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## AUGMENTECHTURE - 3D Projection of Building Construction Floor Plan using Marker Based Augmented Reality Technology

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**Abstract:** Nowadays, due to rising growth in all sectors, be it in healthcare, infrastructure, finance, education, and logistics, etc. Even though in the era of smart technology constructors, builders are using the old-style method, i.e., usage of brochures by generating 2D sketches of project layout. Builders use these files to sell their construction sites like flats, buildings, or any property to clients by just showing them various floor Plans in multiple views, etc. This procedure aims to be unproductive and ineffective because it does not give a clear idea regarding how exactly the property will look like. Augmented Reality, as shifting to a new developing technology, it gives an entirely new outlook for development. The AR implementation offers many advantages for construction planning, which will help our customers to draw a clear view regarding the assets before making deals without actually visiting the sample flats. To develop an AR-based brochure as a development tool that will serve as an application to intelligently increase the clients by minimizing their efforts and easing their decision-making process and maximizing the complete efficiency.

**Keywords** - Augmented Reality, Vuforia SDK, Unity, Brochures, Infrastructure Development.

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### I. INTRODUCTION

In today's world, Estate Agencies are the leading business. Many people rely on estate agents and their services to sell their properties, renting them, and buying properties. So, the market is vast, and day by day, the growth of this market is inclining towards its peak. This technology also opens a door for competition among the estate agents to make successful deals with people and leveraging their needs and even fulfilling their expectations. Besides that, the estate agency has emerged into marketing and sales, so one should be good enough in both as a marketing agency for the client and also should effectively market their properties using various technologies. The main motive of an agency must be to differentiate their own business from other businesses and provide better results to the customer.

Moreover, this can be achieved by thinking smart. The estate agents are currently attracting clients by focusing on their "sample flats" provided with the brochures. In this process, the client has to visit various agencies and look for the best deals that the agent provides. Also, clients need to spend their time visiting the sample flats and waiting until the sample flats are ready. Till that, they do not get a clear idea of how that flat exactly looks. This approach sometimes leads to delay in their decision to choose that property. Hence becomes time consuming for the sellers as well as for the buyers. It allows real-time interaction between the users concerning the real environment. AR technology systems can help users overlay augmented plans onto the real world. This gives a clear view of showing 3D models by using Augmented Reality as the key by fulfilling the user's expectations.

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### 1.1 Importance of the project:

#### 1.1.1 Real-Time Visualization of Projects:

For example an architect, contractor or owner being able to walk onto a project site, holding a smartphone or tablet with the camera facing the location of the building and seeing a full-scale model of the building on the display before any work begins. This type of real-time visualization allows the architects to provide owners and contractors greater insight into the details and design of a project than is currently available with 2D drawings, scale models and BIM.

#### 1.1.2 Better Collaboration & Communication:

Good collaboration and communication is the key to any successful construction project. With the help of augmented reality a project manager or contractor could walk through a construction site and easily view an overlay of a BIM model and also compare the accessing up-to-date change orders or other project documentation.

#### 1.1.3 Increased Safety:

Safety is an important factor on every construction project. Whether it is allowing a more detailed safety plan to be developed or to provide training on heavy equipment using actual equipment on real sites with augmented threats, AR has the potential to highly improve safety on the construction site. Consider being able to walk to a specific area of construction and having a safety checklist or a recap of that safety meeting specific to the task at hand pop up on a display along with a 3D BIM model.

#### 1.1.4 Greater Implementation of Building Information Modeling (BIM):

BIM is widely used by the AEC community with over 70% of companies in North America. Augmented reality has the potential to push BIM to 100% adoption throughout the construction industry. AR has a feature to look down at a small-scale BIM model and then backup at current construction and then back down at the model to check if something will be completely eliminated.

#### 1.1.5 Projects Delivered on Time & Within Budget:

The use of BIM has already been used to decrease project delivery time and keep projects under budget. Combination of AR with BIM will make doing this even easier.

