

Bomb Threat Simulation

A simulation designed to help save lives



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Introduction

The purpose of this project is to create a simulation in Unity showing at a high level the tasks campus police will need to take in the event of a bomb threat on a school campus. This module is not intended to take the place of real life training but to supplement it and give campus police an understanding of the tasks they need to take to ensure everyone's safety and neutralize the threat.

Goals and Objectives

During the simulation the user will be asked to complete these tasks:

- Activate fire alarm to begin the evacuation of the school building
- Find the three bomb devices and remove them
- Eliminate any bombers they may come across
- Complete the simulation before the timer runs out

If the user does not complete these tasks before the time reaches zero the simulation will end.

Model

The model used in this simulation was downloaded from the Unity Asset Store and developed by Tirgames. The model comprises three main parts: the Courtyard, the Soccer Field, and the School building itself.

Model: The Courtyard

The courtyard is in front of the main entrance for the school building. The walkway has a gray brick texture applied to it to give it a 3D effect and make the pathway seem slightly rough. Around the courtyard are multiple trees and multiple patches of grass that give the scene some greenery. Also scattered around the courtyard are benches and lampposts. The lampposts do not actually give off light but are there merely to make the scene more realistic. The objects in the courtyard have colliders on them, so that the player must walk around or go over the objects instead of being able to walk through them.



Model: The Soccer Field

The soccer field is outside behind the school. The field has a rough green texture applied so that it has the appearance of turf. White lines have been drawn across the field to represent the marking you would find on a normal soccer field. Two soccer goals have also been placed at either end of the field with the turf texture extending a little behind it. Around the soccer field a rough brown texture has been applied with white lines on it to represent a track used for running. All of this is also enclosed by a fence that has colliders on it so that the player may not pass through it.



Model: The School

The school building is a brown and gray structure built in the shape of a U. Multiple windows have been placed around the building so that you can view inside the building from the outside and inside the building from the outside. Inside the school there are two levels. The ground level has a cafeteria, three classrooms, and a gymnasium. Each of these rooms are enterable and has objects within them that apply to each room. For instance the cafeteria has a lunch counter and tables for eating, the classrooms have desks and blackboards, and the gymnasium has a basketball court with different sport objects around it. The upper level has three classrooms also fully furnished and an auditorium complete with chairs and a stage.





Model: Lighting

Various lighting types and intensities were used throughout the scene. Outside directional lighting was used in combination with a sky scene to give the appearance of a bright sunny day. Inside the school a combination of directional and spot lighting was used with different intensities to give a warm appearance in some spots while making it seem really bright in others.

Gameplay: The Alarm

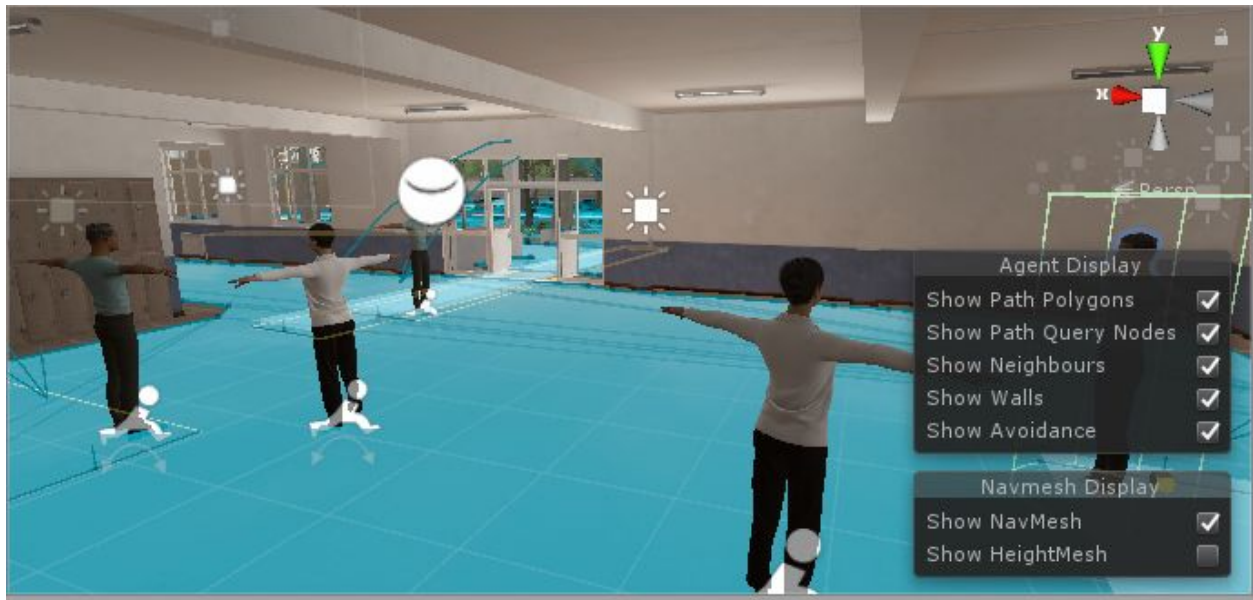
When the simulation starts a timer begins to countdown and the first task the user must complete is to activate the alarm to begin the evacuation of the faculty inside the school. The alarm is represented by an electrical box on the wall near the lockers when you first enter the school.



