Project Deliverable H

-Prototype III and Customer Feedback-

Group B4

Emma Ballantyne [300115563]
Bayza Woldemariam [300131459]
Callum French [300128814]
Reda Hamza [300103331]
Mariane Scalise [300114681]

26/11/2020

GNG 1103 - Engineering Design

Faculty of Engineering – University of Ottawa

Table of Contents

Introduction **3**

Why are we doing this test? **3**

Test Objective Description **3**

What is going on and how is it being done? **3**

When is it happening? **3**

Prototype III **3**

Conclusion **3**

Introduction

In this deliverable we are outlining our third and final testing plan that takes place to determine the viability of our third prototype. At this point our third prototype is complete and our testing will determine the final functionality. Our test plan includes the reasons for testing, the objectives of the testing, a description of our prototype, expected results, desired results and a measuring system for these results. The timeframe of this testing is also outlined to help ensure that the project is staying on track for our design day presentation and satisfying the customers needs.

Why are we doing this test?

The testing is being conducted to monitor the progress of our prototype and to determine its final functionality for design day. To date we have successfully opened the BIM project file into unity and have been able to navigate with the AR camera. The different layers of the building have been defined by adding different colour options to improve visibility. There have also been various user interface improvements implemented to ensure the user has a pleasant experience with our application. These new functionalities must be tested to verify that they operate effectively. The risk factors of the project are decreasing with the more time that is spent in Unity and on the project. However, there is still the risk of trying to convert the work in Unity to a mobile application of which we are unsure of the outcome.

Test Objective Description

The specific objective of our third and final testing phase is to be able to open the building information model, navigate with the AR camera and differentiate between different functional layers of the building using a colour scheme. There has also been a french language option added which will be tested. Previously, we had confirmed that the user can login, reach the file selection page and select a tutorial page. We will also be verifying these previously tested functions continue to operate.

The prototype serves the purpose of combining all of our previous prototypes with our newly added AR components. Compiling all of our gained knowledge of Unity to this point has allowed us to begin implementing an AR component into our application. We have successfully opened the BIM files and are building onto this. This testing period will display if our attempts with AR are successful or not, and that our previous functions continue to operate.

The potential results for this testing phase are more uncertain than previous testing phases. A successful outcome would be that the file opens and we can navigate through the building with the camera, viewing each different coloured layer of the building while also being able to login, switch the language to french and visit the tutorial page. There are many errors that could occur, such as the camera failing to operate smoothly, the coloured layers not appearing or the language not completely switching over.

If the BIM opens successfully, can be navigated with the camera and the different layers can be seen then our project is on track to be completed for design day and only minor features will be

added/altered to ensure the best possible product for design day. If any aspect of this file fails then we will need to closely examine the scripts that have been written thus far and troubleshoot to achieve a successful outcome.

This testing period will be considered a success if the user can login, select their preferred language, view the file selection page (and tutorial page), open the BIM file, navigate with the camera, and the four functional layers of the building can be differentiated by colour. Any outcome less than this would be considered a failure for the prototype and suggests there are errors which must be corrected for design day.

What is going on and how is it being done?

Our prototype III is the continuation of our second prototype. Therefore, this prototype is a focused analytical one just like the two previous ones. Indeed, this prototype contains all the features we have worked on including the ones in the first and second prototype. This prototype is also a focused one and it is the last one. Our third prototype answers specific questions such as security, mainly aesthetics and user interface but also the different possible views of the building we will design since we have worked a little bit more on that. This is also an analytical one because it is cheaper than a physical prototype (it did not cost anything for the entire project) and we can make modifications more easily since the prototype is done through Unity which means we have more freedom with it. As said in the previous deliverable, we have chosen this type of prototype because it is easier for us to make many prototypes where we will add features every single time which will allow us to obtain our final product. Therefore, this prototype has new features the previous one did not have. In this prototype, features have been improved to better the experience of the users.

