IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 26, Issue 2, Ser. 1 (Mar. – Apr. 2024), PP 36-41
www.iosrjournals.org

Adding Immersive To Virtual Reality With Architectural Models

Sreeramoju Shraddha
Department Of Information Technology Sathyabama Institute Of Science And Technology
Chennai, India

Chabathula Vazra Hima Bindhu
Department Of Information Technology Sathyabama Institute Of Science And Technology
Chennai, India

Subhashini R
Department Of Information Technology Sathyabama Institute Of Science And Technology
Chennai, India

Yanamadala Satya Priyanka
Department Of Information Technology Sathyabama Institute Of Science And Technology
Chennai, India

Santha Sheela A C
Department Of Computer Science Sathyabama Institute Of Science And Technology
Chennai, India

Abstract—
Using architectural models to create an immersive virtual reality (VR) experience requires utilizing technology to make the models come to life in a three-dimensional setting. Digitize your architectural models first. You can accomplish this by using 3D modelling software, which enables you to produce precise, in-depth depictions of your architectural concepts. Your 3D models must be translated into a format that works with VR platforms once you have them. This frequently entails making sure the models are interactive in the VR environment and optimizing them for real-time rendering. Create a virtual reality setting that can hold your architectural models. To create a realistic experience, this environment can mimic elements of the real world, such as lighting, textures, and atmosphere. Put in place elements that let consumers communicate with the models. This may be being able to move around, zoom in and out, switch up the materials, or turn on specific architectural features. Incorporate immersive components to improve the experience. For example, include background music, interactive features such as doors that may be opened, particular architectural features. Test the VR experience thoroughly to make sure it's intuitive and delivers the desired immersive experience. Adjust it in light of user comments. In order to maximise performance in virtual reality (VR) without sacrificing the fundamentals of the design, the abstraction process may entail stylising or streamlining some architectural aspects.

Keywords—*virtual reality, architecture, buildings*

Date of Submission: 01-03-2024 Date of Acceptance: 10-03-2024

I. INTRODUCTION

By using architectural models to create immersive virtual reality experiences is a ground-breaking method of bringing designs to life and transforming how we view and engage with architectural spaces. Architects can go beyond the conventional presentation format and provide clients and stakeholders with a dynamic and fully immersive experience by utilizing virtual reality technology. With the help of these virtual reality (VR)-enabled architectural models, users can enter a space and explore it in three dimensions, interact with its elements, and gain a realistic sense of scale and proportion. With the help of this technology, which closes the gap between blueprints and reality, architects, clients, and investors can now see and comprehend architectural designs in a way that was previously unattainable. Virtual reality architectural models offer an immersive experience that goes beyond mere aesthetic display to capture the spatial experience. Within a virtual

setting, users can explore rooms, take in lighting effects throughout the day, and even mimic the way natural elements interact with the design. This degree of immersion encourages a more profound comprehension and admiration of the architect's concept. VR architectural models help with decision-making and teamwork. Better-informed feedback from clients, on-the-spot adjustments from architects, and first-hand experience from stakeholders with the proposed space all contribute to improved communication and, eventually, better-designed spaces. VR in architecture has a wide range of potential uses that are growing quickly as technology develops. Urban planning, commercial buildings, and residential designs. Virtual reality architectural models are revolutionizing the way we imagine, design, and interact with spaces. Adopting this technology is about more than just innovation; it's about improving our interactions with our surroundings and forming an increasingly creative and productive future for architecture.

II. Literature Survey

Klaudia Mandhi, Lara Marie Reimer, Stephan Jonas [1] We developed a hands-free model allowing intuitive movement in virtual environments. Unlike traditional obstacle courses, our model mimics natural walking by smoothly transitioning between left and right movements. This method replicates a stepping pace, making it easy to learn and use interactively. Using videos of different walkers didn't affect user movements, allowing us to derive ankle platform data for mapping to virtual walking. We linked negative peaks to foot tapping and positive peaks to midstance/terminal stance, defining the avatar's movement. Our model increases avatar speed with increased ankle movement frequency. Virtual Reality (VR) immerses users in computer-generated environments through headsets, while our Haptic Ankle Platform enables discrimination of terrains during walking. Interfaces with haptic feedback were easier to learn than those requiring manual input, though synchronization issues existed. Experimental studies using LLCM supported our findings on avatar motion calculation.

