

# Multi-User evacuation for Computer Science building at BSU

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**Objective:** To simulate crowd behavior and evacuation in Computer Science building, Bowie State University.

## Modeling:

Sketchup make provides many templates and tools to design the building. There are many tools to design with accurate measurements. From Sketchup warehouse we can download the models already designed and uploaded for user's sake. It is very easy to design buildings in Sketchup. Some models are designed in 3D Studio Max which is another 3D models design application software. In 3D Studio Max we can design models and can add animations to the models developed.

- Computer Science building three floors designed in Sketch up.

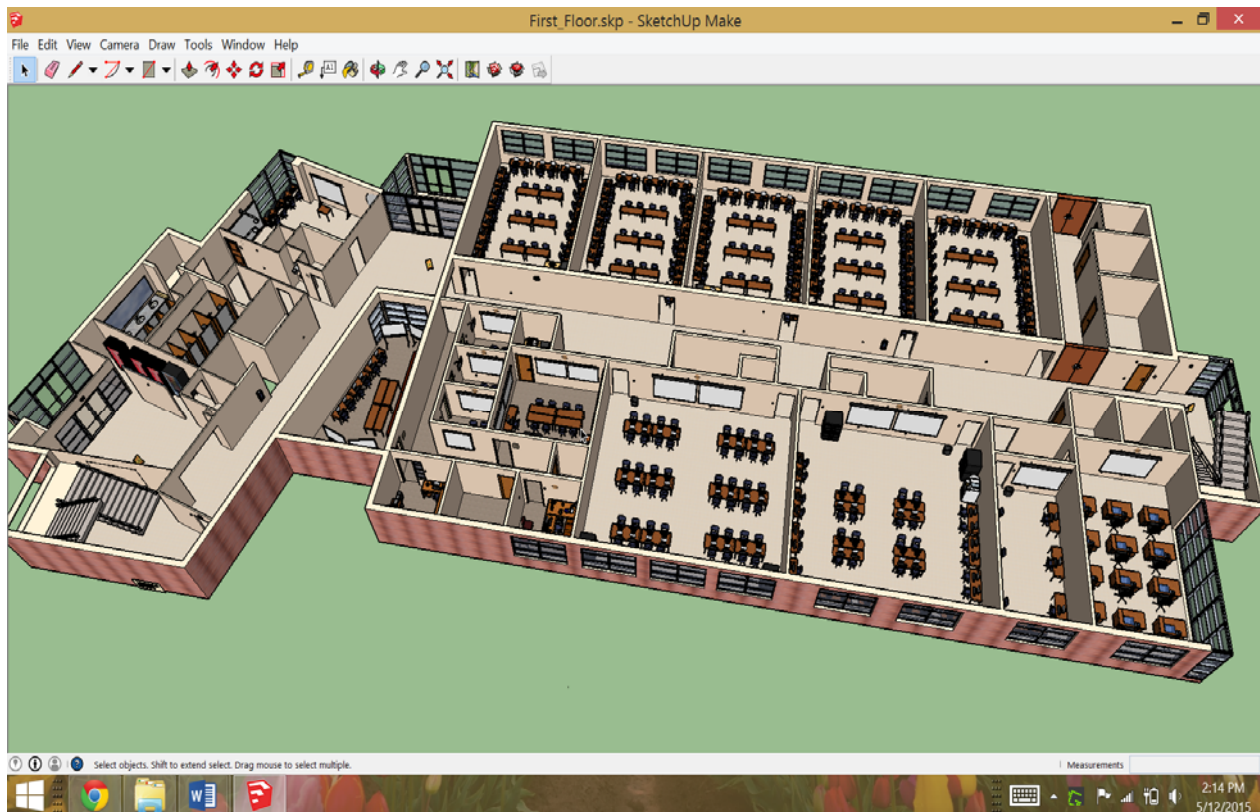


Fig. 1: Screen shot of Sketch up design file for first floor of Computer Science building.

