

ADDING IMMERSIVE TO VIRTUAL REALITY

EXPERIENCE WITH ARCHITECTURAL MODELS

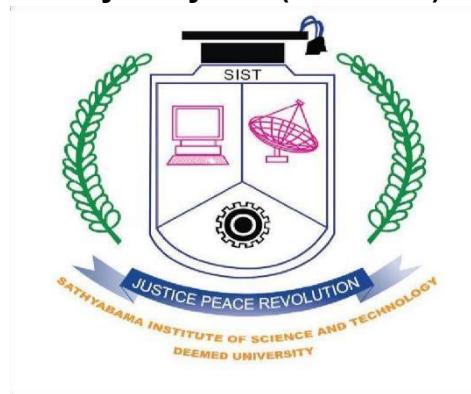
Submitted in partial fulfillment of the requirements for the award
of Bachelor of Technology degree in Information Technology.

By

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DEPARTMENT OF INFORMATION TECHNOLOGY

SCHOOL OF COMPUTING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Category-1 University by UGC

Accredited with Grade "A++" by NAAC

12B Status by UGC |Approved by AICTE

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CHENNAI - 600 119

APRIL - 2024



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **CH.V.Hima Bindhu (40120019)** **Sreeramoju Shraddha (40120088)** **Y Satya Priyanka (40120121)** Who carried out the project Entitled "**ADDING IMERSIVE TO VIRTUAL REALITY EXPERIENCE WITH ARCHITECTURAL MODEL**" under my supervision from January 2024 to April 2024

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DECLARATION

I, hereby declare that the Project Report entitled "**ADDING IMMERSIVE TO VIRTUAL REALITY EXPERIENCE WITH ARCHITECTURAL MODEL**" done by me under the guidance of **Dr.R. Subhashini ME., Ph.D.,** at Sathyabama Institute of Science and Technology (Deemed to be University), Jeppiar Nagar, Rajiv Gandhi Salai, Chennai – 600019 is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Information Technology.

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ABSTRACT

Virtual Reality (VR) has revolutionized the way architectural models are visualized and experienced. This paper explores the integration of immersive elements to further enhance the realism and engagement of architectural models in VR environments. We investigate the incorporation of advanced technologies such as haptic feedback, spatial audio, and realistic lighting to create a more immersive architectural experience.

Through a combination of user studies and technical analysis, we assess the impact of these immersive elements on user perception and understanding of architectural designs. Our findings highlight the potential of these enhancements in improving architectural visualization, education, and collaboration. This research contributes to the ongoing efforts to create more immersive and interactive VR experiences within the field of architecture, offering architects and designers new tools to convey their visions and engage stakeholders effectively.

An industry a business or a firm requires quality personnel for the accomplishment of objectives framed by them to survive in this competitive era. They all are at the beginning of the fourth industrial revolution. To remain competitive in this digital world all search for bright, potential, and dynamic employees.

Organizations with an effective recruitment strategy will be able to employ suitable individuals to manage the digital world and developing business environment. So, the recruitment strategy is the prime factor for every organization in hiring skilled employees who could be more efficient and effective in accomplishing the job objectives.

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CHAPTER 1

INTRODUCTION

VR experience for architecture models offers a revolutionary way to visualize and interact with buildings, spaces, and structures. By donning a VR headset, users are fully immersed in three dimensional environments, enabling them to explore designs from various angles, walk through rooms, and even interact with elements within the virtual space. Architects can now present their designs with unparalleled realism, enhancing communication and collaboration with clients, stakeholders, and project teams. Clients can experience the scale, proportions, and ambiance of their future spaces before construction begins, fostering a deeper understanding and appreciation of the architectural vision.

The term “immersive elements” in this context refers to advanced technologies and techniques That go beyond basic 3D visualization. These elements encompass features such as haptic feedback, spatial audio, realistic lighting, and interactive elements, all of which aim to deepen the sense of immersion within the virtually architectural environment. By exploring the possibilities of integrating these elements, we aim to uncover the potential benefits, challenges, and implications for architectural practice and education.

