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CAMPUS NAVIGATION USING AUGMENTED REALITY

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ABSTRACT
the process or activity of accurately ascertaining one's position and planning and following a route. This field includes categories like land navigation, marine navigation, aeronautic navigation, and space navigation. The main purpose of this tool is to navigate the campus. The majority of people find it difficult to prospect new areas or unknown locations by themselves. Hence the application system will serve as a helper to them and lead in navigation through the campus, as we have selected the college campus area for our study. We currently working at developing a system that shall enable a new person to explore unknown campus areas which he is unfamiliar with. Furthermore, the proposed project may be extended at a larger scale and we can set a large number of data as a trained data in the database.

KEYWORDS:
Android application, Android phone, Augmented Reality, Location, Navigation

1. INTRODUCTION

Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY, Bengaluru is a very large campus area spanning across 26 acres (110,000 m^2) of land[1]. It has 2 entrances, 4 academic blocks, an administration center, 2 cafeterias, and much more. Especially new students and people who are on it for the first time have a hard time to orientate themselves and find places.

Since the enormous campus area and academic blocks are unfamiliar to them, it is very difficult to find the crave location on the campus. Every day numerous students, teachers, and visitors move across the campus by driving their vehicles or walking.

Our project aims at providing proper guidance and navigation via a simple android app that is easy to understand and use. The AR would make it easier and more interactive for users to find a certain location. This would help the users to navigate through the campus area in a hassle-free manner It would reduce the confusion regarding the various academic and administrative blocks in the campus area.

The campus would be delineated as a Graph structure, with locations (buildings, parking lots, etc.) on campus stored as vertices of the Graph and transitions between the locations (roads, sidewalks, etc.) stored as edges between the vertices. This application directs the user from his current location to the exact location he searches on the campus. It reduces the effort of the user to walk all over the campus.
Augmented Reality: Is a process in which a digital layer is superimposed on the physical world, integrating the physical, real environment with virtual details to enhance or "Augment" the real world which can be experienced with: Smartphones, tablets and other head-mounted display. [2]

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Virtual Reality: creates an interactive, completely digital environment that provides a fully enclosed, synthetic experience incorporating auditory and visual feedback, experienced often through the use of a head-mounted device (HMD). [3]
Augmented Reality provides a step-by-step instruction while performing a manual task and remote assistance for support and guidance, hence this technology can be used for indoor navigation. [2]

2. OBJECTIVE OF THE PROJECT

The main purpose of the project to develop an android/unity application or handheld application. Provide effective information for navigation through the application, which contains all the necessary information and provide an accurate destination point for users on request. The project gives users an experience of AR while navigation and Android applications are cost-effective.

3. LITERATURE SURVEY

We have researched in Dr. AIT and made a discussion with visitors, faculty, and students, based on our discussion we found that they face a lot of problems to visit the required destination in the campus. Hence our main aim to navigate the users to their required destinations.

4. SYSTEM ANALYSIS AND DESIGN

System analysis plays the most important role in our project success. The purpose of studying a system or its parts to identify its objectives. The processes of this phase include the collection of data, classification, validation.

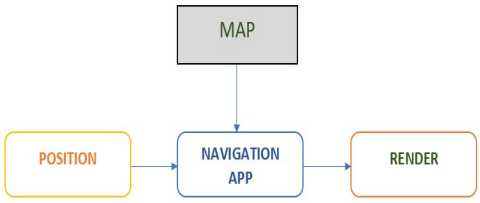

Fig 1. Block diagram of a navigation system.