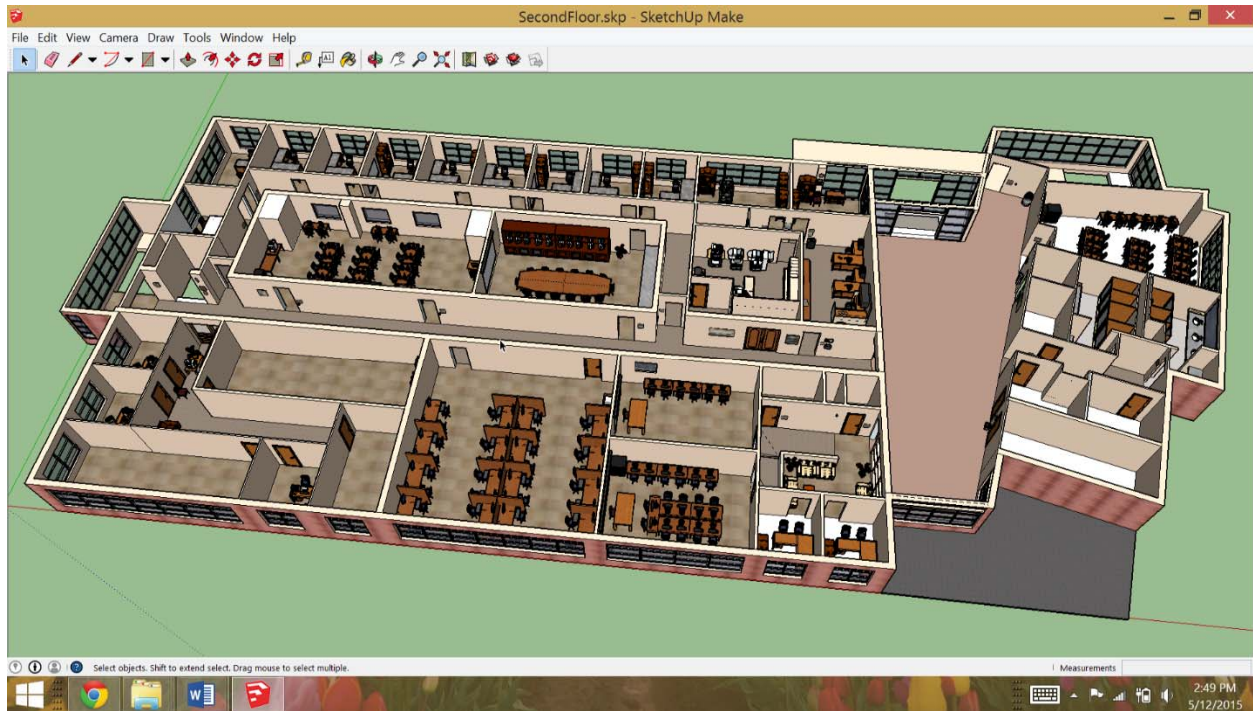


Fig.2: Screen shot of Sketch up design file for second floor of Computer Science building.