VR allows users to step into a virtual architectural space, providing a sense of scale, depth, and presence That was previously unattainable. This immersive quality has the potential to revolutionize Architectural design, education, and collaboration by enabling stakeholders to explore and understand architectural concepts in a more intuitive and engaging manner.

While VR has already demonstrated its value in architectural visualization, there is a growing interest in further enhancing the immersive nature of these experiences.

Architects and the designers are increasingly seeking ways to make VR models even more lifelike and captivating. This paper aims to address this emerging need by investigating the integration of immersive elements into VR models.

Through a comprehensive examination of current research and case studies, we aim to provide insights into how architectural models can be effectively leveraged to elevate the immersion and realism of VR experiences. Ultimately, by bridging the gap between physical and virtual worlds, we envision a future where VR becomes an indispensable tool for exploring, designing, and experiencing architectural spaces.

Desktop-based virtual reality involves displaying a 3D virtual world on a regular desktop display without use of any specialized VR positional tracking equipment. Many modern first-person video games can be used as an example, using various triggers, responsive characters, and other such interactive devices to make the user feel as though they are in a virtual world. A common criticism of this form of immersion is that there is no sense of peripheral vision, limiting the user's ability to know what is happening around them.

A head-mounted display (HMD) more fully immerses the user in a virtual world. A virtual reality headset typically includes two small high resolution OLED or LCD monitors which provide separate images for each eye for stereoscopic graphics rendering a 3D virtual world, a binaural audio system, positional and rotational real-time head tracking for six degrees of movement. Options include motion controls with haptic feedback for physically interacting within the virtual world in an intuitive way with little to no abstraction and an omnidirectional treadmill for more freedom of physical movement allowing the user to perform locomotive motion in any direction.

Augmented reality (AR) is a type of virtual reality technology that blends what the user sees in their real surroundings with digital content generated by computer enhance how the real surroundings look in some way. AR systems layer virtual information over a camera live feed into a headset or smart glasses or through a mobile device giving the user the ability to view three-dimensional images.

Mixed reality (MR) is the merging of the real world and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time. In order to improve the feeling of immersion, wearable multistring cables offer haptics to complex geometries in virtual reality. These strings offer fine control of each finger joint to simulate the haptics involved in touching these virtual geometries.

Special input devices are required for interaction with the virtual world. Some of the most common input devices are motion controllers and optical tracking sensors. In some cases, wired gloves are used. Controllers typically use optical tracking systems (primarily infrared cameras) for location and navigation, so that the user can move freely without wiring. Some input devices provide the user with force feedback to the hands or other parts of the body, so that the user can orientate themselves in the three-dimensional world through haptics and sensor technology as a further sensory sensation and carry out realistic simulations. This allows for the viewer to have a sense of direction in the artificial landscape. Additional haptic feedback can be obtained from omnidirectional treadmills (with which walking in virtual space is controlled by real walking movements) and vibration gloves and suits.

Virtual reality cameras can be used to create VR photography using 360-degree panorama videos. 360-degree camera shots can be mixed with virtual elements to merge reality and fiction through special effects. Virtual reality cameras can be used as a steppingstone to make realistic holographic displays these cameras can be used to cover every angle of the needed experience. VR cameras are available in various formats, with varying numbers of lenses installed in the camera.

CHAPTER 2

LITERATURE SURVEY

- **In this study of [1] in 2021 by Xinyi Su, Xue Chen Zhao, and Chong Cao. 2021. Designing Obstacle Reminder for Safe AR Navigation. In 27th ACM Symposium on Virtual Reality Software and Technology**

Designing Obstacle Reminder for Safe AR Navigation” is the title of a study or paper presented at the 27th ACM Symposium on Virtual Reality Software and Technology. This suggests that the study is focused on developing a system or method for reminding users of obstacles to ensure safe Augmented Reality (AR) navigation. The “27th ACM Symposium on Virtual Reality Software and Technology” refers to an academic conference or symposium where researchers and experts in the field of virtual reality and software technology gather to present and discuss their research findings and innovations. In summary, the title indicates that the study is about creating a solution for safely navigating in augmented reality environments by providing reminders or alerts about obstacles.

