Utilizing Virtual Reality to Simulate A Fire Emergency on A Construction Site

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Introduction

- Human safety should always be the priority when working on a construction site. Often many corners are cut to speed up the project, which could injure the workers. Many accidents, such as fires, also occur because of lack of knowledge or training. Construction site safety during a fire emergency is hard to manage because the building is still under construction, so obvious evacuation routes and fire emergency management are not clearly established.

- Due to unclear exits, one of the best ways for a construction worker to become familiar with the site environment is through virtual reality training. Virtual reality and computer simulations can create a nearly identical model of the site so that the workers are aware of all the exits and how to make their decisions in the event of a fire emergency.

Virtual Construction Site Fire

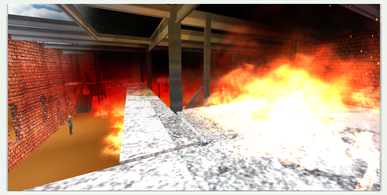
Objectives & Impact of Professor's Research

- The objective of this project is to create a computer simulation of a construction site in the event of a fire emergency.
- The outcome of this can be used to help workers become familiarized with the site and how to evacuate it during an emergency.

Skills Learned

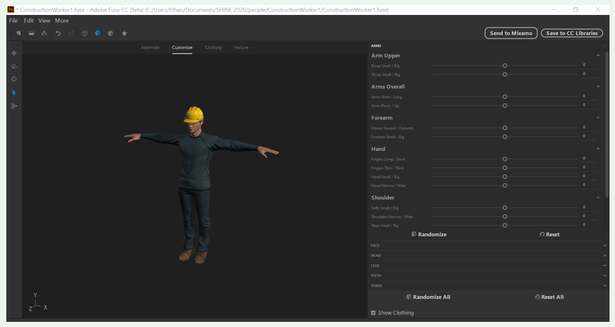
- Unity
  - Unity is a software that is used to create games and virtual 3D environments
  - I learned how to write C# scripts to change in-game objects and animate in-game characters.

Fire Fighters using the Talk Animation



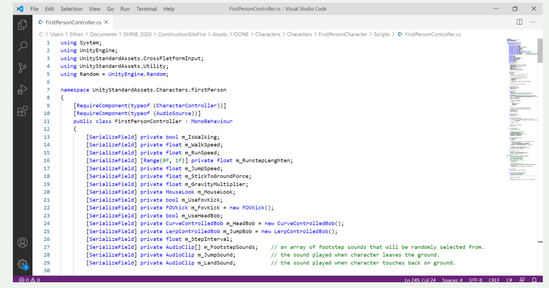
Virtual Fire and Smoke on the Construction Site

- Adobe Fuse CC
  - Adobe Fuse is a software used to create human models.
  - I used Adobe Fuse to create virtual characters and I used Mixamo to import models from Fuse to Unity.



Construction Worker on Adobe Fuse

- Lab Environment
  - I learned how to behave in a lab environment and how to think critically.
- Academic Papers
  - I learned how to read complex academic papers and research papers.



```
using System;
using UnityEngine;
using UnityStandardAssets.CrossPlatformInput;
using UnityStandardAssets.Utility;
using Random = UnityEngine.Random;

namespace UnityStandardAssets.Characters.FirstPerson
{
    [RequireComponent(typeof (CharacterController))]
    [RequireComponent(typeof (AudioSource))]
    public class FirstPersonController : MonoBehaviour
    {
        [SerializeField] private bool m_IsWalking;
        [SerializeField] private float m_WalkSpeed;
        [SerializeField] private float m_RunSpeed;
        [SerializeField] [Range(0f, 1f)] private float m_RunstepLenghten;
        [SerializeField] private float m_JumpSpeed;
        [SerializeField] private float m_StickToGroundForce;
        [SerializeField] private float m_GravityMultiplier;
        [SerializeField] private MouseLook m_MouseLook;
        [SerializeField] private bool m_UseFovKick;
        [SerializeField] private FOVKick m_FovKick = new FOVKick();
        [SerializeField] private bool m_UseHeadBob;
        [SerializeField] private CurveControlledBob m_HeadBob = new CurveControlledBob();
        [SerializeField] private LerpControlledBob m_JumpBob = new LerpControlledBob();
        [SerializeField] private float m_StepInterval;
        [SerializeField] private AudioClip[] m_FootstepSounds;    // an array of footstep sounds that will be randomly selected from.
        [SerializeField] private AudioClip m_JumpSound;           // the sound played when character leaves the ground.
        [SerializeField] private AudioClip m_LandSound;           // the sound played when character touches back on ground.
```

Script for the First Person Controller

Relation To STEM Coursework

I've always wanted to pursue a career in engineering and after working on this project, I was further motivated to follow the engineering pathway. I enjoyed designing 3D items using Unity, which is very helpful for my future studies in engineering design, such as designing different mechanical components for robots.

Next Steps for You OR Advice for Future SHINE Students and/or Short Bibliography

My advice for future SHINE students is to keep trying to improve their research project because there will always be something to improve. If you keep on trying you will get closer and closer to perfection.

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