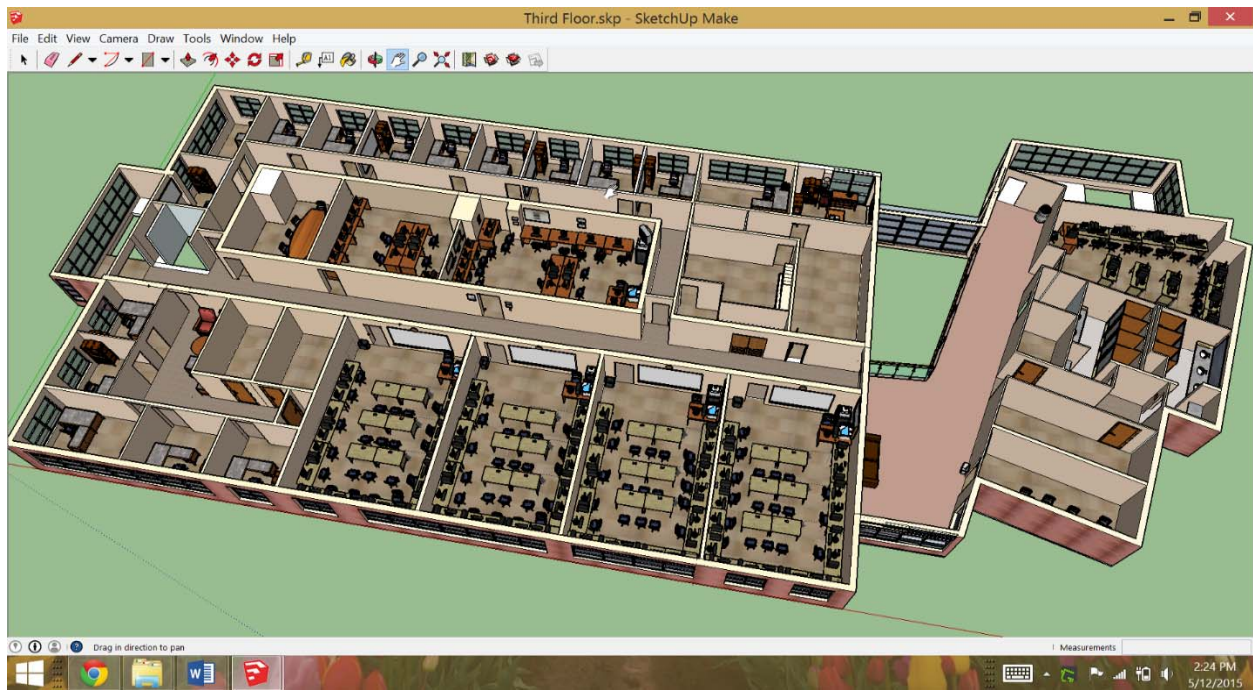


Fig. 3: Screen shot of Sketch up design file for third floor of Computer Science building.

We have taken care of inches and feet. All the measures are to the exact scale. There are convenient tools in Sketchup to make the measurements. We tried to place all the models which look exactly same as the real ones in Computer Science building.

Unity is a powerful engine with a variety of tools that can be utilized to meet your specific needs. The editor is intuitive and customizable allowing you a greater freedom in your workflow. Using Unity 3D gaming software, we created a terrain with a Computer science environment on it. The models from Sketchup are export as .dae file and were imported to the Unity gaming environment.

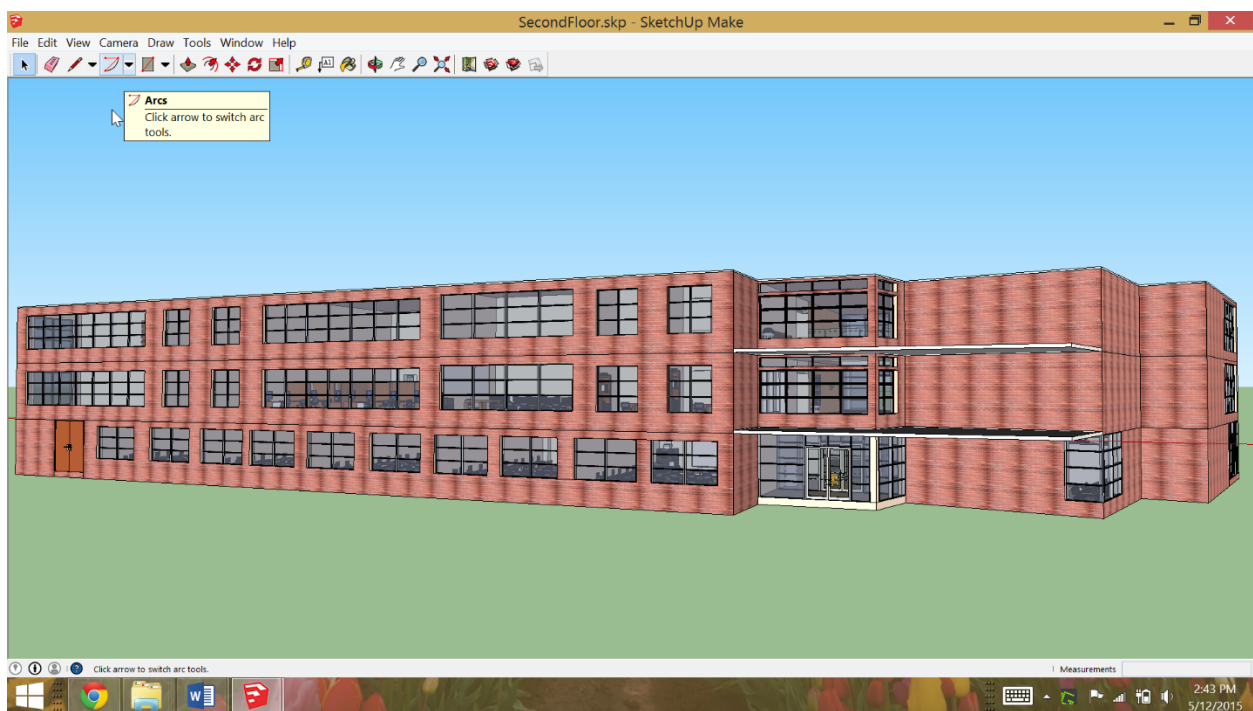


Fig. 4: Final Computer Science building in Sketchup.

