



Virtual Reality for Real Estates

Rasika Dilip Sonje¹, Revati Ravindra Lokhande², Vaibhavi Vijaykumar Joshi³
BE Student^{1, 2, 3}

Department of Information Technology
NDMVPS' KBT College of Engineering, Nashik, India

Abstract:

Mixed reality is the result of blending the physical world with the digital world. Mixed reality is the next evolution in human, computer, and environment interaction. It is made possible by advancements in computer vision, graphical processing power, display technology, and input systems. Mixed reality is a combination of virtual reality and augmented reality. Virtual reality (VR) is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment. Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment.

Keywords: Virtual Reality; Mixed Reality; Augmented Reality; Real Estates

I. INTRODUCTION

The application of mixed reality goes beyond displays but also includes environmental input, spatial sound, and location. Virtual Reality technology provides us a virtual world which is just like the real world. With the application of Virtual Reality in architecture design, architecture engineer is able to achieve their works in virtual world, which is visible, touchable and sensible. Virtual Reality technology not only can give a new way of artistic expression for architectural creation, but also let the architectural design method and concept greatly changeable. Virtual Reality technology is of great interaction, immersion feeling and real-time. In the traditional system, the customer is absolutely unaware about the apartment he is buying without having any knowledge of floor area, colour of walls, spaces between various components of the apartment. So, the customer has to trust the real estate agents blindly. This system provides a virtual view of the apartment that the customer wants to buy. This enables customer to be aware about everything that is related to his property. The aim of this system is to get enhanced and better view of the real estates. The system makes the customer to be able to get preview of the respected estate. Customers can feel the area and many other entities that are related to their property even before it is constructed. The system uses not only virtual reality but also augmented reality for betterment.

II. SYSTEM ARCHITECTURE

Nowadays the area of real estate has grown fast and it is very wide. Customers are always in a dilemma while buying some property as those are under construction and the customer is not aware of how the apartment will look after construction, how much floor area will be useful and many other issues like colour of the apartment, furniture, flooring etc. So, the customer has to wait until the construction is done. So this system gives solutions to all these issues by providing Virtual Reality and Augmented Reality view of the respected apartment even before the construction is completely done. Advancements in sensors and processing are giving rise to a new area of computer input from environments. The interaction between computers and environments is effectively environmental understanding, or *perception*. Environmental

input captures things like a person's position in the world (e.g. head tracking), surfaces and boundaries (e.g. spatial mapping and spatial understanding), ambient lighting, environmental sound, object recognition, and location. Now, the combination of all three – computer processing, human input, and environmental input – sets the opportunity to create true mixed reality experiences. Movement through the physical world can translate to movement in the digital world. Boundaries in the physical world can influence application experiences, such as game play, in the digital world. Without environmental input, experiences cannot blend between the physical and digital realities.

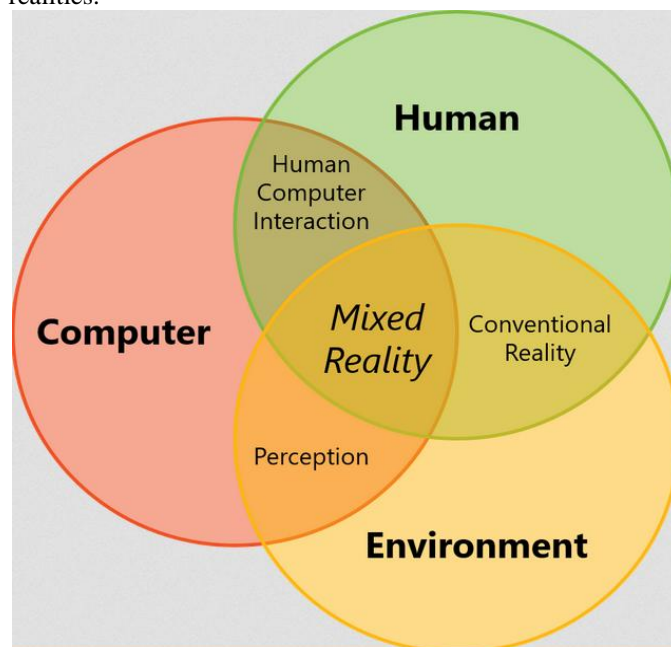


Figure.1.Mixed Reality

Virtual and Augmented reality for real estate is the model where the customer can have an actual view of the apartment he is paying for. The architecture of mixed reality consists of Android phones, Tracking system, Database server and VR Headset. The experiences that overlay graphics on video streams of the physical world are *augmented reality*, and the experiences that occlude the view to present a digital experience are *virtual reality*.