- **In this study of [2] in 2020 by S. Hu, X. Jiang, and K. J. Fu, “Research on the experience design of interactive public guidance systems based on SEM,”.** Research on the experience design of an interactive public guidance system based on SEM (Structural Equation Modeling) typically involves studying the user experience and usability of such systems. SEM is a statistical technique used to analyze the relationships between variables, making it relevant for understanding how various factors influence the user experience in interactive systems. In this type of research, you might explore

User Behavior:

Use SEM to analyze how different aspects of the system (e.g., interface design, information presentation, interaction flow) impact user behavior, such as engagement, adoption, or compliance with guidance.

Factors Affecting Experience:

Identify and model various factors that influence the user experience. This might include system characteristics, user demographics, and environmental factors.

Measurement and Validation:

Employ SEM to validate measurement scales for assessing user experience. This could involve creating and testing survey instruments or questionnaires.

Improvement and Optimization:

Use SEM findings to suggest improvements to the system's design and functionality based on empirical data and user feedback.

Predictive Modelling:

Develop predictive models that can help anticipate how changes to the system will affect user experience.

- **In this study of [3] in 2015 by H. Xue and N. N. Zhu, “Mobile augmented reality technology drives library experience innovation,” Library Sci. Enhanced Learning:**

AR apps on mobile devices can overlay digital information, such as 3D models, videos, or additional text, onto physical books or exhibits. This enhances the learning experience by providing supplementary information and interactive elements.

Virtual Tours

Libraries can offer virtual tours using AR. Visitors can use their smartphones or tablets scan QR codes or markers within the library to access informative and interactive content about different sections or historical aspects of the library.

Interactive Storytelling:

AR can be used to create interactive storytelling experiences within the library. Users can scan AR markers in books or around the library to access multimedia content, turning the library into a dynamic storytelling environment.

Gamification:

Libraries have used mobile AR to gamify the experience. For example, users can participate in scavenger hunts or challenges that require them to explore the library and use AR apps to unlock clues or information.

Accessibility:

Mobile AR can improve accessibility for library visitors. AR apps can provide audio descriptions, translations, or other accessibility features to support users with disabilities.

- **In this study of [4] in 2021 by J. Q. Wang, Y. Chen, and L. Hang, “A study on the influence of interaction style and gender differences on user experience of travel AR,” Library Inf. Service.**

A study on the influence of interaction style and gender differences on the user experience of travel AR (Augmented Reality) is likely to explore how various factors affect how people, both male and female, perceive and engage with AR applications related to travel. Here's how such a study might be structured.

Research Objective:

Define the primary objective of the study. For example, it could be to understand how different interaction impact the user experience of travel-related AR apps and whether there are gender based differences in this experience.

Hypotheses:

Formulate hypotheses that specify the expected relationships between interaction style, gender, and user experience. For instance, you might hypothesize that certain interaction styles are more preferred by one gender over another.

- **In this study of [7] of 2021 by C.-S. Wang, “An AR mobile navigation system integrating indoor positioning and content recommendation services,” World Wide Web.**

An indoor navigation methodology for mobile devices by integrating augmented reality and semantic web,” suggests a research study or paper that focuses on creating a method for indoor navigation using mobile devices. This method combines two important technologies: augmented reality (AR) and the semantic web. Here’s a breakdown of what this title might entail:

Indoor Navigation:

The primary focus of the methodology is on helping users Navigate within indoor spaces, such as buildings, shopping malls, or airports, using their mobile devices. This is particularly useful in complex or large indoor environments where traditional GPS may not be as effective.

Augmented Reality (AR):

AR technology likely plays a crucial role in this methodology. It could involve overlapping digital information, directions, or visual cues onto the real-world view captured by the device’s camera. This enhances the user’s ability to navigate and find specific locations indoors.