Imported few free characters from Unity asset store which are used for computer generated bots. We have implemented triggered responses for computer-controlled agents. Next Fig shows the implementation of smoke and fire in our proposed VR Computer Science Environment.





Fig.5: Implementation of fire and smoke in the building in Unity 3D.

We imported fire and smoke from Unity assets store. To make it look realistic we also added Fire engines and pumping water on to the fire in the building.



Fig. 6: Front view of the Computer Science building Bowie State University.

We can see the complete front view of the Computer Science building where smoke coming out from the building, fire trucks and ambulances are in their duty, and cop cars in front of the building. Which gives realistic feel to the participants in Virtual Environment.

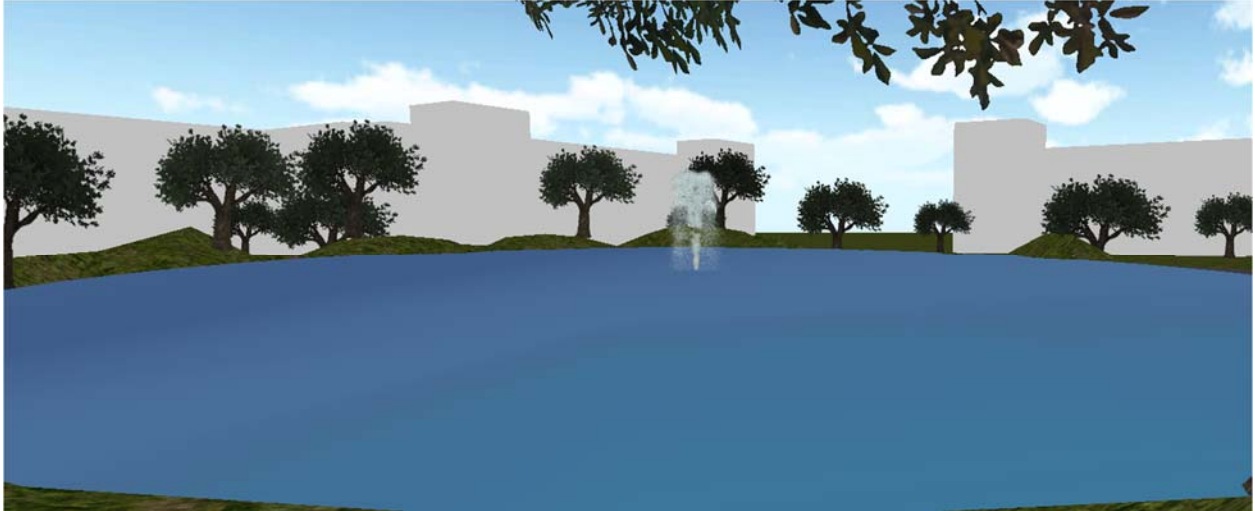


Fig. 11: Water fountain

We have imported trees, pond and water fountain from asset store which gives a realistic look.



Fig. 7: Way point algorithm for moving car.

We used a way point algorithm and created way points to move the car with in the way points continuously until the game stops.





Fig. 8: Waypoint algorithm for imported characters from unity asset store.

We have a start and end points in algorithm and in middle we will create some way points where the character will move within the way path continuously.