### 1.2 Motivation:

The use of augmented reality (AR) in education is an important point of research. AR involves the addition of virtual objects into real environments to facilitate real-time interaction. Research on AR applications in education is still in an initial stage, and there is a lack of research on the effects and implications of AR in the field of education. The use of AR has become more accessible as it no longer requires specialized equipment and may easily be used on mobile devices. Most people now own mobile devices, and the use of these devices has increased, thereby enabling greater access to AR; the applications for mobile AR in education are increased rapidly and also feasibility of mobile AR has increased due to advances in mobile technology. AR mobile applications are available for several areas of education, and education related AR applications are now more commonly found on mobile devices. The use of AR can increase student learning motivation and contribute to improved academic achievement.

## II. HEADINGS

### 1. Introduction

- 1.1 Importance of the project
  - 1.1.1 Real-Time Visualization of Projects
  - 1.1.2 Better Collaboration & Communication
  - 1.1.3 Increased Safety
  - 1.1.4 Greater Implementation of Building Information Modeling (BIM)
  - 1.1.5 Projects Delivered on Time & Within Budget
- 1.2 Motivation

### 3. Methodology

- 3.1 Creating a 2-D floor plan of building and rooms
- 3.2 Creating a 3-D model database
  - 3.2.1 Flexibility
  - 3.2.2 Quality
  - 3.2.3 Interactivity
- 3.3 Creating Android Application

### 4. Partial Implementation

### 5. Conclusion

## III. METHODOLOGY

Augmented Reality technology will be used to achieve primary goals of this project. Augmented Reality (AR) is a technology which is a technology in which 3-D virtual objects are integrated into a 3-D real environment in real time mode.

The research methodology is discussed under three steps:

1. Creating a 2-D floor plan of building and rooms.
2. Creating a 3-D model database.
3. Creating Android Application.

#### 3.1 Creating a 2-D floor plan of building and rooms:

A floor plan is a technical design of a room or commercial building, such as an office or restaurant. The design which is represented in 2D or 3D, indicates the spatial relationship between the rooms, spaces, and elements such as windows, doors, and furniture etc. Floor plans are critical for any architectural project. Engineers, architects, and builders use this software to create plans for their projects. A floor plan is basically a preview of the architectural project. It shows how the space is divided and indicates the dimensions and measurements of the various elements such as windows and doors.

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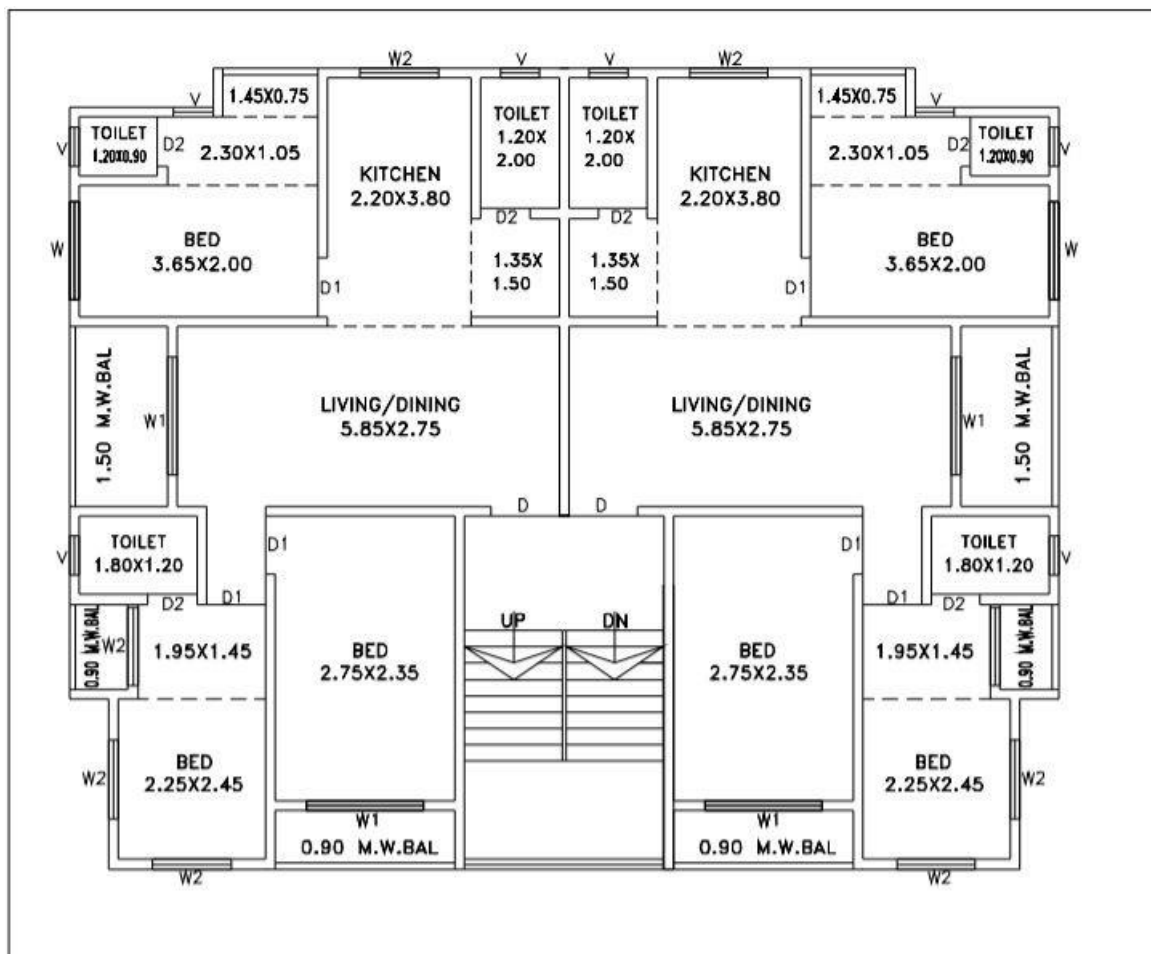