Semantic Web Integration:

The use of the semantic web suggests that this methodology incorporates structured data and linked data principles. It likely leverages semantic technologies like RDF (Resource Description Framework) and ontologies to provide context-aware information for indoor navigation.

CHAPTER 3

METHODOLOGY

The design concept and objectives for the immersive experience. Determine what aspects of the architecture you want users to experience and explore in VR. Develop a detailed architectural model using 3D modeling software like SketchUp, Revit, or Blender. Ensure the model is optimized for VR, considering factors such as scale, texture resolution, and polygon count. Integrate immersive elements into the model, such as interactive objects, animations, and spatial audio. These elements enhance the user experience and provide a deeper understanding of the space. Implement intuitive navigation controls to allow users to move around and interact with the virtual environment seamlessly.

Consider using teleportation, locomotion, or point-and-click navigation depending on the complexity of the model and user preferences. Incorporate interactive elements that enable users to manipulate the environment, such as changing lighting conditions, opening doors, or adjusting furniture placement. This enhances engagement and allows users to experiment with different design options. Design a user interface that provides essential information and controls without overwhelming the user. Include menus, tooltips, and UI panels to guide users and facilitate interaction with the virtual environment.

Conduct user testing to gather feedback and identify areas for improvement. Iterate on the design based on user input to enhance usability and optimize the immersive experience. Optimize the VR experience for performance across different hardware platforms, ensuring smooth frame rates and minimal latency. Consider techniques such as level of detail (LOD) rendering, texture compression, and occlusion culling to optimize performance. Deploy the VR experience on compatible platforms, such as VR headsets like Oculus Rift, HTC Vive, or standalone devices like Oculus Quest. Make the experience accessible to users by distributing it through online platforms or dedicated VR apps.

3.1 RISK ANALYSIS OF THIS PROJECT:

Simulation Sickness:

Some users may experience motion sickness or discomfort in VR environments. Designing smooth, comfortable experiences and providing options for customization can mitigate this risk.

Hardware Compatibility:

Ensure that the VR hardware (headsets, controllers, etc.) is compatible with the software used for architectural modeling.

Software Stability:

VR applications may encounter bugs or stability issues, impacting the user experience. Regular updates and testing are essential.

Investment:

VR hardware and software can be expensive, especially for high-quality immersive experiences. Evaluate the return on investment (ROI) and consider long-term costs such as maintenance and upgrades.

Physical Environment:

Ensure that physical spaces where VR experiences are used are safe and conducive to immersive interactions. Minimize obstacles and hazards to prevent accidents.

Competitive Landscape:

Monitor competitors' adoption of VR technology in architectural design and adjust strategies accordingly to maintain a competitive edge.

Intellectual Property:

Protect intellectual property rights associated with architectural designs when sharing VR models. Implement measures to prevent unauthorized use or reproduction.

Accessibility:

Ensure that VR experiences are accessible to all users, including those with disabilities. Compliance with accessibility standards may be required by law in some jurisdictions.

3.2 SOFTWARE REQUIREMENTS

Operating system: Windows 7 (SP1+) or later, macOS High Sierra 10.13+, Ubuntu 20.04 and Ubuntu 18.04, or a supported version of Linux.

3.2.1. UNITY 3D

Unity 3D is a cross-platform game engine developed by Unity Technologies. It is used to create 2D and 3D games, simulations, and other interactive experiences. Unity is a popular choice for game developers because it is easy to use and has a wide range of features. It also supports a variety of platforms, including mobile devices, desktop computers, and consoles. Here are some of the key features of Unity 3D:

3D graphics:

Unity 3D supports a variety of 3D graphics features, including rendering, (e.g. 90–120 Hz refresh rate)

Physics:

Unity 3D has a built-in physics engine that can be used to simulate the behavior of objects in the real world.

Scripting:

Unity 3D supports C# and JavaScript scripting, which allows developers to create custom features and behaviors for their games.

Asset store:

Unity has a built-in asset store where developers can download and purchase premade 3D models, textures, scripts, and other assets. Unity 3D is used to create a wide variety of games, including.