Qianqian Tong, Wenxuan Wei, Yuru Zhang, Jing Xiao, Fello and Dangxiao Wang [2] This survey delves into hand-based haptic interaction for virtual reality (VR), focusing on wearable devices and sensors that offer tactile experiences in virtual environments. It explores current technologies, challenges, and potential industry applications. Haptic feedback enriches VR immersion by allowing users to sense and interact with virtual objects, enhancing realism. It improves user interaction by conveying texture, shape, and weight, creating more intuitive experiences. However, current hand-based systems may have limitations in providing diverse sensory feedback, impacting immersion. Future directions include enhancing interaction between hands and sensors, improving realistic sensory feedback, and developing software platforms for hand-based haptic simulations. Techniques like kinesthetic rendering simulate hand interactions, facilitating a more engaging VR experience.

Ata Otaran, Ildar Farkhatdinov [3] This study explores a hands-free VR experience using natural walking movements, allowing users to move smoothly in the virtual environment. By observing real walking tasks and mapping ankle movements, the study designed a simple model linking avatar speed to ankle movement frequency. The VR setup immerses users in lifelike scenes, felt through a VR headset, while proposing easily learnable walking gestures for diverse terrains, enabling haptic feedback. The research conducted by Ata Otaran & Ildar Farkhatdinov emphasizes the ease of learning these gestures for interactive walking in VR.

Pier Paola Tricomi, Fedrica Senna, Luca Pajola [4] In this survey, AR/VR the user profiling is a collection & Analysis of user data to their personalised experiences in these immersive environment.Through the headsets developed and platforms may gain insight into users interactions , preferences & behaviours which in turn helps them create more personalized experienced

Nese Calici Alp, Yesemin Ejkan Yazici,Dilan Oner [5]Integrating augmented reality (AR) experiences can significantly impact client interactions, teamwork, and the design process in an architectural design studio. Here is an overview of augmented reality's main features and advantages. Thanks to augmented reality, architects can now view and show their plans in a real-world setting. By superimposing virtual models onto real-world locations, architects can evaluate how well their designs blend in with their surroundings. Through immersive and engaging experiences, augmented reality (AR) improves client presentations. Before construction starts, clients can examine design options, see architectural models in three dimensions, and learn more about the project they have in mind. By concurrently viewing and interacting with 3D models in a shared augmented reality area, teams can communicate more successfully. Team members can now discuss, evaluate designs, and make decisions in real-time.

Saeed Safikhani, Stephan Kevar, Gerald Schweiger &Johanna pirker [6] A Systematic review of immersive VR and its potential to extend Building Information Modelling (BIM) in the architecture, engineering and construction (AEC) sector. Provide a summary of research that looks at how immersive VR improves 3D modelling and spatial representation in BIM visualization. Examine studies on interaction design, user experiences, and the effect of immersive VR on BIM user engagement. Examine research concentrating on how VR helps collaborative design processes in the AEC industry. Examine the use of virtual reality (VR) to

replicate construction processes and spot possible problems during the design stage. Examine research on the use of immersive virtual reality (VR) for safety simulations and worker training in the AEC industry

Virtual reality use in architectural design studios:a case of studying and construction 2013-Elsevier B.V [7]Virtual reality (VR) has the potential to greatly enhance learning experiences across various professions. Through interactive simulations and hands-on training, VR offers dynamic and memorable learning opportunities that traditional classrooms can't replicate. This immersive approach is particularly valuable in high-risk industries like engineering and medicine, where practical experience is limited. Additionally, VR caters to different learning styles, allowing users to study at their own pace. In design studios, VR enables architects and interior designers to immerse themselves and clients in virtual representations of projects, enhancing visualization, fault detection, and communication among team members and clients.

Entering the next dimension: a review of 3d user interface for VR 1st feb 2024 -Adriel Yeo,Benjamin W.J.Kwok,Angelene Joshna,Kan Chan,Jeannie S.A Lee[8]By upending preconceived ideas about user interfaces, virtual reality (VR) has created new opportunities for human-computer interaction. This review examines the field of virtual reality's 3D user interfaces (DUIs), emphasizing the concepts, methods, and uses of these interfaces in several fields. Designing interfaces with spatial awareness in mind improves user comprehension and navigation by utilizing the spatial context of virtual reality experiences. With gaze-based interaction, the user may choose and manipulate virtual objects with targeted attention by moving their head and monitoring their eyes. Through the exploration of virtual settings and interaction with digital content, 3DUIs in education enable experiential learning and hands-on instruction in areas like science, history, and art.3DUIs help with virtual prototyping, collaborative planning, and design visualization in architecture and engineering.