Fig.3.1

3.2 Creating a 3-D model database:

In 2D floor plans the designer works on x-axis and y-axis but in 3D, the designer works on 3 axes to create a floor plan in 3D. It gives many benefits:

- 3.2.1 Flexibility: In a flexibility 3D services are far better than 2D. 2D models are used in the creation of 3D models. High resolution can be achieved for the final model.
- 3.2.2 Quality: In a 3D floor plan designers add furniture, textures to improve the appearance. This makes it possible to produce realistic design.
- 3.2.3 Interactivity: The 3D floor plan designs include many animated options for an improved user experience. In 3D floor plan renderings give more control to the viewer to help them rotate the design to examine the structure from different views. These designs also enables the user to make the changes in furniture, textures, etc. within the rooms.

3.3 Creating Android Application:

Import the 3D models format to the Unity engine along with the Rendering of the 3D models. The 2D floor plan in the initial step will be now imported to the Vuforia database engine for the image processing and to store it in the database for further accessibility. The processed image in the database Of Vuforia SDK will now be imported to the Unity engine along with the license key. Install the AR

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Camera along with the main camera from Vuforia SDK. After all the elements are imported , we will create multiple scenes and through C# coding the scenes will be switched .Now , we have to create an android app with Vuforia AR camera . We will use JAVA programming language and host it in Android studio to develop the application.

