VR FIRE DRILL

Abhishek Saji
Dept.of CSE MBCCET
5188@mbcpeermade.com

Adithya Udayan
Dept. of CSE MBCCET
5285@mbcpeermade.com

Benson Mathew
Dept. of CSE MBCCET
5286@mbcpeermade.com

Cyril Sunil Zachariah
Dept. of CSE MBCCET
5254@mbcpeermade.com

Prof. Ushus Maria Joseph
Dept. of CSE MBCCET
ushusmariajoseph@mbcpeermade.com

***Abstract*—The VR Fire Drill project aims to provide an interactive and immersive training experience for individuals on fire evacuation procedures. The project leverages VR technology to create a realistic simulation of a fire emergency scenario in a virtual building, allowing users to familiarize themselves with the building layout, emergency exits, and proper evacuation procedures. The simulation includes various fire hazards, such as smoke, flames, and heat, to provide a realistic experience, as well as interactive elements like emergency exits, alarms, and fire extinguishers. The project also includes customized simulations to match the layout of specific buildings and relevant fire hazards and uses analytics and tracking to evaluate individuals' performance during the simulation. The debriefing session after the simulation provides opportunities for improvement. Overall, this VR fire drill project provides a valuable training tool to prepare individuals for real-life fire emergencies and improve their overall fire safety awareness.**

I. INTRODUCTION

Fire emergencies are among the most critical situations that can occur in a building or facility. The speed and effectiveness of the evacuation process can be the difference between life and death. As a result, it is essential that individuals working in a building are well trained in evacuation procedures and are familiar with the layout of the building and the location of emergency exits. The aim of the MBC Fire Safety Virtual Drill Based on VR is to provide an interactive and immersive training experience that prepares individuals for a fire emergency. The use of virtual reality technology in this project offers a number of benefits. Firstly, it allows for a realistic simulation of a fire emergency scenario in a virtual building. This enables users to familiarize themselves with the building layout and emergency exits, and to practice the proper evacuation procedures. Secondly, the use of interactive elements, such as emergency exits, alarms, and fire extinguishers, allows individuals to experience the scenario in a realistic manner. Thirdly, the use of realistic sound effects and other sensory cues enhances the immersion of the simulation. In this project, the VR simulation can be customized to match the layout of a specific building or facility, and to include specific fire hazards that are relevant to that particular location. This ensures that the training is relevant and effective for each individual. The use of analytics and tracking also enables the progress of the individual to be recorded and evaluated, with the aim of identifying areas for improvement. A debriefing session after the simulation provides an opportunity for individuals to discuss their experience and to identify areas for improvement. Overall, the MBC Fire Safety Virtual Drill Based on VR provides a valuable training tool for individuals working in a building or facility. It helps to increase preparedness and response time in the event of a real fire emergency, and to improve overall fire safety awareness. By combining the benefits of virtual reality technology with the importance of fire safety training, this project has the potential to make a significant contribution to the safety and well-being of individuals working in a building or facility. Virtual Reality Technology in Fire Safety Training Virtual reality technology has rapidly evolved over the last few years and has become an important tool in various fields, including education, healthcare, and entertainment. In recent years, VR technology has also been applied in the field of fire safety training, as a way to provide an interactive and immersive training experience for individuals. The use of VR technology in fire safety training offers a number of benefits over traditional training methods. Firstly, VR technology allows for a realistic simulation of a fire emergency scenario in a virtual building. This enables individuals to familiarize themselves with the layout of the building and the location of emergency exits, and to practice the proper evacuation procedures. Secondly, the use of interactive elements, such as emergency exits, alarms, and fire extinguishers, allows individuals to experience the scenario in a realistic manner. Thirdly, the use of realistic sound effects and other sensory cues enhances the immersion of the simulation, making the experience more engaging and memorable.

II. LITERATURE SURVEY

- The paper "VR Color Picker: Three-Dimensional Color Selection Interfaces" by Jeun Kim, Jae-In Hwang, and Jeun Lee discusses the introduction of a 3D color picker in the VR environment. It replaces the traditional 2D color pickers with a cube shaped RGB color space that allows users to select colors using a 3D pointing device. The paper also introduces the HSV color model, represented as a cone, which uses hue, saturation, and lightness as the basic properties of a color. [1]
- The paper discusses the use of bilateral stimulation in virtual reality to reduce stress. Bilateral stimulation is a technique that involves the simultaneous stimulation of both sides of the body, and has been shown to have a calming effect on the nervous system. The authors explore the use of bilateral stimulation in virtual reality to reduce stress and report that their findings indicate that this approach can be effective. They also suggest that further research is needed to fully understand the underlying mechanisms and to develop optimal protocols for delivering bilateral stimulation in virtual reality.[2]
- In this paper an immersive Virtual Reality Technology for learning and teaching is proposed. This makes teaching and learning more immersive. In traditional VR learning environ mints supervision and monitoring of students are difficult, this paper proposes a new conception of a Virtual Reality Learning Management System (LMS) for direct or indirect supervision of the VR students. The supervisor can monitor or intervene with the activities of students whenever they want.[3]
- In this paper a VR system to simulate tightrope walking with a standalone VR headset and Slack Rails is proposed. The usage of slack rail along with VR makes it more realistic. It is harder to maintain balance in this system compared to a standalone

