EDUCATIONAL MODULE/ SIMULATION OF EMERGENCY EVACUATION FOR BUILDING SAFETY

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ABSTRACT:

In this project, we sought to create a virtual reality setting for emergency evacuation scenarios, such as fire mishaps, bomb explosions, and natural disasters. The project is significant because it offers a secure and controlled setting for emergency preparedness training. The virtual reality setting displays a faithful representation of a building with various rooms, hallways, stairs, and exits. People who need training for emergency situations, such as firefighters, security personnel, and building managers, are the application's main target audience. In order to prepare people for actual emergency situations, we set out to develop a practical tool. The application simulates an emergency and directs the user to a safe exit from the building. This application is beneficial because it can offer a secure and affordable training tool that can assist people in getting ready for emergencies.

INTRODUCTION:

Our project's purpose is to create a virtual reality environment for emergency evacuation situations. The project's goals include creating a realistic environment, adding features like interaction, animations, and sensors, and creating a user-friendly interface. A building with numerous floors, rooms, staircases, and exits makes up the virtual environment. Geometry, textures, animations, functionality, and other features of the environment are all included.

IMPLEMENTATION:

1. **Introduction**: The simulation starts a play button for Evacuation from a building during a Fire accident following the exit sign boards and the objective is to exit the building safely before losing full health.

2. Evacuation Introduction: The simulator should follow exit sign boards for evacuating from the building to a safe environment for the evacuation watching the fire that is spreading through the building.

3. **Types of Emergencies**: This project covers different types of emergencies that could occur in a building, such as fire, earthquake, or a gas leak. This evacuation simulation helps the user to evacuate every type of emergency situation that he can face in real time.

4. **Evacuation Plan**: The simulation provides an overview of the building's evacuation plan, including the routes, exits, and assembly points. Users will be able to visualize the evacuation plan and understand the importance of following it in case of an emergency.

5. **Evacuation Procedures**: The simulator helps the user to face the accidental fire situation virtually and helps him/her to follow the evacuation procedure.

6. **Safety Equipment**: The module should cover the safety equipment like smoke detectors when the siren starts.

7. **Simulation**: The application provides a simulation that enables users to practice emergency evacuation procedures.

8. **Assessment**: This project makes a finest assessment to test the users' knowledge and understanding of emergency evacuation procedures. This could include a quiz, a scenario-based assessment, or a practical assessment using the simulation.

Overall, the educational module/simulation of emergency evacuation for building safety should be comprehensive, engaging, and interactive. It should provide users with the knowledge and skills they need to respond effectively in an emergency situation and to ensure their safety and the safety of others.

ACKNOWLEDGEMENT:

Player movement in Unity using the keyboard

https://unt.instructure.com/courses/81449/files/21334914 **(**Emergency Evacuation**)**

REFERENCES: 3Ds max, Sketch Up, Vizard, 3D Unity.

MODELLING:

The virtual setting that is envisioned comprises of a structure with several floors, rooms, stairs, and exits. Unity 3D was used to apply the textures after 3ds Max was used to generate the building's geometry. The software offers a precise simulation of the structure and the situation. The modelling was completed in 3ds Max, then Unity 3D was used to apply the textures. People who need emergency training, such as firefighters, security personnel, and building managers, can use the application.

PROGRAMMING:

The application was programmed using Unity 3D. The C# programming language was used for the programming. The programming specifics were explained through print screen graphics. The application was built with the following features:

VISION:

To provide comprehensive information about the building and the emergency situation, the application makes use of textures and 3D models. The application offers a realistic emergency simulation that people can use to get ready for actual emergencies.

SOUND:

Information about the structure and the emergency is provided by the program via speech and background noise. People can safely exit the building with the aid of the sounds.

ANIMATION:

To mimic an emergency situation, the program employs at least three animated items, such as fire, smoke, and falling things. The animations give a realistic simulation of an emergency situation and aid in the preparation of persons for real-life situations.

INTERACTIVITY:

At least five user-triggered actions are used by the application, including opening doors, using fire extinguishers, and turning on alarms. The interactivity helps people get ready for emergency situations in real life by offering a realistic simulation of the emergency.

CHARACTERS/AVATARS:

To replicate the behaviour of humans in an emergency scenario, the program employs animated agents with path following behaviour. The agents may be manipulated with the keyboard, creating a realistic simulation of an emergency scenario.

SENSORS:

To simulate an emergency, the application makes use of at least three different types of sensors, including proximity, time, and touch. The sensors offer an accurate simulation of the emergency and aid people in getting ready for actual emergencies.

PLAYER:

To give a realistic simulation of the situation, the program employs a player controller, such as a First-Person Controller or a Third-Person Controller.

AI IMPLEMENTATION:

The software simulates human behaviour in an emergency situation by using AI features including navigation, behaviours, and quickest path.

Why this application is useful and why virtual reality is the appropriate technology for this project?

A building safety teaching module or simulation of an emergency evacuation is a significant tool for increasing safety awareness and preparation in the case of a disaster. This technology can assist individuals and organizations learn about basic safety procedures, detect possible risks, and improve reaction times by presenting users with a virtual experience of an emergency evacuation.

Because it can create a highly immersive and realistic experience, virtual reality is an excellent technology for this project. Users can practice emergency evacuation methods in a safe and controlled setting by being placed in a virtual environment that perfectly resembles the architecture and circumstances of an actual building. VR also provides for a high level of involvement, allowing users to conduct tasks and communicate with one another.

Furthermore, virtual reality may be easily modified and adapted to various building types, scenarios, and user groups. Because of its adaptability, it is a great technology for instructional modules and simulations that must accommodate to a wide range of needs and tastes.

Overall, virtual reality can provide a valuable and effective tool for educating people about emergency evacuation procedures and improving building safety by combining the benefits of immersive experience, interactivity, and customization.

The problems that will be encountered and remaining shortcomings (Future Work)?

However, there were some issues encountered and shortcomings that need to be tackled in future work. For example, developing VR simulations necessitates tremendous resources in terms of both time and talent. Creating a high-fidelity simulation may be a lengthy and costly operation, limiting its accessibility and scalability.

Furthermore, the effectiveness of VR simulations is determined by their accuracy and relevance to the intended audience. The simulations must be based on extensive study and analysis of the building's layout, emergency protocols, and possible risks in order to be effective. They must also be adjusted to the users' unique requirements and skills, which may differ based on criteria such as age, gender, or physical condition.

These limitations might be addressed in the future by developing more streamlined and user-friendly tools for building VR simulations. This might entail creating standardized templates and libraries of pre-made objects and settings, reducing the time and knowledge necessary to produce high-quality simulations. Furthermore, future work could concentrate on increasing the accessibility and scalability of VR simulations by developing cloud-based platforms that can host and deliver simulations to a larger audience. Finally, future research could look into ways to tailor VR simulations to the needs and abilities of individual users, such as through the use of biometric sensors or adaptive algorithms.