

AUGMENTED REALITY FOR REAL ESTATE

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Abstract - This project deals with the topic augmented reality (AR) in the field of real estate. Augmented reality (AR) is a digitally augmented version of the real physical environment created by the use of digital visual elements, music, or other sensory stimulation given through technology.

As technology advances, Augmented Reality is becoming more prevalent in many businesses. One of which is the real estate sector. The field of augmented reality applications for real estate is vast, but unexplored. For the Real Estate sector, Augmented Reality opens up a plethora of new business prospects. The amount of time spent touring each site with consumers and not having appropriate resources to impress them is a common challenge that real estate developers face. However, by including augmented reality technology into the equation, the way commercial real estate investors, stakeholders, and clients engage with a specific area may be altered. With this project, we are aiming to create a user-friendly mobile application that helps the users to view every aspect of the property virtually in 3D, without needing them to take the effort to travel there and visit the property physically. This application also allows the real estate developers to diversify their marketing methods and give the buyers a more memorable home experience.

Key Words: Augmented Reality (AR), Real Estate, AR Technology, 3D, mobile application

1. INTRODUCTION

The use of augmented reality (AR) is growing in every field. Real estate isn't the first industry that comes to mind when considering how AR may be employed. No one can dispute, however, that it has enormous promise for improving the selling and purchasing experience in the real estate industry. Everyone nowadays has a smartphone or tablet with which they can readily access the internet, and the technology in these devices is improving by the day. As a result, using AR tools with the advanced devices we carry in our pockets is becoming easier and more comfortable. This development paves the way for an AR-enhanced real estate technology.

There was a lack of perfection in everything when there was no augmented reality in real estate. Customers and agents both become equally irritated when visiting each and every site one by one. In the time constraints, people may make the incorrect decision.

Through this application, using augmented reality in real estates makes the home showing process more efficient and successful. The amount of time spent touring each site with consumers and not having appropriate resources to impress them is a common challenge that real estate developers face. Also, in this current world where everything is done virtually, one of the major problems faced by real estate developers is how to make things more convenient for the buyers. However, with the introduction of AR technology, the way commercial real estate investors, stakeholders, and clients deal with a specific location can be altered. AR can help real estate developers expand their marketing methods and give clients a more memorable home experience. Through this technology, buyers can look at every corner of the house/space just virtually and see what suits their needs, thus helping buyers to make decisions more quickly with more accurate information, resulting in less hesitation and reduced buyers' remorse.

Customers will mainly benefit from this app. They may see how their ideal house would appear using Augmented Reality in Real Estate. For example, when individuals were buying a plot, they had to deal with ambiguity and could only speculate on what they could build with it. They can now visualise everything thanks to this augmented reality technology. Customers can take a virtual 3D tour of each property, viewing each room and interior. As a result, customers will be able to make better purchasing decisions, making every purchase a joyous occasion. It not only improves the buyer's experience, but it also improves the agent's by revolutionizing the selling and expanding the marketing methods.

AR is used efficiently in visits for property purchase booking, progress tracking, worker preparation, risk management, time and cost executives, and quality and flaws. Furthermore, AR is used to grow an organisation that allows the possibility of having gatherings with persons who are topographically far apart from one another yet need to buy homes from precisely where they are. It is expressly viewed as the many applications of Expanded Reality and how they are used in the Land Business to make transactions smooth and simple.

1.1 Literature review

The impact of augmented reality application on learning motivation of students -

The goal of this study was to assess and comprehend the impact of an augmented reality mobile application on

undergraduate health science students' learning motivation.[1]

Augmented Reality in Education: Current Technologies and the potential for Education -

The purpose of this paper's research was twofold. The first was to study the term augmented reality (AR) that is used to describe this new artificial and augmented environment. The characteristics of an augmented reality system that are described, and the technologies used in this system categorized. Second, is the educational potential in this context.[2]

Augmented Reality technology in the manufacturing industry: A review of the last decade -

The goal of this review was to identify the main areas and industries where AR is now being used, describe the technological solutions used, and highlight the primary benefits that may be obtained with this type of technology.[3]

The Past, Present, and Future of Virtual and Augmented Reality Research: A Network and Cluster Analysis of the Literature, *Frontiers in Psychology* -

The purpose of this study was to conduct a systematic and computational examination of the growing interdisciplinary VR and AR areas in terms of multiple co-citation networks in order to investigate the growth of this knowledge domain's intellectual structure over time.[4]

Augmented reality for real estate -

The goal was to investigate the structural, technological, and user-related factors that facilitate or impede the dissemination of augmented reality applications for real estate, and to provide a smart overview of existing applications and market potential for AR applications for real estate, as well as a visionary conclusion of expected future developments.[5]

Review and analysis of augmented reality literature for construction industry -

The purpose of this study was to evaluate the application areas of augmented reality technologies, including the goals for which these technologies were used in different project phases and how augmented reality models were used to meet project issues.[6]