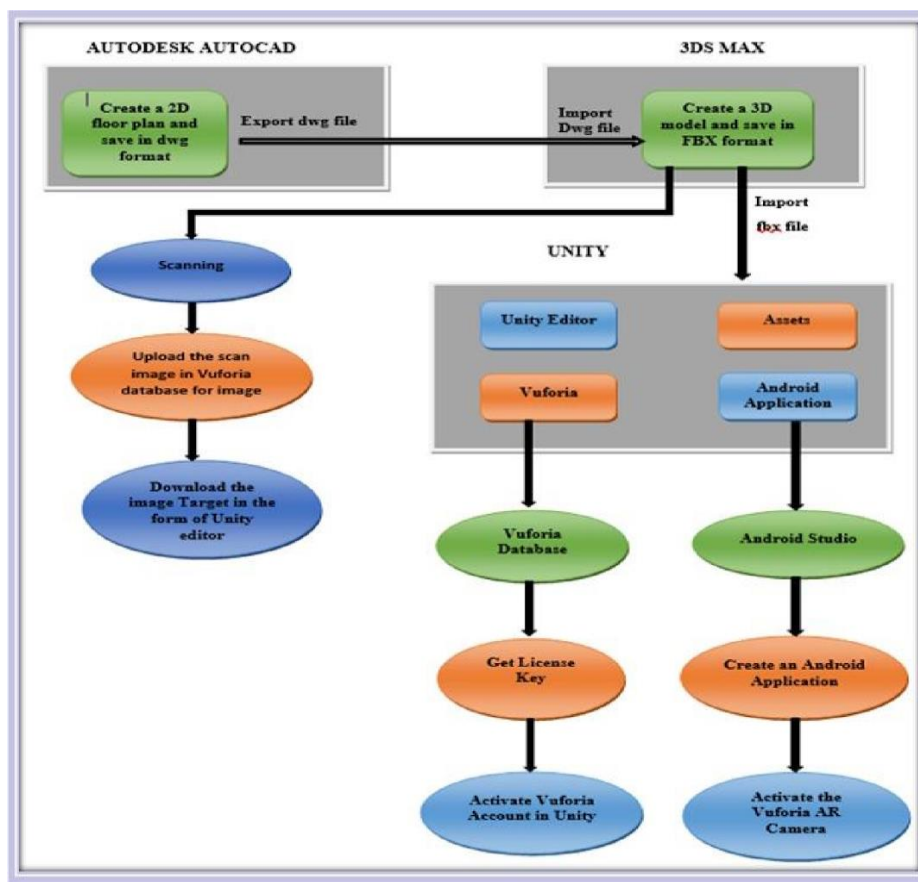


Fig.3.2

#### IV. PARTIAL IMPLEMENTATION

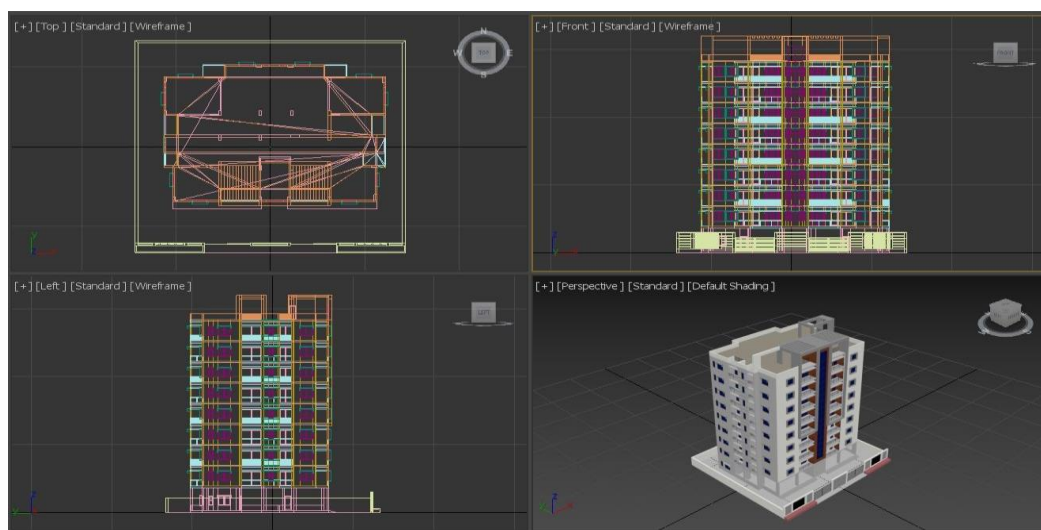


Fig.4.1

## V. CONCLUSION

These technologies will provide the construction industry with the efficiency and flexibility it requires for its day to day operations. AR technologies will result in a decrease in cost, quality, and time saving; and this technology is believed to be a game changer for the global construction industry. The use of Augmented Reality in Infrastructure Development has provided a digital touch by transforming the use of 2D model into a 3D model. The development has aimed at improving efficiency while being effective and innovative. The system tries to be simple and efficient by using new technologies to make the system more accessible and compatible. This system is capable of enhancing the performance by allowing multiple users to experience and visualize how the property exactly looks like by minimizing their attempts to visit the sample flats and make their deals. This system proves to be a helping tool for real estate agents in acquiring new customers as well as in increasing customer engagement and retention. It requires a lower development cost and is capable of boosting productivity.

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