In order to proceed on our project, we need to test our prototype. The testing process for the first prototype was a success since we were able to login into Unity and be redirected into where the files' company will be stored. The testing process for the second prototype was a success too since we were able to see a building and move around it with different angles. By testing our prototype we will be able to detect any possible flaws it may have or even if there might be a way to simplify the use of the app because our aim is to have a final product that is very easy to use.

The testing process of this prototype has been the more difficult and complex one. As to verify if everything we have tested in the past prototypes still works properly, we have decided to as well test them along with the other new features of the third prototype. The first step is then to login into the registration page where we will be redirected into the files on Unity where all company files for instance will be stored. After that, the aim is to be able to open the building information model file on Unity. Since it is a very heavy file, we have had a few issues uploading it. Even after that, it was hard to move the camera and enter the building but we have worked on that issue on this prototype. Furthermore, after opening the file we were able to see a building which concludes our verification process for the prototypes. We are still trying to add a feature which will lead to a potential tutorial if the users find any issues or have trouble finding something. We were to improve the camera feature where we can enter the building and go around it more

easily since it is easier to use and it doesn't glitch. We also have worked on the aesthetics of this building. We were able to develop a code that added colors to the building which makes it easier to distinguish each part of it including the insides where we could distinguish different types of pipes for example. Moreover, we have successfully added a french side to our prototype where all of the english features have been translated to french making our app fully bilingual. We were able to make the french setting connect with the french page and the english ones with the english page. Finally, in order to test our tutorial we will have to follow the steps to find it and then click on it and see if we are redirected to the part that explains how to use the app.

With this prototype, we measure and record the level of safety with the registration page, the aesthetics because we want to make sure that the login page, the files storage and Unity main page are welcoming and easy to understand to all users and that the building's components are easily distinguishable. We also measure and record the different views so that we are able to see the building from the top, bottom, right or left so that the users can see their buildings from any angle they want and finally thanks to the improvement of the camera we are now able to see the inside of the building and go around all the rooms more easily. We finally measure the aesthetics which have been improved since the last prototype thanks to the code we have been able to write. We have now a colorful STEM building where we can differentiate all of the building's components. We can add that we measure and record as well the level of communication since we were able to add a french side to the prototype III. Since we are based in Canada, having a bilingual app is very important. Finally we successfully uploaded a tutorial which we can see on our screenshots below.

The goal here is to make sure we can safely open the building information model file on Unity, that we can see the building with the plane we have added from different angles easily with all the components in different colors to distinguish them and finally that we can see the inside of the building with again, colored components (such as pips or rooms etc.). We will, as said before, measure and record all those attributes in order to see if this prototype has been a success or not in the testing process. And so, the work that needs to be done is to evaluate the app and see if it won't crash when opening the file or editing it for example. However, since it is the last prototype we will try to have an app where our features work rather than an app with too many features where some don't work properly or do not even work at all.

When is it happening?

The testing process will not take long. It will happen before the due date of the deliverable which is November the 26th. In fact, all that needs to be done is as said above to login in order to make sure the registration page works and to open the BIM file on the files storage to see if we can open it. However, before that we need to make sure that the code for the login page works and that the BIM file has been successfully uploaded onto the storage file room. Indeed, if the file has not been successfully uploaded, we will not be able to open the file on Unity and if the code ends up having an issue we will not even be able to login and try to open the file. We also have to make sure that the code that made the components for the STEM building distinguishable works too. We also need to try to see if we can start a tutorial or not because if

we can't we will have to remove it since we only want to keep features that are operational. The results should be required immediately after the testing process. However, the results will be given right after it since we will be able to figure out if it is possible to open the file on Unity. As said above for this test, we mainly depend on the BIM file because if we cannot open it, we won't be able to proceed and verify that we can see a building from different angles for instance. Finally we will try to move around and inside the building in order to evaluate the camera in case it still glitches.