Currently, **MAP** is the only module that is straight forward. Where it is a visual representation of the area, it's easy to make a route.[4]

Rendering module manages the design of AR content and its work directly depends on the precision of positioning. We can easily draw a route in 3D but face some challenges while matching the virtual objects with the real world. [4]
But when it comes to **Positioning**, the situation becomes a little bit daunting. There's no accurate way of determining the precise location of users indoors, including the exact floor. Determining the proper accuracy levels is also a challenge. For example, is 10 meters enough? What about 5 meters? Or 1 meter?
The minimum accuracy for human perception is not more than 10% of the minimum distance between the points of destination. Example: The required accuracy for indoor navigation is 40*0.1= 4 meters.[4]

4.1 Analysis

It's good to check the existing methods to emerge a new method. The existing methods are expensive to maintain and do not fulfil what the user wants. They are even costly to maintain and do not provide 100% fulfil requirements. There are some old methods that exit.[5]

- A huge banner of college map displayed at the entrance.[5]
- Displaying the building block name at the entrance of the block. [5]
- Naming the department using banners.[5]
- Arrows are used for direction.[5]

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4.2 System Design

The system of Mobile application is to guide the user to identify the buildings/departments inside the campus and mainly focuses on finding destinations and details of officials easily. Mainly five modules have been used to implement the application to make the development easier. The modules are as follows.[6]

- Indoor navigation AR module [6]
- Administration module [6]
- Official's login module [6]
- Official and student management module [6

The following flowchart shows the complete working of the navigation app.

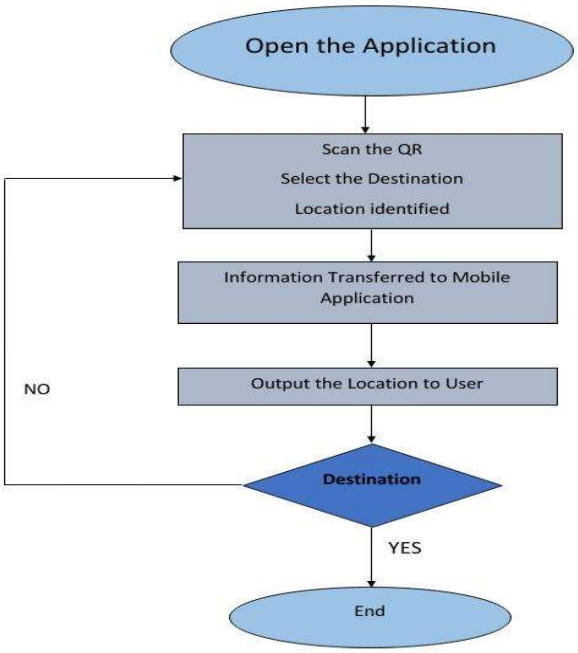

Fig.4.1 shows the flow chart of the system working

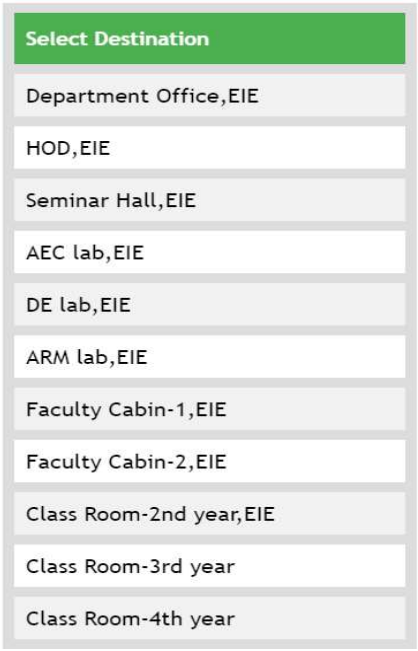

Fig. 4.2 shows destination list

The application works by guiding the user to the desired destination in college using augmented arrows and texts. Upon opening the application, scan QR code using the Android application code contains a link to maps with a direction you will be prompted to open Maps or taken to the web version of maps. [7] The possible destination is listed out for the user to select as shown in the fig. 2a. After choosing the desired destination, the application changes to the navigation view which displays a live feed from the backend camera. The user receives the output based on their request and shows the shortest path from the user's current location to the desired destination by displaying augmented arrows on the screen to lead the user to the destination.