2. METHODOLOGY

2.1 Block diagram

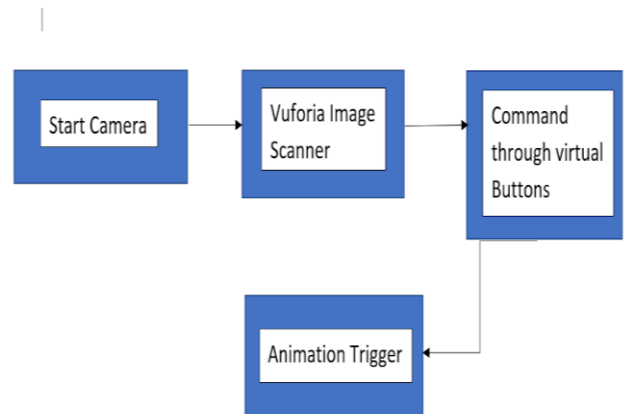


Fig. 1. Proposed Model Flow Diagram.

When a user starts the AR HOUSE application firstly, the intro scene will be there. There will be several houses in the intro scene. Users should choose one of them according to their choice. After that, the application will start the camera, and the user has to point the camera on the image target, and Vuforia will scan the picture, and show the output. Then by clicking the virtual buttons users can get to perform the required actions and the animation will be triggered.

2.2 Software Used

- I. Unity - The UNITY engine is capable of producing 2D, 3D, virtual reality, and augmented reality games and other interactive experiences.
- II. Vuforia - Vuforia is a mobile-based augmented reality software. Vuforia finds "feature points" in the target picture and uses the findings to compare the features in the target image with the receiving frame from the camera. Vuforia compares images captured by a camera to a predefined reference image. Vuforia scans typically high-contrast patches, curves, or edges that will not vary considerably when viewed from multiple angles. If the image lacks enough feature points, it will most likely not be detected properly. As a result, the primary goal is to have a large number of feature points that can serve as a form of anchor for object recognition technology. The same feature extraction algorithm is used again, and if the majority of reference feature points on a camera frame are located, the image is identified as the marker. All objects are scanned with Vuforia's built-in Object Scanner tool.

III. SKETCHUP - 3D House model.

IV. Canva - 3D House model

2.3 Working

The model consists of creating an Augmented Reality based real estate application and projecting a full-size home model in the real world. Then using virtual buttons for removing the roof, and the second floor, toggling into the day mode and night mode, etc. In this proposed model, there are three scenes. Those scenes are the intro, house, and first-person 3-D view scenes.

There are numerous methods for image recognition in Vuforia, i.e., Model Targets Area Target Image Targets Object Targets Multi-Targets Cylinder Targets VuMarks External Camera Ground Plane. This proposed model used the Vuforia library for detecting a target image. Vuforia compares pictures captured by a camera to a previously given reference image. Vuforia scans the high-contrast spots, curves, and edges and isolates certain areas with plenty of feature points.

The target manager of Vuforia has a star rating system that comes up with a heuristic analysis of the given target but does not necessarily appear for the actual run-time detection and tracking performance. Vuforia uses the edge-detection technique. If the high-contrast image has more vertices or lines, Vuforia considers it a high-rated image.

1. Intro Scene:



Fig. 2. Introduction Scene

In the intro scene, the user can toggle through various house models and pick the house model which user wants to project in the real world, where the model is for the first house only, the remaining houses were added for scroll view so, the user can choose the first house for projecting it in the real world.

2. House Scene:

There are 3 image targets as the user starts the camera and as the user keeps the prints of these pages in front of

them, then the application will keep on tracking this image target and these buttons will appear in front of them.

a. Target Image 1 for house model:



Fig. 3. Target Image 1

Fig. 3 is a target paper for house model. In Fig. 3 users can point the camera on the paper and here mainly we have included a promotional demo video of the company on a plane, which is augmented on one paper. There are two virtual buttons for starting and stopping the video. If the user presses the virtual button 'START VIDEO', then the video will be augmented, and it will get stopped when the user clicks on the virtual button 'STOP VIDEO'.

Output:

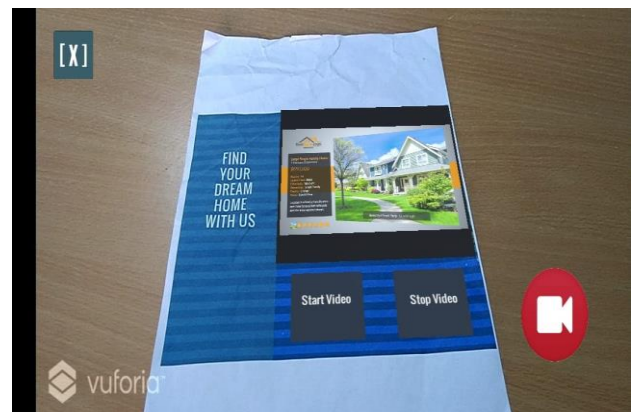


Fig. 4. Video Augmented on Target Image.

b. Image Target 2 for house model:



Fig. 5. Target Image 2 for House Model.