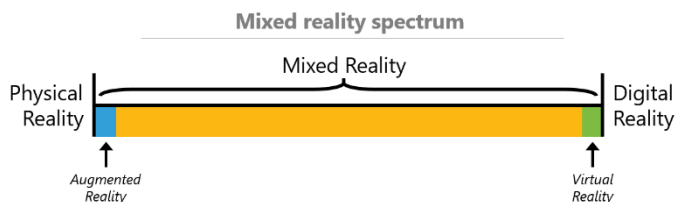


Figure.2.Mixed Reality Spectrum

III. SYSTEM OVERVIEW

Various features of the system which makes it a successful model for real estate business are: It is not only helpful for the customers but is also helpful for the builders. By using this model, builders do not have to visit the site with customer. They can show various models of flat to them anywhere which time is saving. Some more features of this system are as follows:

- Interactive view for customer to view property.
- High quality rendering for existing property with minimal resources.
- Custom view with many tools such as painting, textures, etc.
- 360 immersive view with head tracking.

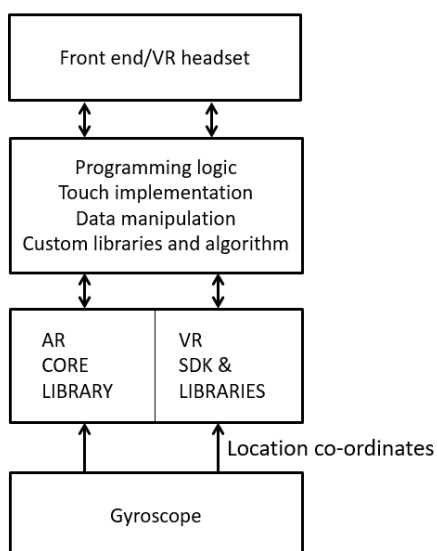


Figure. 3.System diagram

A. Gyroscope

Gyroscope is the software which is used for tracing or scanning the apartment. It is used for measuring or maintaining orientation and angular velocity. It assumes a random point initially. The scanned view is then transferred to the next level of the architecture.

B. VR and AR SDK

AR and VR SDK are the software development kits for augmented and virtual reality. This is the second level of the architecture which takes scanned view of the apartment from the lower level and outputs the virtual or augmented view of that apartment. Then the Virtual or Augmented view is then transferred to next level which is programming logic.

C. Logic

In this level, all the logic is performed with respect to the output of VR and AR SDK level. It consists of programming logic, touch implementation, data manipulation, customer libraries and algorithm.

D. VR Headset

VR Headset is basically a medium for interaction between the system and the customer. In this project, the system is enhancing the view of the property the customer is willing to buy. The system does not only help the customer but also the

builders as they do not always have to take the customer to the site of the apartment.

E. Google VR SDK

Google VR provides an SDK for Unity that allows us to build VR content for rich ecosystem of devices. Stereo Rendering and head tracking are enabled automatically for the default pawn when using the Google VR plug in. Google VR will automatically apply a neck model, improving the user experience.

F. Vuforia AR SDK

Vuforia is an Augmented Reality SDK for mobile devices that enables the creation of Augmented Reality applications. It uses Computer Vision technology to recognize and track planar images (Image Targets) and simple 3D objects, such as boxes, in real-time. This image registration capability enables developers to position and orient virtual objects, such as 3D models and other media, in relation to real world images when these are viewed through the camera of a mobile device. The virtual object then tracks the position and orientation of the image in real-time so that the viewer's perspective on the object corresponds with their perspective on the Image Target, so that it appears that the virtual object is a part of the real world scene.

G. Unity Editor

It is feature-rich and highly flexible editor. Unity is the ultimate game development platform. Unity is used to build high-quality 3D and 2D games, deploy them across mobile, desktop, VR/AR, consoles or the Web, and connect with loyal and enthusiastic players and customers.

IV. SYSTEM IMPLEMENTATION

The system implementation includes entities like Gyroscope, VR and AR SDK, different libraries and VR Headset. Also programming logic is implemented at the third level of the architecture which performs the actual operations regarding the proposed system.

