

Active Shooter Response for University Campus

Goals and Objectives:

Active Shooter Response Training system to help teach students and campus personnel how to respond in the event of an active shooter within a college campus within a safe virtual world.

Importance:

Active Shooter Scenarios are highly common and dangerous. Most individuals are not aware of how to react in this type of stressful situation and real-life demonstration and drills might become triggering for select individuals. This project allows users to gain awareness and experience of an active shooter scenario within a safe and controlled virtual environment.

Target Audience:

Students and personnel within any environment that could experience an active shooter. The environment is set within a virtual university campus, so the directed audience is any person within a university campus.

Reference material and design:

This Training system will have three scenarios that will include a mode each of the recommended responses within the U.S Department Homeland Security's Policy.

These responses are given as:

Modes from the victims POV:

1. Run
2. Hide
3. Fight

Mode from the shooters POV:

4. Provide a view from the active shooter's point of view like a first-person shooter but with further emotional reactions and reasoning.

Disclaimer: *This mode is to give a different perspective of the event outside of the victims themselves and not meant to devictimize or desensitize the event.*

Development Environment:

We will use Unity to implement this training and develop it as a desktop application using WASD, keyboard responses, and mouse click responses as needed to interact with GUI and environment.

Functionality:

Scene Navigation: A main screen is given to navigate to the modes in the project. This is a UI developed within unity and contains three buttons one for each scenario/mode.



Figure: Mode Navigation

Run/Hide Mode Design (Designed and Developed by Denzel Prince):

Purpose: User will be introduced to tactics, techniques, and procedures that should be followed in the case that he/she are caught in an active shooter scenario. This mode will familiarize users with how to quickly determine the most reasonable way to protect their lives and others.

Location: Building located on Bowie State University campus. Model will be provided by instructor.