Prototype III

The focus of this third prototype was to get an app up off the ground and working. Unfortunately, we did not have the computer capabilities to get the application onto mobile, but a build for windows was possible. This build included the active rendering of the entire STEM Building, the automatic color assigning of every individual layer in the FBX model, and a fly-camera that could be used to walk through the building. Behind the build was the coding of a script for the fly-camera and a script to apply the material to each layer. Applying this layer proved to be an immense challenge, so time was lost to implement future steps, like layer opacity, a toggle-able flashlight, and the full connection of login-screen and building model. Additional errors appeared that could not be fixed, like our electrical layer. Many parts of the electrical layer were appearing upside down, not attached to the proper roof, or floating in midair. It was determined that this was an issue with our given FBX model and not the program, so the build was continued. Below are some screenshots taken showing the entire model.

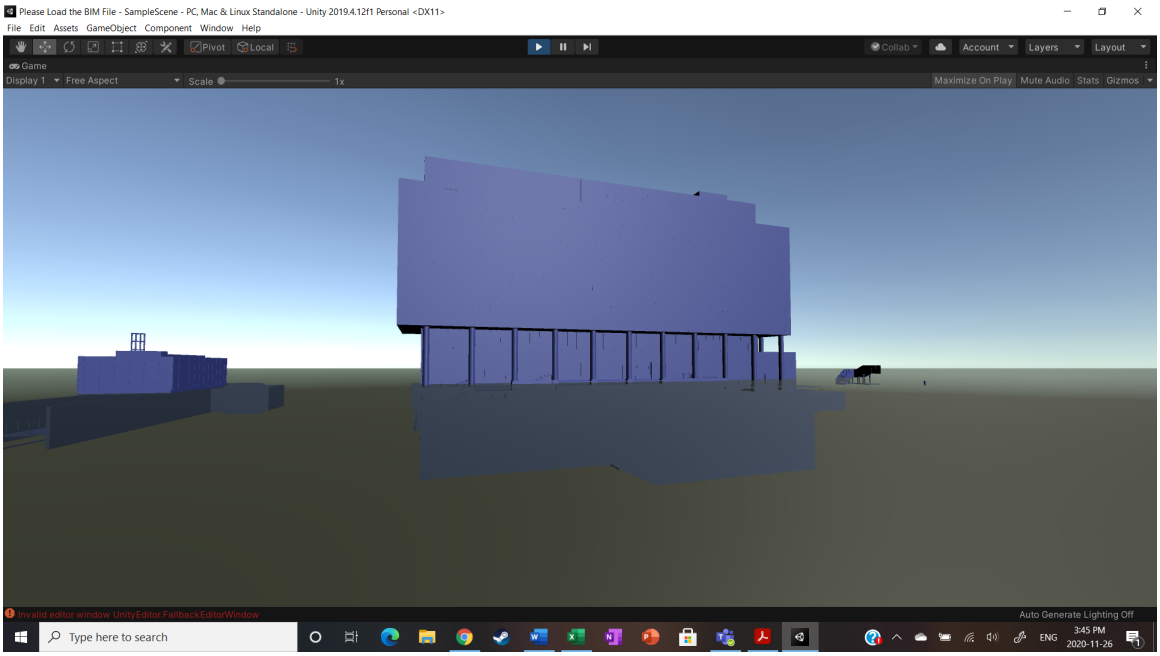

Figure 1: A rendering of the architectural layer from the built-in Unity launcher