VR system.[4] • The 3D semi-immersive virtual reality (VR) system for online luxury goods visualization and customizing service is evaluated in this article. The outcome demonstrates that views toward the 3D virtual reality system are significantly positively impacted by perceptions of presence, utility, usability, and experience value. It also demonstrates how leveraging the benefit of 3D VR systems with access to real-time product manipulation has improved attitudes regarding the technology in this particular situation.[5] • This paper describes an educational program, created for learning the history of Renaissance architecture with the support of ScoolAR platform. The experience conducted within the educational program allowed us to achieve several interesting results in terms of student involvement and know edge acquisition. ScoolAR aims to boost more engagement and awareness in the exploitation of AR and VR. There is no evidence in the state-of-art of a didactic tool that allows to create AR/VR applications without programming skills. ScoolAR will enable an autonomous content creation system without the requirement of any programming skill.[6] • The paper" Feasibility Analysis of VR Technology in Physical Education and Sports Training" by Tangbao Li and Yupeng Li investigates the potential use of virtual reality (VR) technology in physical education and sports training. It evaluates the feasibility of using VR in this context and the potential benefits and challenges that might arise. The study aims to provide a comprehensive overview of the current state of VR in physical education and sports training and to identify future directions for research and development in this field.[7] • The paper" VR Technology in English Teaching from the Perspective of Knowledge Visualization" by Yanfeng Zhou focuses on the use of virtual reality technology in English language teaching and the concept of knowledge visualization. The author discusses how VR technology can help enhance the learning experience of students by providing an immersive environment for practicing language skills and visualizing complex concepts. The paper also explores the challenges and limitations of using VR technology in language education and suggests possible solutions to overcome these issues.[8] • This paper evaluates the feasibility of using VR technology in basketball training. The authors analyze the potential benefits and challenges of incorporating VR into basketball training and determine whether it is a viable option for enhancing player performance. The study focuses on how VR technology can be used to provide players with a realistic and immersive training experience that improves their basketball skills [9]. •This paper discusses the development of a near- eye display that can switch between Augmented Reality (AR) and Virtual Reality (VR) modes and also support accommodationvergence and eyeglass prescription. The authors aim to enhance the VR/AR experience by allowing users to switch between AR and VR modes and providing a customized display that accommodates for individual eyeglass prescription and eye convergence. The technology stack used in this project is not specified in the paper.[10]

III. PROPOSED WORK

A. PROBLEM STATEMENT

The need for proper training and preparation in the event of a fire emergency is crucial for the safety of individuals in any building or facility. Despite the importance of fire safety, traditional fire drills and training sessions can be limited in their effectiveness, particularly in terms of simulating a realistic fire emergency scenario. This can result in individuals not being fully prepared for a real-life fire emergency, and can lead to confusion, panic, and in extreme cases, injury or death.

B. PROPOSED METHODOLOGY

The proposed methodology for the MBC Fire Safety Virtual Drill Based on VR project is to use virtual reality technology to simulate a fire emergency scenario in a building or facility. The VR simulation will be designed to provide an interactive and immersive experience for individuals, allowing them to familiarize themselves with the building layout and emergency exits, as well as to practice the proper evacuation procedures. The VR simulation will also include various fire hazards, such as smoke, flames, and heat, to provide a realistic fire emergency scenario.

C. SYSTEM DESIGN

The VR fire drill system will be as follows: 1. Students, faculty members, and staff will wear the VR headset and enter the simulation environment. 2. The simulation environment will simulate a fire emergency scenario with visual and audio cues. 3. Users will use the fire extinguisher simulator to practice extinguishing a simulated fire. 4. Users will be evaluated on their performance and provided feedback on areas of improvement.

D. PROPOSED SYSTEM

The VR fire drill system will be as follows: 1. Students, faculty members, and staff will wear the VR headset and enter the simulation environment. 2. The simulation environment will simulate a fire emergency scenario with visual and audio cues. 3. Users will use the fire extinguisher simulator to practice extinguishing a simulated fire. 4. Users will be evaluated on their performance and provided feedback on areas of improvement.

- **The Training Room Scene** will provide a virtual space for the learners to practice using fire extinguishers and develop their fire safety skills. The room will have a designated area for the learners to practice using fire extinguishers, and the learners will be able to interact with the virtual environment using controllers.
- **The Fire Drill Scene** will be the main section of the VR Fire Drill system, where learners will experience a simulated fire emergency. The system will include a scenario that simulates a real-life fire emergency, and participants will wear VR headsets and use controllers to navigate through the virtual space.
- The VR Fire Drill system has been designed to be highly effective and efficient in simulating real-life fire scenarios, providing trainees with an immersive and realistic experience of fire emergencies, which is crucial

in preparing them to handle actual situations.