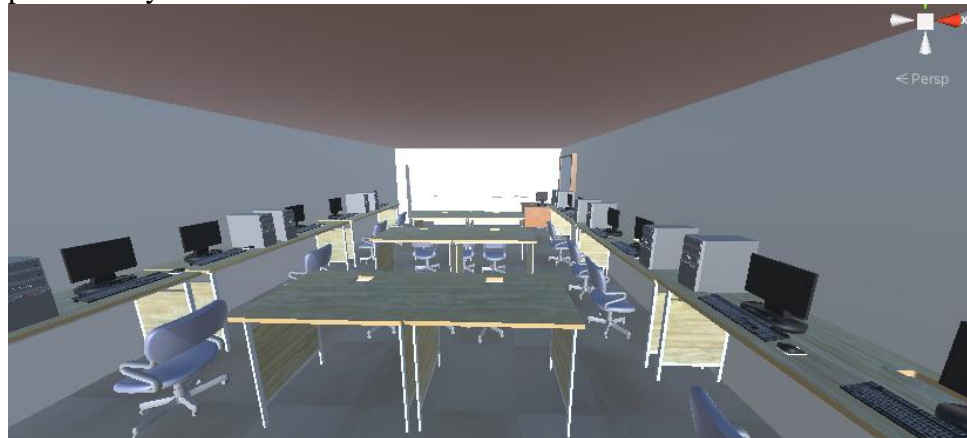


Figure: Computer classroom on campus



Figure: External view of computer science building

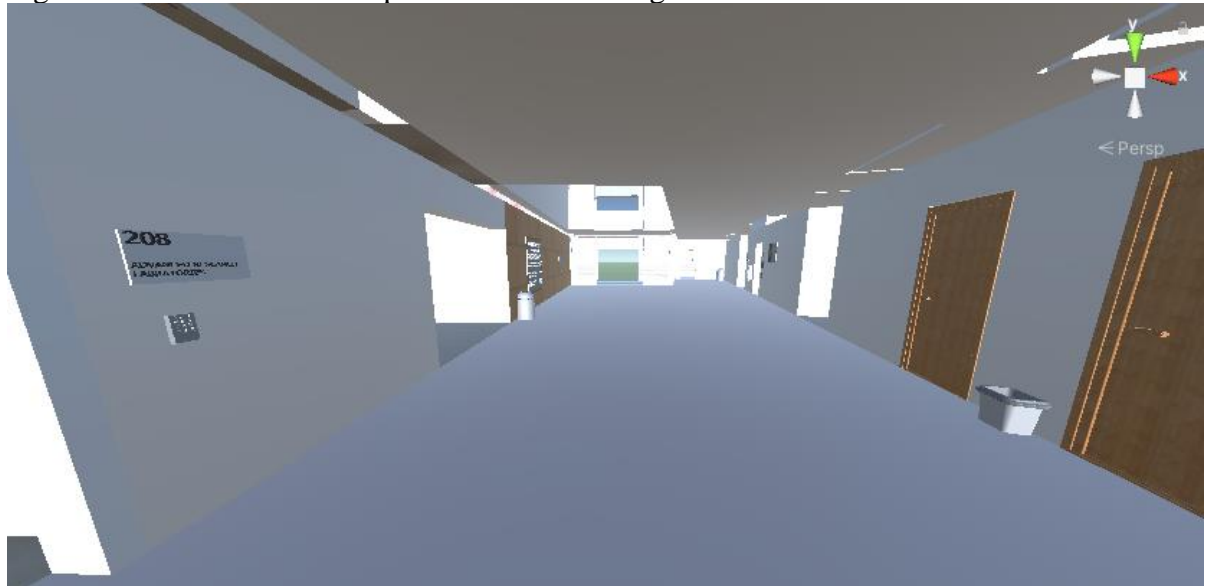


Figure: Hallway within computer science building

Avatars/Animation: This mode will consist of 5 avatars. Each avatar will display a unique animation which will play in a natural loop.

Interactivity: The user will be required to complete several actions to successfully complete the mission.

1. Identify the active shooter
2. Pull the alarm to alert all bystanders of the threat.
3. Locate a “safe space” to provide cover and protection.

Sensors:

1. Proximity Sensor – used to simulate damage to user health when near the active shooter.
2. Timer Sensor – the player will have 95 seconds to identify the threat and pull the alarm to notify bystanders of the local threat. Users will then have an additional 60 seconds to locate the designated “safe space”.

Sounds: Fire alarm

Controls:

- Walk
- Run
- Press button
- Fire alarm

Fight Mode Design (Designed and Developed by Lindsei Berman):

Purpose: This mode will be used to simulate the scenario in which the user, student in our scenario, is unable to hide and unable to escape a confrontation with the shooter. This is the last resort scenario from the NSA standards, in which the shooter has blocked the persons only way out of a room and the student must fight, throw objects at, and disarm the shooter to leave the room. The goal to decrease the shooters “health” down to zero before the time runs out.

Location: Placed in a computer classroom within bowie state university campus with one single entrance that is blocked and locked by the shooter

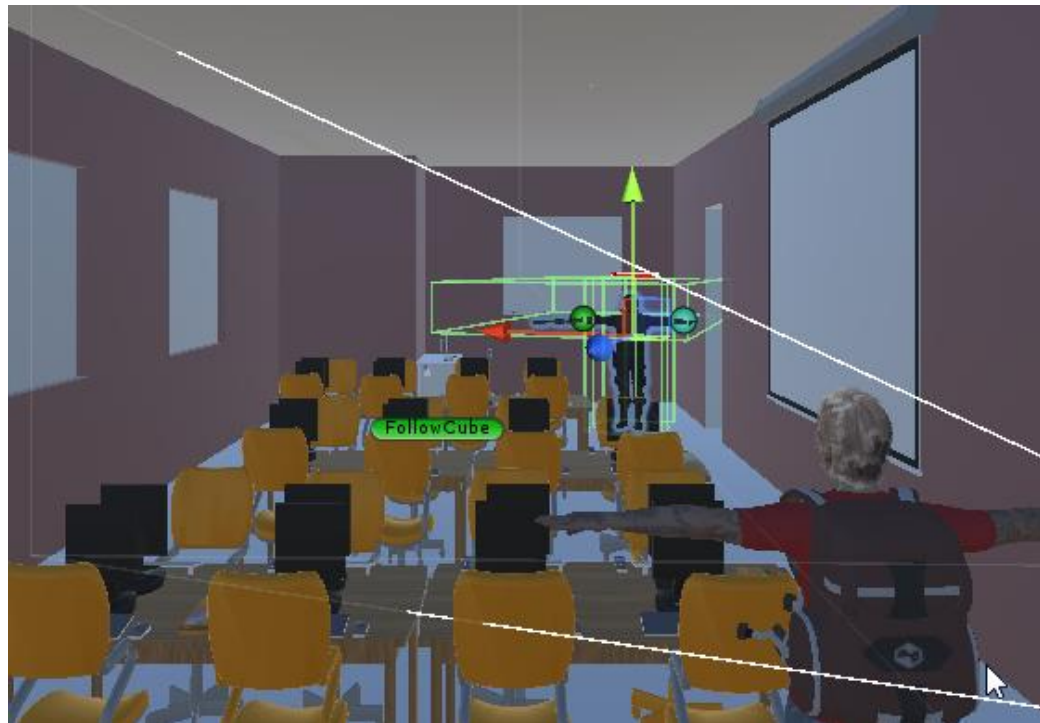


Figure: Fight Scenario showing layout of the classroom, student, shooter, and his colliders

Behavior:

Student:

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- Dropped into a computer classroom with a shooter blocking his only way out. He is a third person-controlled player who has to move around the classroom, crouched, and grabbing textbooks to add to his backpack.
- Must remain hidden while the shooter is armed by remaining crouched and walking around the room since the shooter has a FOV collider box positioned at his eye level used to “catch” and end the game for the student.
- Has an inventory that consists of textbooks used to harm and disarm the shooter from a far
- Able to kick and punch the shooter once the shooter is disarmed and weakened.



