**Group B01-3**: Cameron Jackson, Justin Dudtschak, Mohamad Radwan, Yawar Farhan

**Introduction:**

For the second prototype of the EllisDon VR in Construction project, our team wants to verify that the new features added since the first prototype were implemented well. We also want to confirm that the original features still work well after being refined. This prototype is where the project gets most of its integral features like housing the STEM BIM file and giving the user a view inside the building with working movement. It’s important to test these key features before moving ahead with project finalizations like VR movement as they are integral functionalities of the project.

**Main Body:**

**Test Objectives:**

The specific objectives of the second prototype are:

* The main menu buttons work and allow the user to access the BIM model.
* The BIM file is imported into the project and the user can properly view it.
* The user can see inside the building.
* The user can easily move around while viewing the building.
* Nothing strange happens like falling through the floor.
* User interface has buttons for displaying certain systems as well as instructions.
* The user can change floors via buttons.

The second prototype shows how much progress the team is making and whether we are on track with the test plan set out in Deliverable E. Through testing, the team hopes to determine which features work effectively and which ones need more work before Prototype III is ready.

By testing the prototype we could determine:

* If the BIM file is stable in Unity and the user can view it properly.
* If the main menu has fully functional buttons.
* If the user movement is functional and user friendly.
* If the user has freedom to view whichever floor or system they want to.

As with prototype I, the results of the above tests will determine whether the team has to dedicate more time to refining each respective feature of the project. Each feature will be tested qualitatively multiple times. The team will assess their function and identify where improvements are needed. Then, we will attempt to fix the problem and test again. Overall, the results of the tests will show us where we need to dedicate our time.

As stated above, the features of the project will be tested qualitatively so there is no fixed measure of success or failure. Instead, the results will be assessed on a scale of Good to Acceptable to Needs Improvement based on what the team thinks after testing. The features that rate on the Good end of the scale do not require more attention until Prototype III and the features ranking towards Needs Improvement will receive immediate attention from the team.

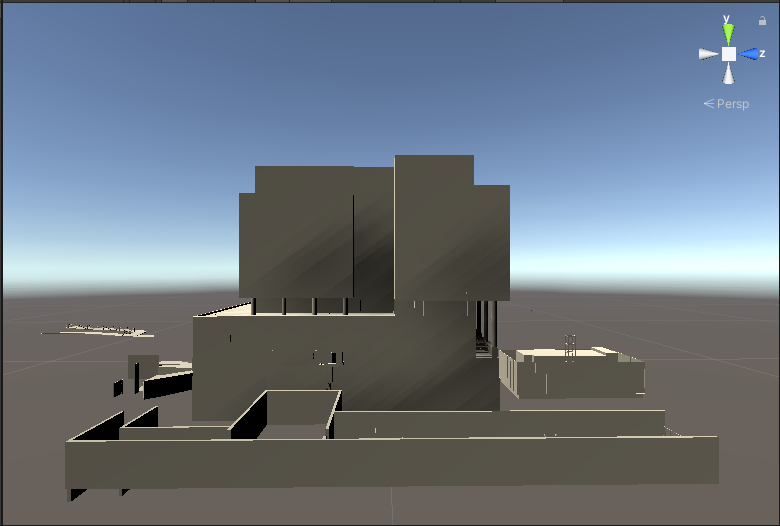
# **Prototype II Overview and Updates:**

At this point the prototype is entirely comprehensive. The team is working on a collaborative project in Unity that allows multiple team members to make changes to the same file. We chose to use this kind of prototype because it eliminates the need for the team to repeatedly integrate their individual parts together for testing. This saves time and effort and allows continual testing and improvement of one file that will eventually be the completed project.

For the second prototype, the team is doing repetitive, comprehensive testing to ensure that important features are working properly. When working with the prototype, the team focuses on one aspect at a time. The specific updates in the second prototype compared to the first are discussed below.