Desktop games:

Unity can also be used to create desktop games. Some popular desktop games that were created with Unity include Hearthstone, Cuphead, and Rim World

Console games:

Unity can also be used to create console games. Some popular console games that were created with Unity include Pokémon Go and Call of Duty: Mobile Unity3D is a powerful and versatile game engine that can be used to create games for a variety of platforms. It is a popular choice for game developers of all levels of experience.

3.2.2. SKETCH FAB

Sketch fab is a popular online platform and community for 3D modeling and sharing. Here's an overview of what Sketch fab is and what it offers:

3D Model Sharing:

Sketch fab allows users to upload and share 3D models online. Users can upload models they've created with 3D modeling software or scanned using 3D scanning technology.

Viewing and Interactivity:

Once a 3D model is uploaded to Sketchfab, it can be viewed in 3D directly within web browsers or on mobile devices. Users can rotate, zoom, and pan around the model to examine it from various angles.

Embedding:

Sketch fab provides embedding options, allowing users to easily integrate 3d Models into websites, blogs, and other online content. This is particularly useful for showcasing 3D models to a wider audience.

Community and Marketplace:

Sketch fab has a community of 3D artists, designers, and enthusiasts who share their work and interact with others. Additionally, there is a marketplace where users can buy and sell 3D models.

VR and AR Support:

Sketch fab supports Virtual Reality (VR) and Augmented Reality (AR) viewing of 3D models. Users can experience 3D models in immersive environments. Using VR headsets or AR apps.

Educational and Creative Uses:

Sketch fab is used in various industries, including gaming, animation, architecture, education, and art. It's a valuable resource for professionals and hobbyists alike.

File Compatibility:

Sketch fab supports a wide range of 3D file formats, making it Versatile for 3D artists and creators.

3.2.3 SKETCH UP

SketchUp is a popular 3D modeling software developed by Trimble Inc. It's widely used by architects, designers, engineers, and hobbyists for creating 3D models of buildings, interiors, objects, and more. Here are some key features and uses of SketchUp:

User-Friendly Interface:

Up is known for its intuitive and user-friendly interface, making it accessible to both beginners and experienced 3D modelers.

3D Modelling:

It allows users to create 3D models from scratch using a range of drawing and modelling tools. You can draw shapes, push and pull surfaces to create 3D forms and apply textures and materials.

Architectural Design:

SketchUp is particularly popular in architectural design. It's used to create 3D models of buildings, houses, and landscapes. The software includes tools for creating accurate floor plans and architectural details.

Interior Design:

Interior designers use SketchUp to visualize and plan interior spaces. You can add furniture, fixtures, and decor to your models to see how they fit and look in a room.

3D Printing:

SketchUp supports 3D printing, making it a useful tool for designing objects and prototypes for 3D printing.

4.1.4. BLENDER

Blender is a powerful and versatile open-source 3D computer graphics software. It is known for its extensive set of features and capabilities, making it a popular choice for a wide range of 3D modeling, animation, rendering, and simulation tasks. Here are some key aspects of Blender:

3D Modeling:

Blender provides a comprehensive suite of modeling tools for creating 3D objects, characters, environments, and more. You can use it for both organic and hard-surface modeling.

Animation:

It supports animation with features for rigging, character animation, keyframing, and motion capture. Blender's animation system is robust and flexible.

Texturing and Materials:

You can create and apply textures, materials, and shaders to 3d Models to achieve realistic or stylized visual effects.

Sculpting:

Blender includes a sculpting mode for high-detail sculpting and painting on 3d Meshes. This is useful for character and creature design.

Simulation:

It has built-in physics simulations for fluids, smoke, fire, cloth, and soft/rigid bodies. These simulations are valuable for creating realistic animations.

Rendering:

Blender features the Cycles and Eevee rendering engines. Cycles is a path- tracing engine known for high-quality, photorealistic rendering, while Eevee is a real-time engine suitable for interactive or game-like visuals.

Video Editing:

Blender includes a video editing workspace for editing and compositing video footage, making it a complete solution for video production.

VFX and Compositing:

You can add visual effects to your animations and footage using Blender's compositing nodes and tools.