III. PURPOSE OF WORK

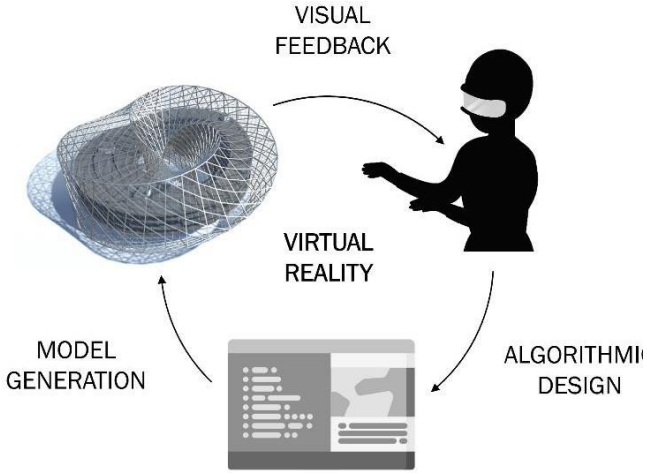


Fig. 1. Frame work for VR Architecture models

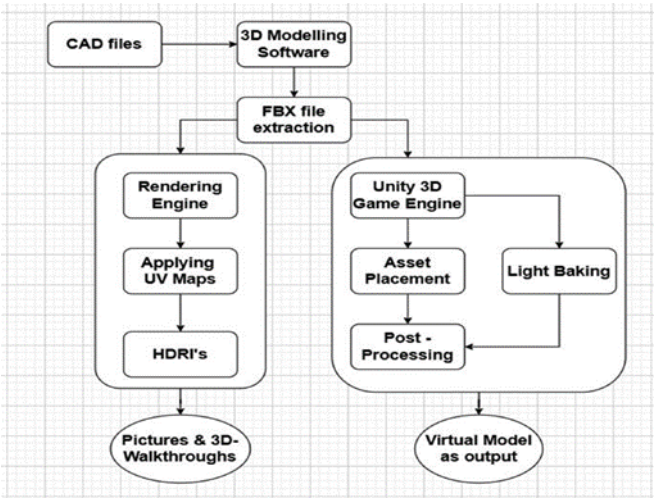


Fig..2. Workflow for Immersive experience

Our proposal is to create a comprehensive virtual reality (VR) environment that is customised to our clients' unique requirements and goals. Our group will use best practices and state-of-the-art technology to give

users an immersive and interesting experience. The main phases of development are described in this proposal, from specifying the requirements and scope to deploying and providing post- launch support.

Architecture and stakeholders interaction with architectural models has been transformed by virtual reality (VR) technology. Users can navigate, explore, and interact with architectural designs in immersive virtual environments by utilising virtual reality (VR), which provides a novel and dynamic means of assessing and communicating design concepts. This related topic investigates how to improve architectural experiences in virtual reality environments by integrating interactive features, real-time feedback, and collaboration functionalities. This allows architects and stakeholders to efficiently communicate and assess designs.

To obtain a thorough understanding of the architectural design, users are free to roam around the virtual environment and explore various areas and viewpoints.Intuitive navigation controls, such as teleportation, free locomotion, or room-scale movement, enhance user immersion and facilitate seamless exploration of the virtual space.Design concepts can be seen in real time by users interacting with virtual objects, adjusting design elements, and starting animations or simulations.In addition to offering context and extra information, interactive hotspots, tooltips, and annotations lead users through the architectural model while emphasising important elements or design considerations.In the virtual reality environment, real-time feedback mechanisms allow stakeholders and architects to assess design iterations andoffer prompt feedback or recommendations.

Multiple users can join a shared VR session thanks to collaborative features, facilitating real-time communication and teamwork between stakeholders, clients, and customers.Through realistic and powerful VR experiences, stakeholders can experience architectural designs, leading to a deeper comprehension and appreciation of the design intent.

A. Proposed Algorithm

CREATING A NEW PROJECT:

Gather Architectural Assets: For the building or area you wish to recreate, gather architectural drawings, blueprints, CAD models, and any other reference materials.Acquire or produce three-dimensional models of the architecture, encompassing the exterior of the building, interior spaces, furnishings, fittings, and additional pertinent items.

Select a Platform for VR Development: Choose a VR game engine or development platform, such as Blender, Unreal Engine, or Unity3D, that supports virtual reality.Make sure it works with the VR devices you want to use and the features you want.

Modelling: Open the VR development platform ofyour choice and import architectural models.Make the models as efficient as possible for VR and real-time rendering.As needed, create extra assets like plants, landscaping, or decorative accents.

Texturing and Material Assignment: To add realism and detail to the 3D models, apply materials and textures.To preserve performance, make sure the texture resolution is appropriate for virtual reality.For accurate lighting and shading, use physically-based rendering (PBR) materials.