A proximity sensor has been placed on the electrical box so that the alarm cannot be activated unless the user is within a certain distance of it. Once within the specified range the user must press the “O” key on their keyboard to activate the alarm. This is all controlled by a C# script created called TriggerAlarm. The electrical box has also been programmed to flash a different color when the user hovers over it so that they can more easily identify it. Once the alarm is triggered it will activate a running animation on all avatars in the building except the bombers and cause them to evacuate the building to a set location outside.

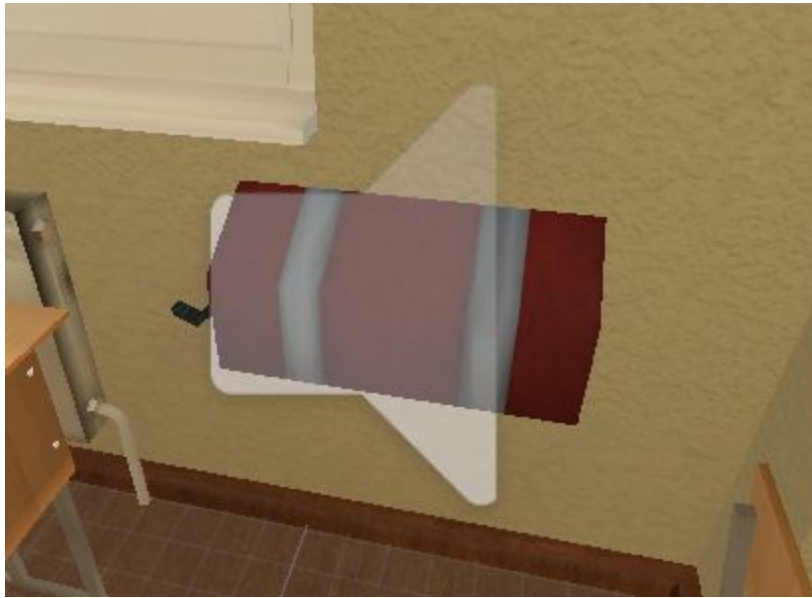
Gameplay: The Evacuation

In order to get the avatars to evacuate the building to the specified location in the courtyard a mesh renderer had to be applied to the whole scene. However, the issue with a mesh renderer is that it works on machine learning and most times will not include walks as it counts them as barriers. To overcome this so that the avatars could cross through the doorway to exit the school, I had to add a Nav Mesh link to each of the six avatars I wished to exit. A nav mesh link basically creates a bridge between two points on a mesh render so that an avatar can pass over.



Gameplay: Removing the bombs and bombers

Once the alarm has been activated and the user must now find the bombs and remove them. The bombs have proximity sensors on them so that when the user is within a certain distance of a bomb a beeping clip will begin to play. Once a bomb is found the user must enter within a certain distance and press the “P” key to remove the bomb. This is all controlled by a C# script called RemoveBomb.



Around the location of the bombs are bomber avatars in orange jumpsuits. The user must use the handgun and click to shoot and remove the bomber (it takes four shots to remove a bomber). Each bomber has a pacing animation applied to them so that they walk in a short specified loop. The handgun has a script applied to it called Pistol which controls the muzzle flash and smoke animations of the gun and also controls the ammunition. The Pistol script then calls another script which is applied to each bomber called DamageEnemy which allows the bomber avatar to take damage from the gunshots and eventually disappear.

CONCLUSION

This project has the intended purpose of helping campus police recognize the tasks they will need to complete in order to successfully end a bomb threat on a school campus. The simulation is intended to enhance training not replace it. While developing the simulation the biggest difficulty faced was the animated evacuation. Figuring out how to move all the characters out to a specific location took some research and trial and error, mostly because the mesh renderer would not include doorways. At the end, I am happy with how the simulation turned out and hope it can be of use in training scenarios in the future.