5. METHODOLOGY

To develop a system, choosing an appropriate methodology is important. The methodology provides the basic guidelines that will guide the developer to accomplish the project task. This section, which is the best methodology need to be applied to this project are discussed.[5]

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This project involves heavy user interaction thus is more suitable to use the prototyping approach. A prototype will be developed based on the known requirements of the system so that with the prototype the client has a basic idea of how the completed product will look like. The interactions with the client can have a better understanding of the requirements of the desired system. Normally, the prototype is not a complete system and there are some of the features that are not built in the prototype. The objective of the prototype is to deliver a system that can provide basic functionality.[5]

5.1 TOOLS

5.1.1Software:

Unity: The engine can be used to create three-dimensional, two-dimensional, virtual reality, and augmented reality games, as well as simulations and other experiences. The engine has been adopted by industries outside video gaming, such as film, automotive, architectureengineering, construction.[8]

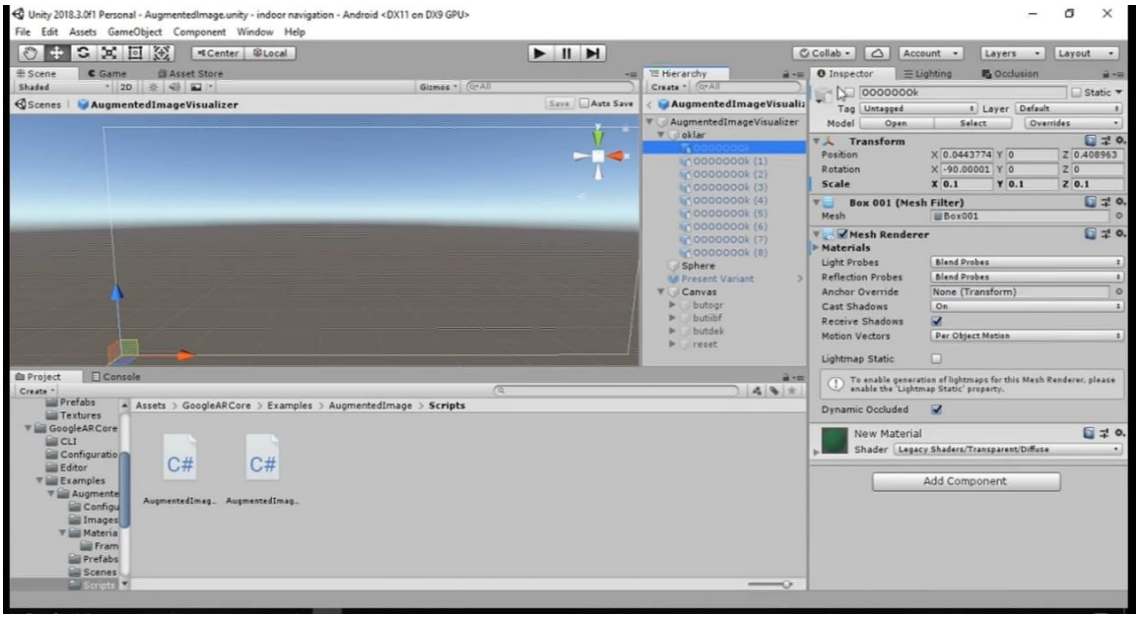

Fig 5.1.1 Showing working platform of unity 3D

Visual Studio

Microsoft Visual Studio is an integrated development environment from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps.[9]