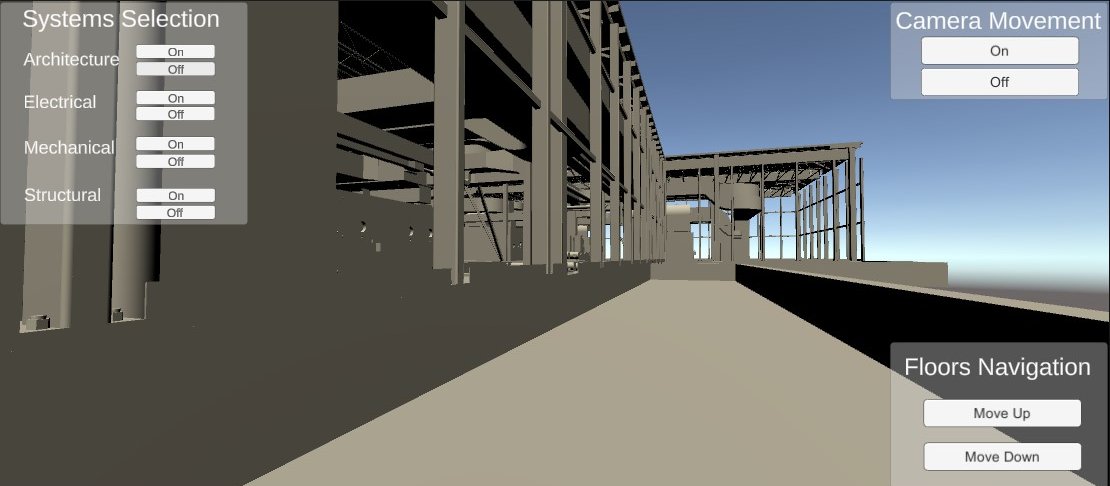
1. First Update:

One focus of testing for this prototype is to make sure the BIM file is working and the user can view it. We can test this feature by entering the scene and looking all around the different parts of the building. The user should be able to look all around and see the model clearly. The figure below shows a view of the STEM BIM model that was provided to us to demonstrate that our solution functions properly.



1. Second Update:

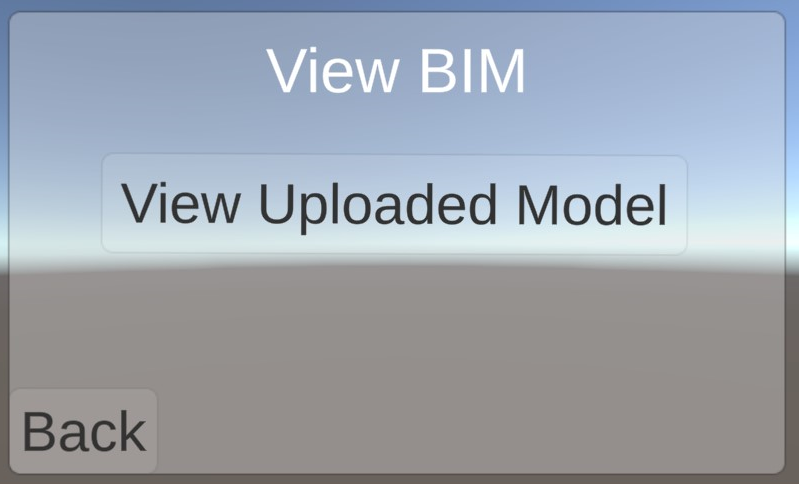
Another focus is the user interface while viewing the BIM model. This user interface consists of three key sections: Systems Selection, Camera Movement, and Floors Navigation. The first one allows the user to turn on and off any combination of systems they wish to view. The second one allows the user to enable or disable the camera movement, which is more convenient when the user would like to change the systems selection or change floors. The third button allows the user to move up and down to go to the desired floor. All three sections are shown in the figure below.



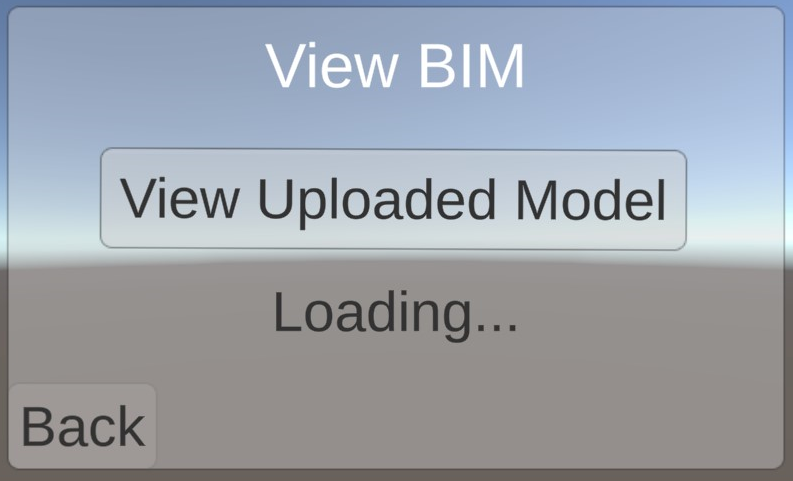
The team tests these features by entering the Unity scene and checking all buttons to make sure they all perform the desired task. If all buttons do function correctly, then this part of the prototype is a success, which was indeed the case with us.