E. SYSTEM REQUIREMENTS

1. VR headset or other VR technology that is compatible with the VR simulation software. 2. High-performance computer with sufficient graphics card and processing power to run the VR simulation smoothly. 3. Adequate bandwidth and network infrastructure to support the VR simulation and the transfer of data between the VR headset and the computer system. 4. Software to create and customize the VR simulation, including assets and 3D models of the building, emergency exits, and fire hazards. 5. Technical support personnel to aid and troubleshoot any technical issues that may arise during the simulation

1) Hardware Specification: • Processor: i5 or i7 (i7 is better) • RAM: 12GB (Minimum) • Hard Disk: 500GB or above • Mouse • Keyboard

2) Resource Required: • VR hardware: VR headset or other VR technology to create a realistic simulation of the building and fire emergency scenario. • Computer system: High-performance computer with sufficient graphics card and processing power to run the VR simulation smoothly. • Software: VR simulation software, tracking software. • Content creation tools: Tools to create and customize the VR simulation, including assets and 3D models of the building, emergency exits, and fire hazards. • Technical support: A team of technical support personnel to provide assistance and troubleshoot any technical issues that may arise during the simulation.

IV. CONCLUSION

The VR Fire Drill will offer a cutting-edge training solution for building occupants to practice fire evacuation procedures in a realistic virtual environment. The VR technology provides an immersive experience, allowing individuals to familiarize themselves with the building layout and emergency exits, and to practice the proper evacuation procedures. The use of interactive elements, sound effects, and sensory cues will further enhance the realism of the simulation, making it an effective tool for preparing individuals for real-life fire emergencies. The project is a step towards ensuring the safety of building occupants and promoting fire safety awareness.

V. SCREEN SHOTS

REFERENCES

[1] J. Kim, J. -I. Hwang and J. Lee, ”VR Color Picker: Three-Dimensional Color Selection Interfaces,” in IEEE Access, vol. 10, pp. 65809-65824, 2022, doi: 10.1109/ACCESS.2022.3184330. [2] D. Kamin´ska, K. Smo´łka, G. Zwolin´ski, S. Wiak, D. Merecz-Kot and G. Anbarjafari, ”Stress Reduction Us- ing Bilateral Stimulation in Virtual Reality,” in IEEE Ac- cess, vol. 8, pp. 200351-200366, 2020, doi: 10.1109/ACCESS.2020.3035540. [3] D. Kamin´ska, K. Smo´łka, G. Zwolin´ski, S. Wiak, D. Merecz-Kot and G. Anbarjafari, ”Stress Reduction Us- ing Bilateral Stimulation in Virtual Reality,” in IEEE Ac-cess, vol. 8, pp. 200351-200366, 2020, doi: 10.1109/AC CESS.2020.3035540. [4] S. Aoyagi, A. Tanaka, S. Fukumori and M. Yamamoto, ”VR system to simulate tightrope walking with a standalone VR headset and slack rails,” 2019 IEEE Conference on Virtual Reality and 3D User Interfaces (VR), Osaka, Japan, 2019, pp. 1293-1294, doi: 10.1109/VR.2019.8797999. [5] S. Altarteer and V. Charissis, ”Technology Acceptance Model for 3D Virtual Reality System in Luxury Brands Online Stores,” in IEEE Access, vol. 7, pp. 64053-64062, 2019, doi: 10.1109/ACCESS.2019.2916353. [6] M. Puggioni, E. Frontoni, M. Paolanti and R. Pierdicca, ”ScoolAR: An Educational Platform to Improve Students’ Learning Through Virtual Reality,” in IEEE Access, vol. 9, pp. 21059-21070, 2021, doi: 10.1109/ACCESS.2021.3051275. [7] C. Li and Y. Li, ”Feasibility Analysis of VR Technology in Physical Education and Sports Training,” in IEEE Access, doi: 10.1109/ACCESS.2020.3020842. [8] Y. Zhou, ”VR Technology in English Teaching from the Perspective of Knowledge Visualization,” in IEEE Access, doi: 10.1109/ACCESS.2020.3022093. [9] Z. Ma, F. Wang and S. Liu, ”Feasibility Analysis of VR Technology in Basketball Training,” in IEEE Access, doi: 10.1109/ACCESS.2020.3019810. [10] X. Xia et al., ”Towards a Switchable AR/VR Near□eye Display with Accommodation-Vergence and Eyeglass Pre□scription Support,” in IEEE Transactions on Visualization and Computer Graphics, vol. 25, no. 11, pp. 3114-3124, Nov. 2019, doi: 10.1109/TVCG.2019.2932238. [11] https://learn.unity.com [12] https://www.blender.org/support/tutorials