Lighting Design: To replicate artificial and naturallighting, add virtual lights to the surroundings.To improve the mood and atmosphere, play with the colour, shadows, and light intensity.If required, incorporate dynamic lighting effects, such as shifting weather patterns or day-night cycles.

Optimisation: Use level of detail (LOD) approaches, optimise textures, and minimise the number of polygons in the VR environment to maximise performance.To guarantee smooth frame rates and low latency, test the environment on the intended VR devices.

Interactive Features and Navigation: Incorporate interactive features like windows, doors, switches, and movable items.Configure teleportation, free locomotion, androom-scale movement as well as other navigation features toallow users to move around the virtual reality environment.To access more options or information, includeinteractive menus or hotspots.

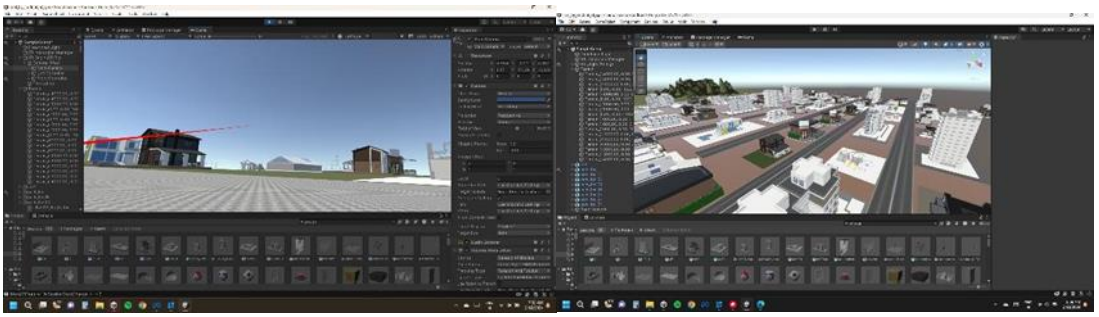
Designing User Experiences (UX): Create user- friendly virtual reality (VR) interfaces (UI) for interaction.To guarantee a relaxing and engaging experience for every user,take into account accessibility and usability guidelines.To get feedback and make changes, test the VR environment on prospective users.

Testing and Iteration: Carefully test the virtual reality environment to find and address any bugs, glitches, or performance problems.Adjust the design iteratively in response to user input and testing outcomes.To fulfil user expectations and project goals, the VR environment should be improved and refined continuously

IV. RESULT AND DISCUSSION:

There are several advantages for the IT and computer science fields when virtual reality is combined with architectural models. It offers better user engagement, better collaboration, and enhanced visualisation. Users will be able to interact realistically and intuitively with architectural designs through an immersive experience provided by the proposed work. Applications for this integration can be found in many fields, such as historical preservation, real estate, education, urban planning, and architecture. The algorithms created for this project

guarantee effective model loading, user interaction, visualisation, virtual environment navigation, and collision detection. All things considered, thecombination of virtual reality and architectural models has enormous potential to change how architectural designs are viewed and experienced.



Result

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

Discussion

VR allows for real-time 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 theproject. VR architectural models transcend language barriers and technical jargon, making it easier to communicate design ideas to diverse audiences. Beyond designing is a very big rocess to create every object and every floor and complete city with neat architecture of any design process .and by using sketup files creating some environments. VR can be used for training simulationssafety evaluations, and maintenance planning, offering practical applications throughout a building'slifecycle. Identifying design flaws or conflicts in VR before construction can significantly reduce costly changes during the construction phase.The virtual setting gave rise to many unexpected conditions, including behaviors, perceptions, and attributions. To understand the attribution process, the focus of the interviews was first to examine behaviors that would typically not be exhibited in a non-virtual setting. Interviewees were asked to specifically recall unusual or inappropriate behaviors, as these would potentially leave a longer impression Creating an immersive virtual reality (VR) experience with architecture models involves combining cutting-edge technology and architectural design to provide users with a compelling and realistic virtual environment. This project aims to elevate the traditional architectural modeling process by integrating VR, allowing users to explore and engage with architectural designs in a more interactive and immersive way. One of the key aspects of this project is the utilization of virtual reality to simulate the spatial dimensions and visual aesthetics of architectural models. By donning a VR headset, users can step into a three-dimensional representation of the proposed architecture, offering a sense of scale, proportion, and perspective that goes beyond traditional blueprints or 3D renderings. This immersive experience enables architects, clients, and other stakeholders to better understand the spatial relationships within the design. Moreover, the project may incorporate features such as real-time rendering, allowing users to see how different lighting conditions affect the architecture and experience a more lifelike representation. This dynamic interaction with the virtual environment contributes to a more comprehensive understanding of the design's impact in various scenarios. Collaboration and communication within the project team can also be enhanced through the use of VR. Multiple stakeholders can join the virtual space simultaneously, enabling real-time discussions and feedback. Architects, designers, and clients can explore the virtual model together, discussing design elements, making adjustments on the fly, and fostering a more collaborative and iterative design process. Morover after creating complete architure file and forming complete by using vr headset we can clearly watch through that we can experience the real world Additionally, integrating interactive elements into the VR experience can further enhance user engagement. Users might have the ability to manipulate certain aspects of the architecture, such as changing materials, adjusting lighting, or even experiencing different design options. This level of interactivity not only empowers users to make informed decisions but also adds an element of playfulness to the architectural exploration. To achieve these goals, the project likely involves a combination of architectural expertise, 3D modeling software, and VR technology. The architectural models need to be meticulously crafted to ensure accuracy and realism, while the VR implementation should be seamless to provide a smooth and immersive