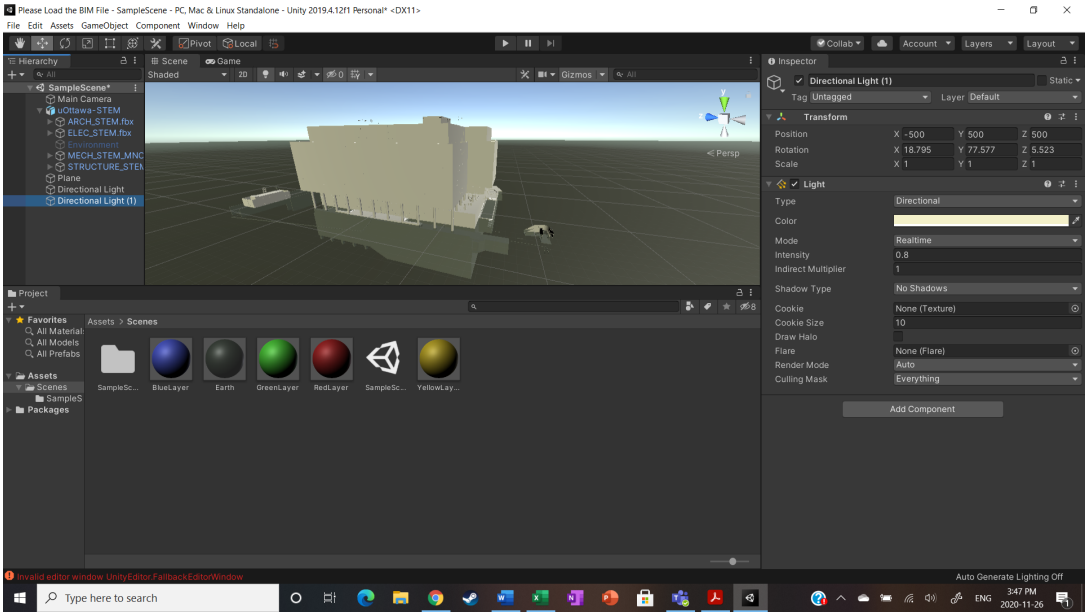

Figure 2: A photo of the Unity page showing the unrendered, unmaterialed model

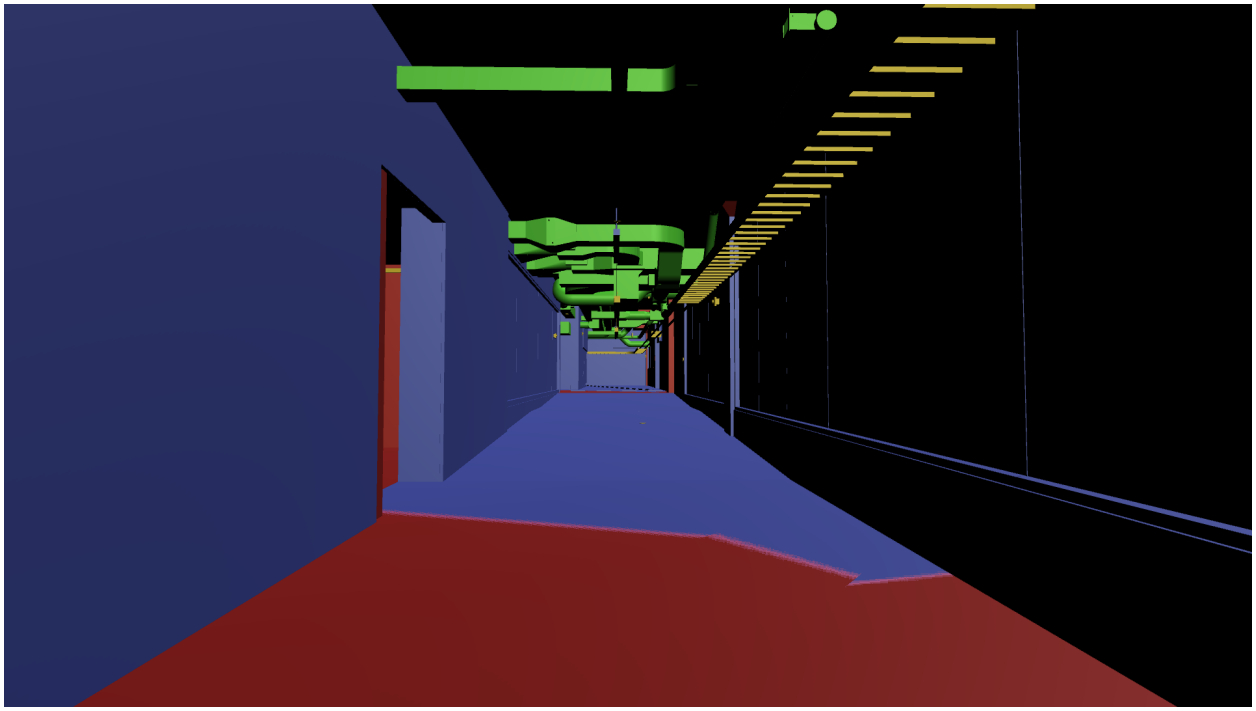

Figure 3: A photo taken in VizBIMBuild1 showing a slanted