1. Third Update:

Moreover, we have modified the main menu from the first prototype into a more effective one. We removed the screen for selecting floors, as it would be easier for the user to navigate the floors when viewing the model itself, rather than from the main menu. We also implemented a feature on the View BIM menu that allows the user to choose a button to view the preloaded BIM model, as shown below.



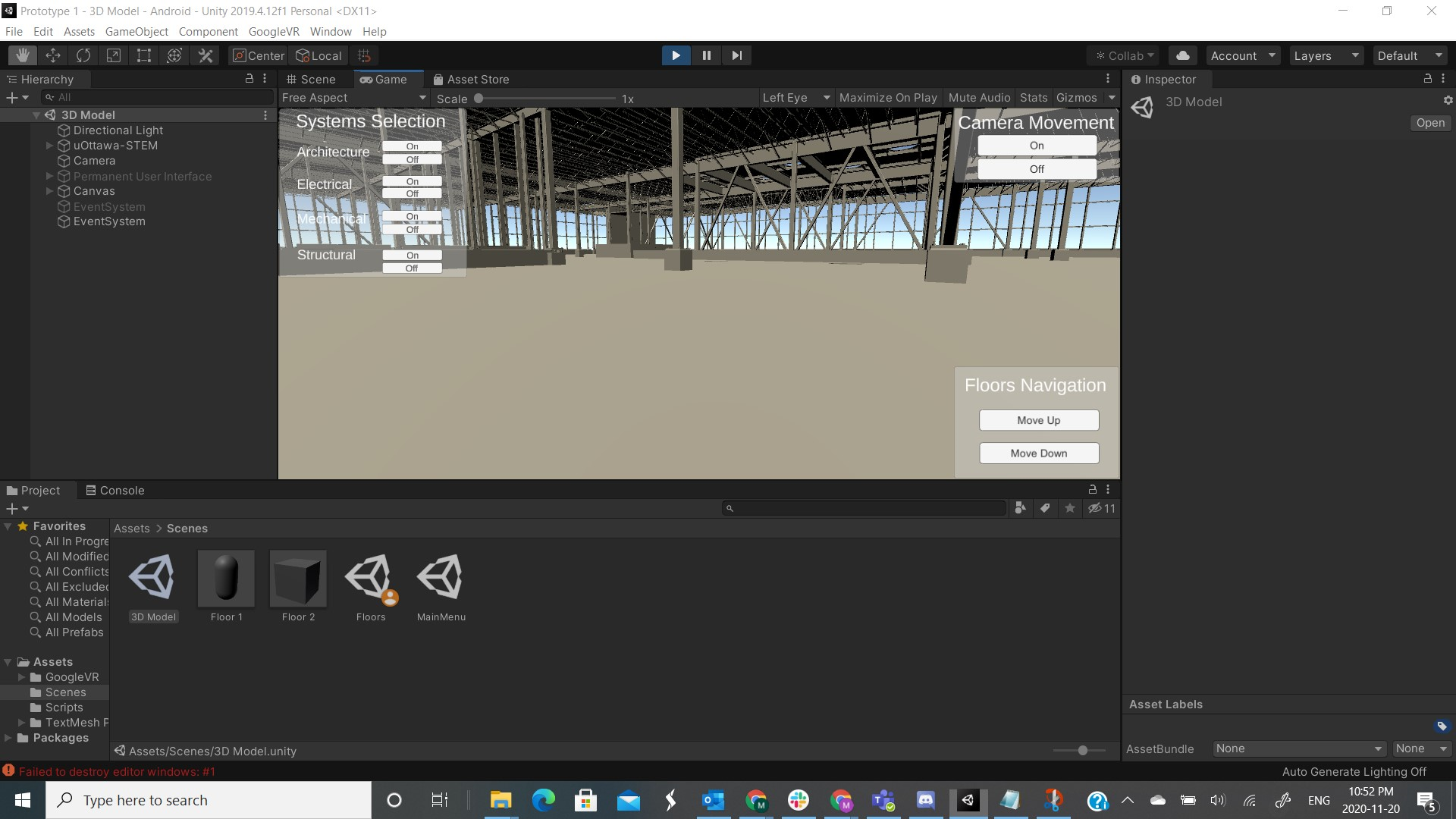
Once the user chooses to view the uploaded model, a “Loading” text will appear so that the transition when loading the model is smoother, as demonstrated below.

