty in finding the station. The AR application was successfully implemented by using the angle of inclination and azimuth between the user's locations with the location of destination railway station to find the best route which was supported by image-based mobile searching to the destination station. The route finding using AR was supported by image-based mobile searching to the destination station using SURF algorithm.

Luis Weruaga [10] evaluated an indoor image-based positioning system which used the Augmented Reality benefits of the smartphone camera. This system also allows to navigate in any campus, by providing markers in the database which will help them to find their location using the combination of image marker recognition and inertial measurements .The use of image recognition enables the system to run on any campus, provided the database for recognizing markers, obtaining the location and displaying the information in AR exists. Also the result shows that inertial navigation provides a suitable approach to track the user location indoors. This system also allows them to navigate in any campus, by providing markers in the database which will help them to find their location and generate the shortest path towards the destination using the A* algorithm. This is the best and most efficient algorithm for this kind of searching.

Sebastian Kasprzak [11] proposed a system for indoor navigation which uses features such as position markers. They have used Augmented Reality Technique for paperless navigation particularly for multiple floors. Here, they provide their source and destination and then by scanning the image that will be mapped to the images in the databases, it will further show the path. Also they have described a system for navigation in indoor environments that uses features of these environments as position markers, instead of requiring special markers or other infrastructure.

3.PROPOSED MODEL

The proposed system aims to designed in-Store map navigation application which will be more efficient and fun to search for products, add them to a shopping list and locate the product within the store using augmented reality. Apart for this system is capable of augment detail description of product and proceed for online payment gateway too.

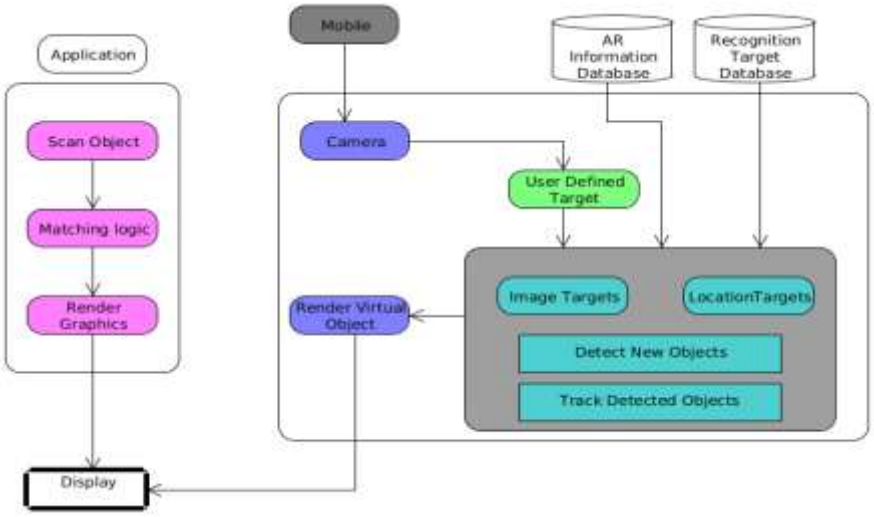

Fig -1: Architecture diagram

a)Camera Module

When the Application is launched, the camera module is invoked to serve the purpose of scanning the particular object. The user defined target is used to identify the type of target scanned .Based on the output generated from the user defined target; the tracker module calls the respective target functions.

b)Tracker Module

The Tracker module is responsible for performing the following tasks:

- Image Detection:

The system uses Scale Invariant Feature Transform (SIFT) algorithm for extracting features from images. It is very efficient algorithm for both extracting features and enhancing the quality of the features extracted. This algorithm consists of various steps which need to be followed in order to get features. The various steps in the algorithm are shown below with the help of diagram.

The steps involved in the SIFT algorithm are described as follows:

Step 1: Scale-space Extrema Detection – This step involves identification of the key point's i.e. Point of interest. The maxima or minima of the Difference of Gaussians (DoG) occurring at multiple scales are considered as key points. DoG is an algorithm for enhancing features.

Step 2: Key point Localization- In this step key points obtained from first step are refined in order to get correct result.

Step 3: Orientation Assignment- One or more orientations are assigned to each key point which helps in achieving rotational invariance.

Step 4: Key point Descriptor- A descriptor vector is computed in such a way that it is highly distinguishing and thus it is assigned to each key point.

- Location Detection:

A* Search algorithm is one of the best and popular technique used in path-finding. Many games and web-based maps use this algorithm to find the shortest path very efficiently.

// A* Search Algorithm

1. Initialize the open list
2. Initialize the closed list
   Put the starting node on the open
   List (you can leave its f at zero)
3. While the open list is not empty
   a) Find the node with the least f on The open list, call it "q"
   b) Pop q off the open list
   c) Generate q's 8 successors and set their Parents to q
   d) For each successor
   i) If successor is the goal, stop search
   Successor = q.g + distance between Successor and q
   successor.h = distance from goal to Successor (This can be done using many Ways, we will discuss three heuristics- Manhattan, Diagonal and Euclidean Heuristics)
   successor.f = successor.g + successor.h
   ii) If a node with the same position as Successor is in the OPEN list which has a Lower f than successor, skip this successor
   iii) If a node with the same position as Successor is in the CLOSED list which has A lower f than successor, skip this successor Otherwise, add the node to the open list
   End (for loop)
   e) Push q on the closed list
   End (while loop)

Here a square grid having many obstacles is considered and we are given a starting cell and a target cell. We want to reach the target cell (if possible) from the starting cell as quickly as possible. So here A* Search Algorithm comes to the rescue.

A* algorithm consists of two functions.

g(n)-cost to reach node n.
h(n)-cost to reach the goal node from n.
f (n)=g(n)+h(n)

Where f (n) is the estimated cost of the cheapest solution through node n.

c) Database

To store the target markers so that targets will be fetched from the database whenever needed.

4. CONCLUSION AND FUTURE WORK

As seen from the above survey and study, we have found that many innovative approaches exist for indoor localization and navigation system, which helps in attracting the user by using neoteric technologies such as augmented reality, virtual reality and social media. Though these technologies have not created a powerful impact on the indoor navigation system, so we have ample amount of possibilities and opportunities which will offer the customers a great shopping experience, help in navigation for the product, share one's content and also

enhance its interaction with the shopping mall. Therefore, it is one of the most promising prospectives that fosters the interaction of customers with mall, not only tourists but also local residents. The goal of this project is to provide a next level shopping experience to the customers for shopping and it also aims in providing informative experience. This allows them all kind of characteristic features they would wish for in the palm of their hand by concealing every single approach of granting suggestions and recomendations and a wide range of information.

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