Figure: Student Avatar

Controls: Keyboard commands

1. G – Grab an item
2. T- To throw the item
3. P – Punch
4. C – Crouch
5. K – Kick
6. WASD- To move

Shooter:

- Computer controlled avatar that follows a continuous loop around the room to simulate the shooter looking around for people

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- Semi-Sentient includes a FOV collider which can see a student if they stand up and collide with his vision. If armed, this decreases the student's health completely and ends the game.
- Has a health-bar that is affected by the student (player) and is the controlling point for his disarmed state. This disarmed state starts when his health is less than or equal to 80%.
- If he collides with the student (player) while disarmed, he will remember the last position the student was seen and will move to that location.
- If he collides with the student a second time, he will automatically react to the inaction by punching the student and decreasing his health



Figure: Shooter Avatar

Timer:

The student is given a timer set to 10 minutes. This represents the amount of time he must decrease the shooter's health to zero to win.



Figure: Timer to defeat shooter

Inventory:

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To disarm and affect the shooter from afar, the student is given a backpack that acts as an inventory. This inventory will contain textbooks that are located all around the classroom and can be collected as a sort of ammo.

Four textbooks are given by default from the start of the game and others around the room can be collected by pressing G and thrown at the shooter to affect his health by pressing T.

The state of the inventory is recorded on the screen and updated each time a textbook is picked up and thrown



Figure: Inventory Counter

Health Bar:

Both avatars are given a health bar that will decrease as damage is inflicted onto them.



Figure: Student Health bar



Figure: Shooter with health bar

Models: All models needs are either provided by Dr.Sharma upon request, like the campus, or downloaded from free3d.com.

Sensors:

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- a. Proximity Sensor – used to determine the shooters awareness of you and used to determine the affect of an attempted attack to both the player and the shooter
- b. Timer Sensor – the player will have 10 minutes to beat the shooter.

Avatars: Only the player and the shooter are involved in the scene.

Animation: All avatars and animations are downloaded from adobe mixamo.

Active shooter POV:

Purpose: To study the reactions and conditions of an active shooter scenario since it would be dangerous or too difficult to closely simulate in the real world. The proposed outcome is to allow the user to play a part in the simulation itself.

Location: Building located on Bowie State University campus.

Interactivity:

- User will pull the alarm to signal the emergency
- User can pick-up selected objects to shield themselves or throw
- User can press button(s) to open selected door(s)

Sensors:

- Proximity sensor is used for shooter taking aim
- Bounding box or sphere sensor used for fire damage
- Touch sensor used for alarm switch and door button(s)

Avatars: 15 agents will consist of both custom and inbuilt avatars



Figure: Students on campus talking



Figure: Students running to safe point

Implementation Functionality:

- Lights: ambient from sunlight via sky w/environmental map
- Timers: Health counter will show on-screen. Full health is 100.
- Time elapsed counter will update every second and show on-screen.
- Keyboard: arrow keys control first-person controller. Mouse cursor is used for object interaction.

Hardware: Input devices are mouse & keyboard

Animation: Behavior of the avatar are pulled animated precompiled avatars

Shortcomings:

- Run/Hide Scene could have added more colliders to protect avatars from phasing through structures (Walls, doors, etc..).
- Menu is unable to smoothly transition through all scenes.
- Run/Hide scene could use more natural structures and avatars (tress, animals) for outdoor environments.
- The fight scene does not include audio as time did not permit adding it.
- Shooter is not completely sentient and cannot catch user sneaking around corners if their interaction is not close enough. Of course, this is not realistic and might portray to the user a false sense of security.
- Students can walk through tables which is not ideal.

Problems Encountered:

- Prefab sharing was not easy and became difficult since structure of objects were not maintained on transport.

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- Building is full of components and makes the environment react slowly. Would prefer to have a smaller environment, maybe just an individual room or floor for instance.

Recommended improvements:

- Make the scene more realistic and smoother reaction times and make the shooter more sentient to the user's sound and movements.
 - Allow the user to throw more objects at the user that might take more damage and possible implement a stamina bar for the student if throwing larger things
 - Provide sound in a fight scenario for ambiance.