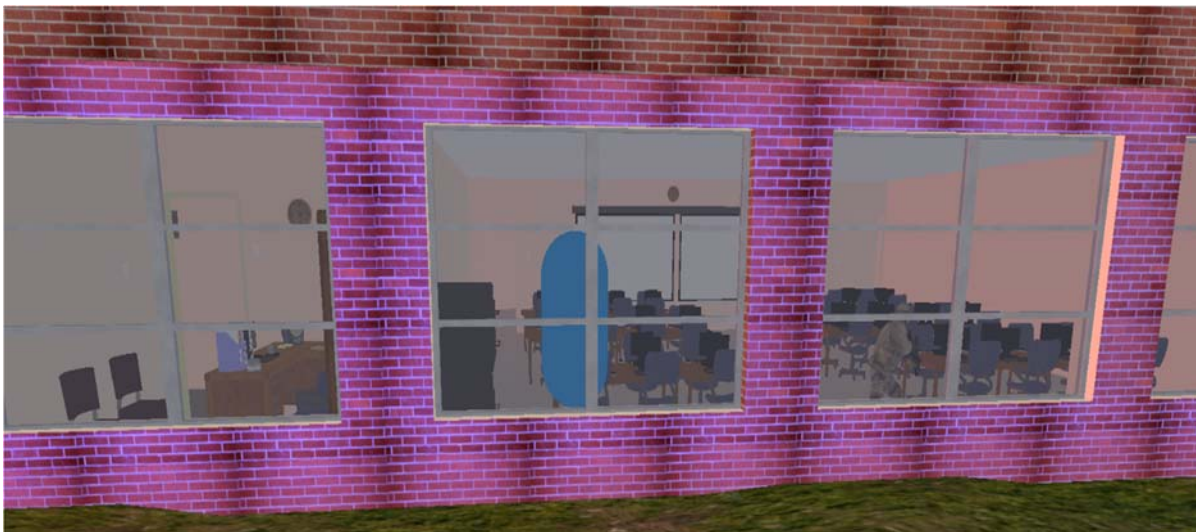


Fig. 9: Bots with artificial intelligence (AI).

For the bots we added artificial intelligence components and will assign the player within the component to whom the bots should follow. When the player reaches within the bots range then the bots should follow the player using artificial intelligence.

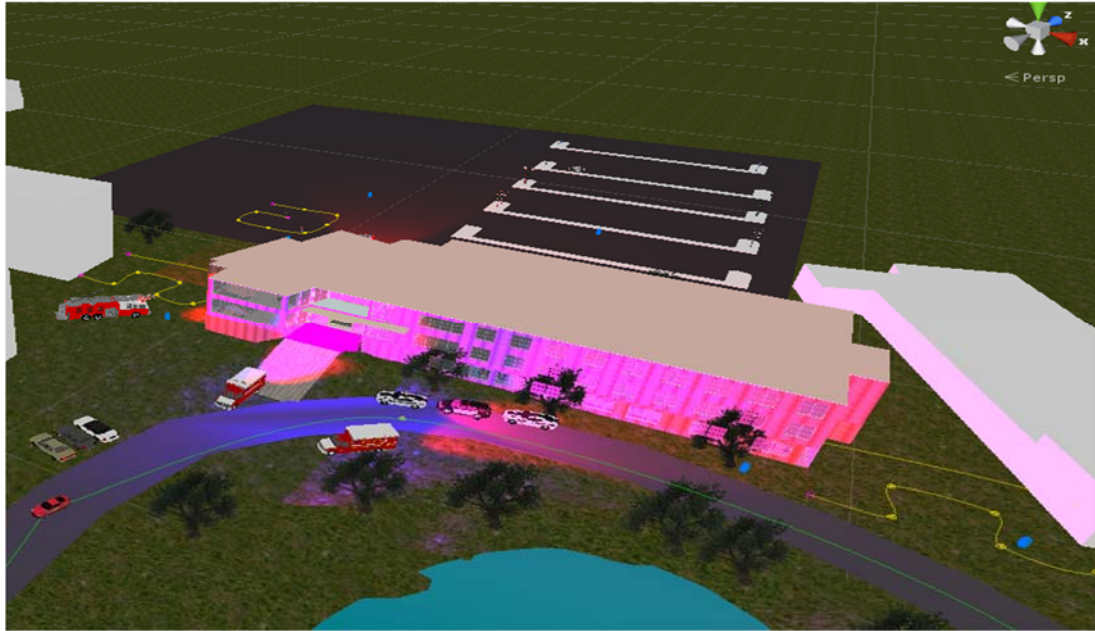


Fig. 10: Top view of computer science building

This is the top view of computer science building where we can see the characters, bots, waypoint paths, emergency situation.