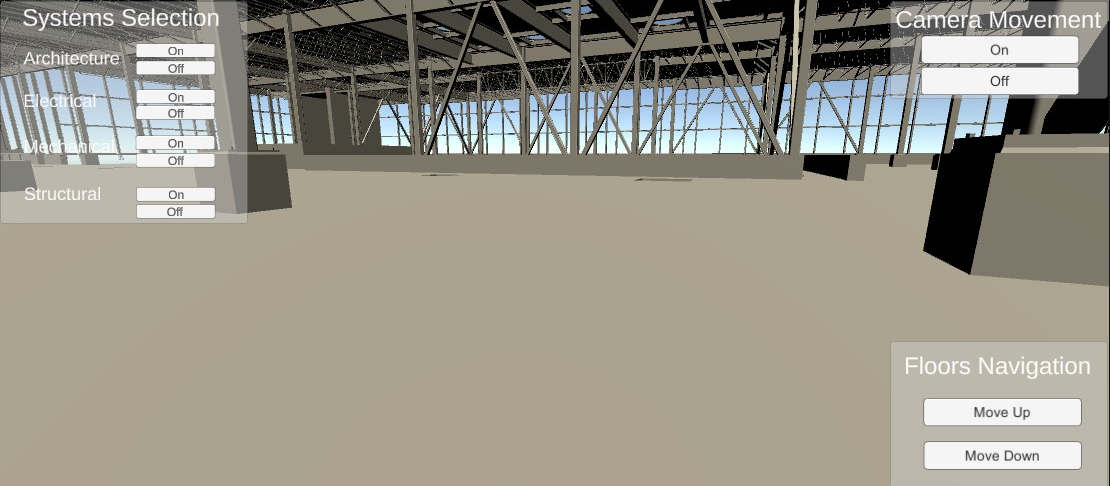


The main menu screen as well as the user guide screen were unchanged as we deemed them properly functional as they are from the first prototype. The team tests the new main menu features by entering the scene and testing the different buttons on the menu to either view the BIM or to view the user instructions.

1. Fourth Update:

The last critical feature of Prototype II is making sure that the user can easily navigate through the building model. Currently the team has designed the prototype to allow the user to move through everything (e.g. walls and other objects in the way) except the floor to make navigation easier. The figure below shows the position of the user at two close instances (moving closer into the page).





Testing this part consists of entering the scene the same way as before and simply moving around to ensure that the user can easily navigate but also doesn’t encounter any fatal bugs like getting stuck or falling through the floor.

**Project Cost, Methods, and Next Steps:**

These qualitative tests don’t produce measurable results but the tester can assess how user-friendly and comfortable the prototype is, allowing the team to decide where to dedicate their resources.

When testing and checking our prototype we observe the scene and our project in Unity to test how our adjustments affect the rest of the project, as well as look for improvements while resolving issues. We record screenshots of our project which can be seen in this document. The screenshots help the team check that we are making the necessary adjustments and keep everyone updated on the progress.

At this point in the project, the team hasn’t used any materials, including assets from the Asset Store in Unity. We also have no cost yet. We don’t anticipate the use of any materials or any cost until we need to make cardboard VR headsets.

The next step for our team is developing and finalizing the test model/prototype to be used on Design Day to explain our solution to EllisDon’s problem of BIM viewing. The specific objectives of the team are features such as implementing a “gaze” method of selecting buttons in the user interface, adding to the user instructions, and refining the user movement to make it smooth and easy to use. As of now we have most of the software and construction done, these features will help the team achieve the main goal of prototype III, which is viewing the file in VR on mobile phones.

To recap, we are currently conducting tests with the STEM building in Unity. Testing is not quite as involved for this project as it is for other projects. Whenever we open the file and move around in the project, we test ease of use and user control mostly. Before we move on to testing the project with VR goggles we need to ensure that the main functions work well with just a mouse. The team hopes that refining the movement with the mouse will give the project a good foundation for VR movement.

This prototype needs to be complete before we move on to the features of Prototype III like real VR capabilities and a fully functional BIM viewing system complete with floor-to-floor navigation and the ability to select systems while in VR.

**Concluding Remarks:**

In this deliverable we outlined the features we expect to feature in our second prototype as well as how they will be tested for quality. The most important new aspects of the project include importing the BIM file for viewing, creating a user interface that allows flexibility, improving the main menu screen to accommodate new features, and improving user navigation through the scene. Each feature stated here will be tested repeatedly as one comprehensive prototype, with the team making small improvements incrementally with each test.