3.3 HARDWARE REQUIREMENTS

VR Headsets:

VR headsets are the primary interface for users to immerse themselves in the virtual architectural environment. There are two main types of VR headsets



Fig no: 3.3 HARDWARE HEADSETS

Following are some of the popular virtual reality Headsets (head-mounted display):

- HTC VIVE
- Oculus Rift
- PlayStation VR
- Samsung Gear VR
- Google Cardboard

3.3.1 HTC VIVE:

It consists of hardware like its titular virtual reality headsets and accessories, virtual reality software and services, and initiatives that promote applications of virtual reality in sectors like business, arts, and video gaming.



FIG NO 3.3.1 HTC VIVE HEADSETS

3.3.2. OCULUS RIFT

It was the first virtual reality headset to provide a realistic experience at an accessible price, utilizing novel technology to increase quality and reduce cost by orders of magnitude compared to earlier systems



FIG NO 3.3.2 OCULUS RIFT HEADSETS

3.3.3 PLAYSTATION VR

The PlayStation VR is compatible with the PlayStation 5 via backward compatibility using a USB to PlayStation Camera adapter that is shipped for free by Sony to anyone who has previously purchased the PS



FIG NO 3.3.3 PLAYSTATION VR

3.3.4 SAMSUNG GEAR VR

The Gear VR unit itself acts as the controller, which contains the field of view, as well as a custom inertial measurement unit, or IMU, for rotational tracking, which connects to the smartphone via USB-C or micro-USB. The Gear VR unit itself acts as the controller, which contains the field of view, as well as a custom inertial measurement unit, or IMU, for rotational tracking, which connects to the smartphone via USB-C or micro-USB.



FIG NO 3.3.4 SAMSUNG GEAR

CHAPTER 4

RESULT AND DISCUSSIONS

1. RESULTS



FIG NO 4.1 Snap shot 1



FIG NO 4.2 Snapshot 2



FIG NO 4.2 Snapshot 3



FIG NO 4.2 Snapshot 2

5.1 DISCUSSION

VR has useful uses across a building's lifecycle, including training simulations, safety assessments, and maintenance planning. Preventing costly revisions during the building phase can be achieved by identifying design defects or conflicts in VR before construction begins. Numerous unforeseen situations, such as behaviors, perceptions, and attributions, emerged as a result of the virtual environment. First, the goal of the interviews was to look at behaviors that would not normally be seen in a non-virtual situation in order to understand the attribution process. Respondents were especially asked to recollect odd or improper actions since they might make a lasting impression. Modern technology and architectural design are combined to create an immersive virtual reality (VR) experience that gives consumers a captivating and lifelike virtual environment.

CHAPTER 5

CONCLUSION

5.1 CONCLUSION

Immersive VR allows architects, designers, and clients to step inside architectural models, providing a More immersive and realistic view of proposed spaces. This enables a deeper understanding of design concepts and spatial relationships. Immersive VR can incorporate real-world context, such as lighting, weather, and environmental conditions, providing a more accurate representation of how a building will interact with its surroundings. Interactive Design: VR allows for realtime interactivity, enabling users to modify and experiment with architectural elements in a dynamic way. This facilitates quick design iterations and decision making. Clients and stakeholders can actively participate in the design process by experiencing VR models firsthand. This leads to more informed feedback and a sense of ownership in the project. VR architectural models transcend language barriers and technical jargon, making it easier to communicate design ideas to diverse audiences. Beyond design, VR can be used for training simulations, safety evaluations, and maintenance, planning, offering practical applications throughout a building's lifecycle. Identifying design flaws or conflicts in VR before construction can significantly reduce costly changes during the construction phase. VR can assist in evaluating the sustainability and energy efficiency of architectural designs by simulating energy usage and daylighting. As VR technology continues to advance, it will become even more accessible and powerful, offering new opportunities for architectural design and visualization.

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APPENDIX:

MOVEMENT OF DOG:

Script

OpenDoor.cs using UnityEngine; using Valve.VR.InteractionSystem;

/*

* This class is attached to a door handle. The door handle is the child of a door.