A. Data Flow Diagram

A data flow diagram (DFD) is a graphical representation of the flow of data through an information system, modelling its process aspects. A DFD is often used as a preliminary step to create an overview of the system without going into great detail, which can later be elaborated.

i. DFD Level 0

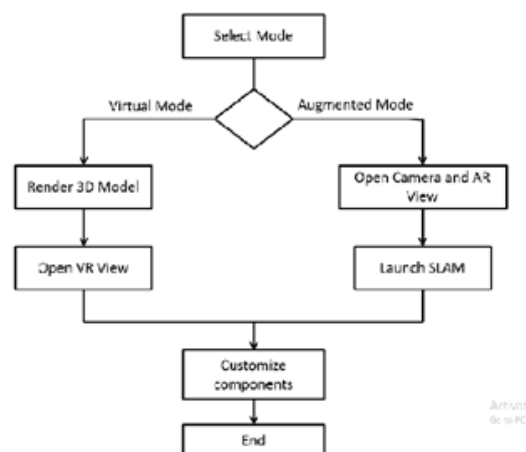


Figure.4.DFD Diagram

In this diagram, the user has the freedom to choose the modes i.e. Virtual or Augmented mode. If it is the virtual mode, then the 3D model is rendered and it opens in VR view. If it is augmented mode, it launches SLAM.

V. ALGORITHM

A. Google VR heading tracking algorithm:

1. Applies a simple neck model translation based on the rotation of the provided head pose.
2. Gets the rotation from start space to head space.
3. Re-centers the head orientation (resets the yaw to zero, leaving pitch and roll unmodified).

Checkout following steps for detailed description:

```
Step 1: gvr_apply_neck_model
gvr_mat4f gvr_apply_neck_model
(
const gvr_context *gvr,
gvr_mat4f head_space_from_start_space_rotation, float factor
)
```

```
Step 2: gvr_get_head_space_from_start_space_rotation
gvr_mat4fgvr_get_head_space_from_start_space_rotation
(
const gvr_context *gvr,
const gvr_clock_time_point time
)
```

```
Step 3: gvr_recenter_tracking void gvr_recenter_tracking
(
gvr_context *gvr
)
```

VI. SEQUENCE DIAGRAM

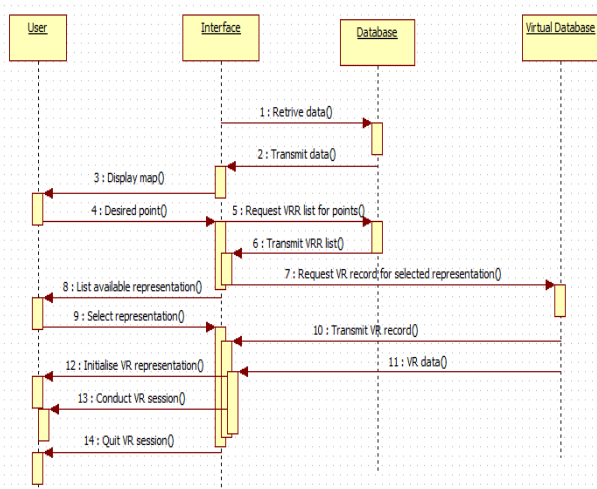


Figure. 5. Sequence Diagram

The figure shows sequence diagram. In this diagram, there are 4 main streams- user, interface, database and virtual database. Where user is the customer, interface is medium to interact with VR mode, database is the tracked view of the apartment and virtual database is actual virtual database which is our system.

VII. CONCLUSION

This system proposes an alternative solution to the traditional system of the real estate. Using this system, customer can view simulation of real estate properties. This also provides integrated view of property before as well as after its construction. The proposed system gives real world experience to user using Mixed Reality that is augmented as well as Virtual Reality in simulation. Because of AR and VR

combination, the enhanced interaction is achieved. It has achieved all the objectives like understanding the outside environment for outline of scene in frame, differentiating floor and wall from the scene, establishing suitable tracking or detection points using sub modules, reducing high rendering time of 3D models using android graphics libraries, resizing 3D models using pinch. In future, we can fetch 3D models using distributed systems over internet. Currently the application size is large due to heavy 3D models. Many times 3D rendering is too slow because of less resource of mobile phones.

VIII. REFERENCES

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