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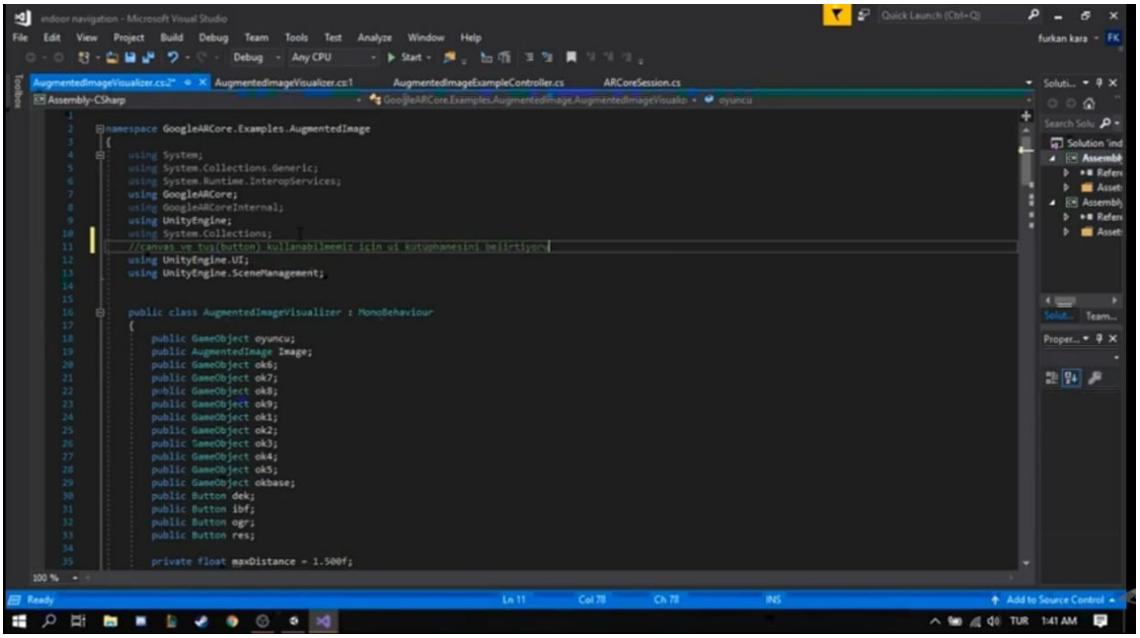

Fig 5.1.2 Showing Working of Visual Studio

5.1.2Hardware

1. Smartphone device [12]

Operating system	Android 7 Nougat
CPU	Octa-Core (4x2.1 GHz Cortex-A57 & 4x1.5 GHz Cortex-A53)
GPU	Mali-T760MP8
RAM	4 GB

2. Computer [13]

Operating System	Windows 10 Genuine 64-bit
CPU	Intel(R) Core (TM) i3-7020U @ 2.30GHz
GPU	NVIDIA GeForce GT 650M
RAM	4GB

6. RESULT

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Fig 6.1 QR Code (Data base image)

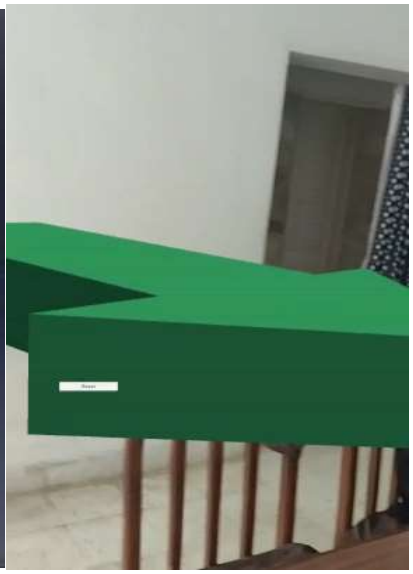

Fig 6.2 Showing direction using Augmented Arrows

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CONCLUSION

There are several commercial navigation applications - such as Google Maps, Yahoo Maps and MapQuest that provide users with directions from one place toanother. However, these applications must search along existing roads; they will not able to provide routes that are as precise as an on-campus path would require.

In this Project we combine IPS with augmented reality without any external mechanism like sensors to determine the position, just the IPS principle.

Real-time mapping can effortlessly make the visitors reach any location inside the facility within a stipulated time. Also, this feature affects the productivity of the facility in the long run, having real-time information on our Smartphone screen.

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