experience. In summary, adding immersion to virtual reality experiences with architecture models is a forward-thinking approach that revolutionizes the way we perceive and interact with architectural designs. It goes beyond static representations, offering a dynamic and collaborative platform that has the potential to reshape the architectural design process

REFERENCES

[1]. Klaudia Mandhi, Lara Marie Reimer, Stephan Jonas We Developed A Hands-Free Model Allowing Intuitive Movement In Virtual Environments

[2]. Qianqian Tong, Wenxuan Wei, Yuru Zhang, Jing Xiao, Fello And Dangxiao Wang.This Survey Delves Into Hand-Based Haptic Interaction For Virtual Reality (Vr).

[3]. Ata Otaran, Ildar Farkhatdinov.This Study Explores A Hands-Free Vr Experience Using Natural Walking Movements, Allowing Users To Move Smoothly In The Virtual Environment.

[4]. Pier Paola Tricomi, Fedrica Senna, Luca Pajola.In This Survey, Ar/Vr The User Profiling Is A Collection & Analysis Of User Data To Their Personalised Experiences In These Immersive Environment.

[5]. Nese Calici Alp, Yesemin Ejkan Yazici,Dilan Onerintegrating Augmented Reality (Ar) Experiences Can Significantly Impact Client Interactions, Teamwork, And The Design Process In An Architectural Design Studio.

[6]. Saeed Safikhani, Stephan Kevar, Gerald Schweiger & Johanna Pirker.A Systematic Review Of Immersive Vr And Its Potential To Extend Building Information Modelling (Bim) In The Architecture, Engineering And Construction (Aec) Sector.

[7]. Virtual Reality Use In Architectural Design Studios:A Case Of Studying And Construction 2013-Elsevier B.V.Virtual Reality (Vr) Has The Potential To Greatly Enhance Learning Experiences Across Various Professions.

[8]. Entering The Next Dimension: A Review Of 3d User Interface For Vr 1st Feb 2024 -Adriel Yeo,Benjamin W.J.Kwok,Angelene Joshna,Kan Chan,Jeannie S.A Lee..By Upending Preconceived Ideas About User Interfaces, Virtual Reality (Vr) Has Created New Opportunities For Human- Computer Interaction.

[9]. Ding, L., Wu, C., & Lin, H. (2016). Vr-Based Evaluation System For Architectural Design. 2016 International Symposium On Computer, Consumer And Control (Is3c), 499-502.

[10]. Guo, S., Li, Y., Liu, X., & Li, H. (2018). Exploring The Application Of Virtual Reality In Architectural Education. 2018 3rd International Conference On Computer Science And Application Engineering (Csae), 579-583.

[11]. Koren, S., Katz, R., & Bar-Sinai, Y. (2017). A Collaborative Virtual Reality-Based Architectural Design System. 2017 Ieee Virtual Reality (Vr), 389-390.

[12]. Park, J., Kim, J., & Cho, M. (2019). Real-Time Rendering Of Large-Scale Architectural Models For Virtual Reality. Ieee Access, 7, 105705-105715.

[13]. Shen, W., Wang, X., & Wu, D. (2018). Application Of Virtual Reality In Architectural Presentations. 2018 9th International Conference On Information Technology In Medicine And Education (Itme), 512-516.

[14]. Wang, Z., Chen, M., & Wang, Y. (2019). A Vr-Based System For Architectural Walkthroughs. 2019 12th International Congress On Image And Signal Processing, Biomedical Engineering And Informatics (Cisp-Bmei), 1-5.

[15]. For Papers Published In Translation Journals, Please Give The English Citation First, Followed By The Original Foreign- Language Citation [6].