This scene gives a little bit more information about this property. Fig. 5 is the target image for augmentation. When the user points the camera on this paper, the primary house model will be visible. There are some virtual buttons which will get augmented on the paper. Users can use the virtual buttons for toggling the roof, second floor, day mode and night mode. This paper is used for observing how the house will look like as shown in Fig. 6. The user needs to click on the virtual buttons, which are augmented on the paper, and the actions like removing/replacing the roof, removing/replacing the second floor, etc., will be taken accordingly. By removing the roof, the user will be able to see the house from the upside. Also, users can see the alignment of rooms and also features of the second floor. By removing the second floor user can see the base floor, i.e., the ground floor of the house from upside. Also, there is a virtual button for toggling into day night mode. Users can observe the look of the house model in day mode as well as in night mode.

There are some point lights, which are added inside as well as outside the house, will help the user to observe the house more efficiently and helps to differentiate between day mode and night mode.

Output:



Fig. 6. House Augmented on Target Image.

3. First-person 3-D view Scene:

a. Target Image 3 for house model:

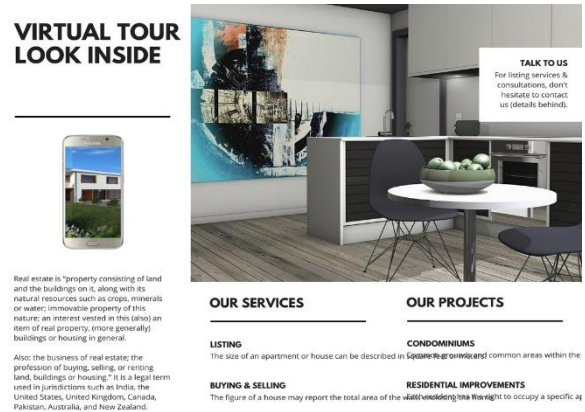


Fig. 7. Target Image 3 for House Model.

In this scene, the user can take a look at the house from inside. When a user points to the AR camera on this paper no. 3, a virtual button for entering into the 3-D view mode will appear. When the user clicks on that button, the application will ask whether to enter in first-person 3-D view mode or not as shown in fig 8. So by clicking on continue Users can navigate throughout the house and actually observe the house from inside very clearly.

Also, we have added mesh colliders to this model so that users will get a real house navigating experience. The use of these mesh colliders is that the user won't pass through the walls until and unless he reaches the door. Also, users can take a walk around the whole house to observe the house from all sides as shown in Fig. 9.

Output:

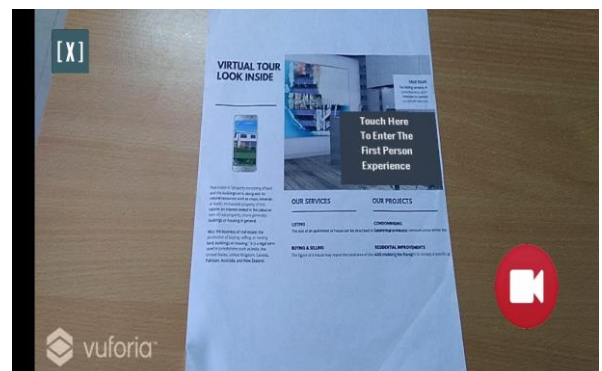


Fig. 8. Virtual Button for the first-person view.



Fig. 9. First Person View of House Model.

This proposed model created four entities for the user to perform required action. Those entities are as follows:

- Remove (Entity)

- Roof



Fig. 10. "Remove roof" action has been taken

- Second Floor



Fig. 11. 'Remove 2nd Floor' action has been taken

- Replace (Entity)

- Roof



Fig. 12. 'Replace Roof' action has been taken

- Second Floor



Fig. 13. 'Replace 2nd Floor' action has been taken

Mode (Entity)

- Day Mode



Fig. 14. Hose Model in Day Mode

- Night Mode



Fig. 15. House Model in Night Mode

- Video (Entity)

- Start Video



Fig. 16. Video started on Target Image

- Stop Video



Fig. 17. Video stopped on Target Image

D. Script:

There are several scripts written in C#, which perform the backend operation of the application. Those scripts are:

1. House Script: This script handles the code to toggle between the house models, and the roof, second floor, day mode, and night mode.
2. VB Button: This script handles the action of virtual buttons. The VB Button script determines what action

should be done when the user hits the virtual button on the paper.

3. Game controller: This script handles the changing scene actions, such as when the user selects the first house from the intro scene, the scene will get changed to the house scene.

3. CONCLUSION

AR is predicted to be used by an even higher number of users in an increasing number of areas. AR technologies can help us to handle the vast information flow generated by the ever increasing worldwide knowledgebase. For the Real Estate market, Augmented Reality opens up a variety of new business prospects. Potential real estate buyers can already visit the property in 3D using AR before making the effort to travel there. AR also gives completely new marketing potential for realtors by utilizing location-based services while also offering the buyer with a one-of-a-kind experience. These days when it is becoming incredibly hard to get a buyer's undivided attention, Augmented Reality could make a significant difference in increasing engagement with potential clients and differentiating your company from the competition. AR technology will improve further, and the real estate business will find new and fascinating applications for it. The real estate business has the potential to be reshaped by augmented reality. Embracing augmented reality technology can help realtors differentiate themselves from the competition by giving clients a one-of-a-kind experience.

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