VR-Based Training and Testing for Active Shooter Incidents

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INTRODUCTION

In recent years, active shooter events in the United States have noticeably increased in frequency. In 2022 alone, there were 309 instances of an active shooter [1]. Therefore we aimed to design a way to help the public prepare for the incident using a flexible and cost effective technique.

Videos and drills are popular training methods in preparing for emergencies.

- However, in real emergencies, mental stress clouds critical thinking and videos offer no experiential learning which plays an important role in solidifying knowledge for real-world situations [2].
- Drills in real settings can offer a realistic experience, but it can raise ethical concerns and require more human and financial resources.

Given the potential of virtual reality (VR) technology as a medium for realistic and immersive education, we created a virtual environment that give individuals an opportunity to practice and to test themselves in case they encounter an active shooter.

SKILLS LEARNED

During my time in SHINE I learned how to create a VR Environment (Fig.1), convert a non-interactive SketchUp model to an interactive Unity model (Fig.2), and modifying a desktop-based VR environment into a immersive VR environment (Fig.3) using keyboards and/or controllers (Fig.4). I've also learned to implement a feedback canvas in the VR environment (Fig.5). While working with Unity, a game engine, I learned to code in C# (Fig. 6). Other than being a developer for this project, I also played the role as a participant running on a treadmill wearing a VR headset (Fig. 7).

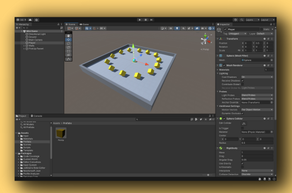


Figure 1

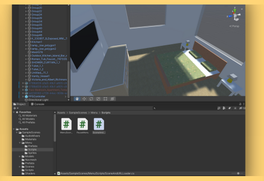


Figure 2

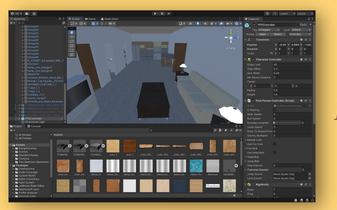


Figure 3

Figure 4

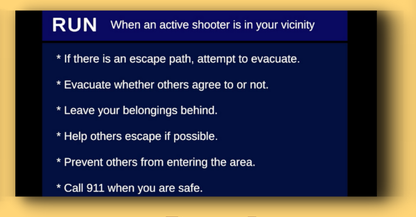
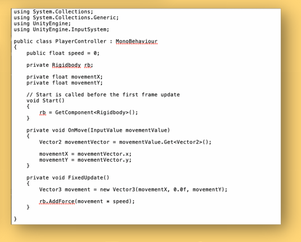


Figure 5



```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.InputSystem;

public class PlayerController : MonoBehaviour
{
    public float speed = 0;

    private Rigidbody rb;

    private float movementX;
    private float movementY;

    // Start is called before the first frame update
    void Start()
    {
        rb = GetComponent<Rigidbody>();
    }

    private void OnMove(InputValue movementValue)
    {
        Vector2 movementVector = movementValue.Get<Vector2>();

        movementX = movementVector.x;
        movementY = movementVector.y;
    }

    private void FixedUpdate()
    {
        Vector3 movement = new Vector3(movementX, 0.0f, movementY);

        rb.AddForce(movement * speed);
    }
}
```

Figure 6

CONNECTION

Immersive VR was not a term I was familiar with before joining SHINE, but after working on multiple models with my mentor I understood more. I was shocked when I read that a game could be a part of engineering and teach children and adults important and crucial information that could potentially save their lives.

VR Game Models

FUTURE GUIDANCE

The research being done here is innovative and can help a large cause. For upcoming students that are interested in this field of engineering I advice you to be familiar with computer science or coding. It is a huge part of engineering and particularly this field.

Figure 7

Fig. 8 is an example of what a subject sees while wearing the VR headset

OBJECTIVE & IMPACT

This research could be used:

- to develop a virtual reality serious game with different levels of interaction capability to get people prepared for active shooter incidents
- to investigate human responses to this emergency under different levels of training (video, passive VR, interactive VR).

This research can improve people's understanding on experiential learning and serious game by developing a training framework with an objective evaluation system on the learning outcomes. Soon, the framework could be applied to environments as hospitals, schools, and other public spaces.

ACKNOWLEDGEMENTS

I would like to thank Professor Becerik Gerber for allowing me to be a part of her lab. I would also like to thank Ruying Liu, my mentor, for her patience while teaching me new skills. Finally, I would like to thank Dr. Mills and my teachers for giving me this opportunity to study at SHINE.

REFERENCES

[1] S. Ahmed, "Halfway through year, America has already seen at least 309 mass shootings," NPR, Jul. 04, 2022. Accessed: Jul. 18, 2022. [Online]. Available: https://www.npr.org/2022/05/15/1099008586/mass-shootings-us-2022-tally-number
[2] D. A. Kolb, Experiential Learning: Experience as the Source of Learning and Development. FT Press, 2014.