*/

public class OpenDoor : MonoBehaviour

{

private Vector3 force; private Vector3 cross;

private bool

holdingHandle; private float angle; private const float

forceMultiplier = 150f; private void HandHoverUpdate(Hand

hand)

{ if (hand.GetStandardInteractionButton())

{

holdingHandle = true;

// Direction vector from the door's pivot point to the hand's current position

Vector3 doorPivotToHand = hand.transform.position -

```
transform.parent.position;
```

```
// Ignore the y axis of the direction vector doorPivotToHand.y = 0;  
// Direction vector from door handle to hand's current position force
```

```
= hand.transform.position - transform.position;
```

```
// Cross product between force and
```

```
direction. cross =
```

```
Vector3.Cross(doorPivotToHand, force); angle = Vector3.Angle(doorPivotToHand,  
force);
```

```
}
```

```
else if (hand.GetStandardInteractionButtonUp())
```

```
{  
    holdingHandle = false;
```

```
}
```

```
}
```

```
void Update()
```

```
{
```

```
    if (holdingHandle)
```

```
    {
```

```
        // Apply cross product and calculated angle to
```

```
GetComponentInParent<Rigidbody>().angularVelocity=cross* angle  
        * forceMultiplier; }
```

```
}
```

```

private void OnHandHoverEnd()
{

//      Set angular velocity      to      zero if the hand stops hovering

GetComponentInParent<Rigidbody>().angularVelocity      =
Vector3.zero;

}

}

```

OBJECT MOVEMENT:

```

using System.Collections; using
System.Collections.Generic; using UnityEngine; public class
FN_Slide : MonoBehaviour {      private      SteamVR_TrackedObject
trackedObject; private  SteamVR_Controller.Device device;

// Use this for

initialization void Start()

{

    GameObject RController = GameObject.Find("Controller (right)");

    trackedObject      =

RController.GetComponent<SteamVR_TrackedObject>();      device      =
SteamVR_Controller.Input((int)trackedObject.index); transform.localPosition = new
Vector3(0, 0, 0);
    } // Update is called once per frame void Update()
{

    if(device.GetPressDown(SteamVR_Controller.ButtonMask.Touchpad)&&d
evice.GetAxis().x <

```

```

0.5 && device.GetAxis().x > -0.5)

{

    transform.localPosition = new Vector3(0, 0, ((device.GetAxis().y - 1f)*(- 0.025f)));

    //transform.localPosition = Vector3.Lerp(new Vector3(0, 0, 0), new Vector3(0,
    0, 0.05f), ((device.GetAxis().y+1)/(-2)));
}

if (device.GetPressUp(SteamVR_Controller.ButtonMask.Touchpad))

{

    transform.localPosition = new Vector3(0, 0, 0);

}

    if (device.GetPressDown(SteamVR_Controller.ButtonMask.Touchpad)
    && device.GetAxis().x < 0.5 && device.GetAxis().x > -0.5 && device.GetAxis().y <
    -0.75)
    {

        device.TriggerHapticPulse(10000);

    }

}

}

```

PLAGIARISM REPORT



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Detailed Review Report

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	Rating of article (5 = excellent, 1 = poor)	5	4	3	2	1
1	Relevant to the themes of the journal	✓				
2	Contribution to academic debate		✓			
3	Structure of the paper			✓		
4	Standard of English	✓				
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6	Relevance and clarity of drawing, graphs and tables				✓	
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Page Number : 1 of 2



Decision regarding the paper

- (*) Accept the paper in its current format
- () Accept the paper with minor changes
- () Resubmit with the major changes
- () Decline the submission

First Reviewer's Comment (Double Blind Peer Review Process)

This paper is well organized and followed the manuscript guidelines of the journal to a large extent. The introduction section is good and shows the importance of the study. Literature review is adequate. Outcomes of the study are consistent with the findings. The approach used is praiseworthy. In my opinion, it should be published with no revision although implication to the research needs to be explicit.

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