hallway, a blue architectural and red structural layer overlapping, a green HVAC system, and a yellow electrical ladder.

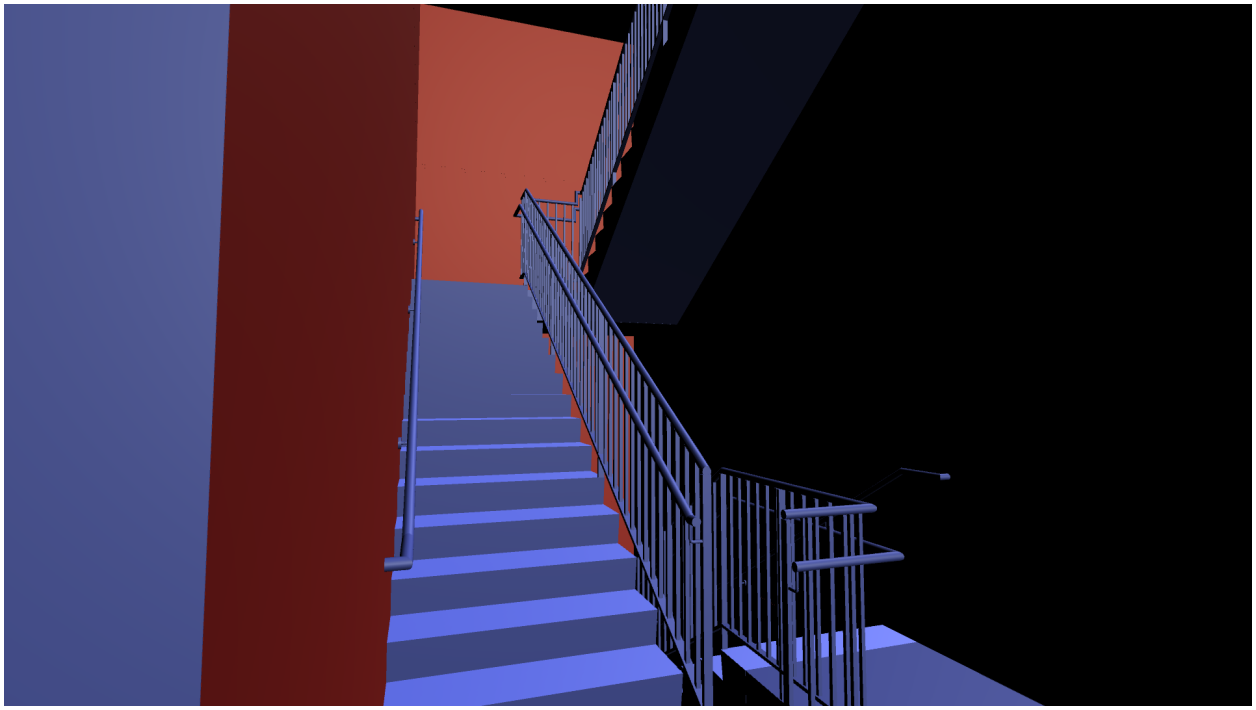

Figure 4: A stairwell inside of the STEM building

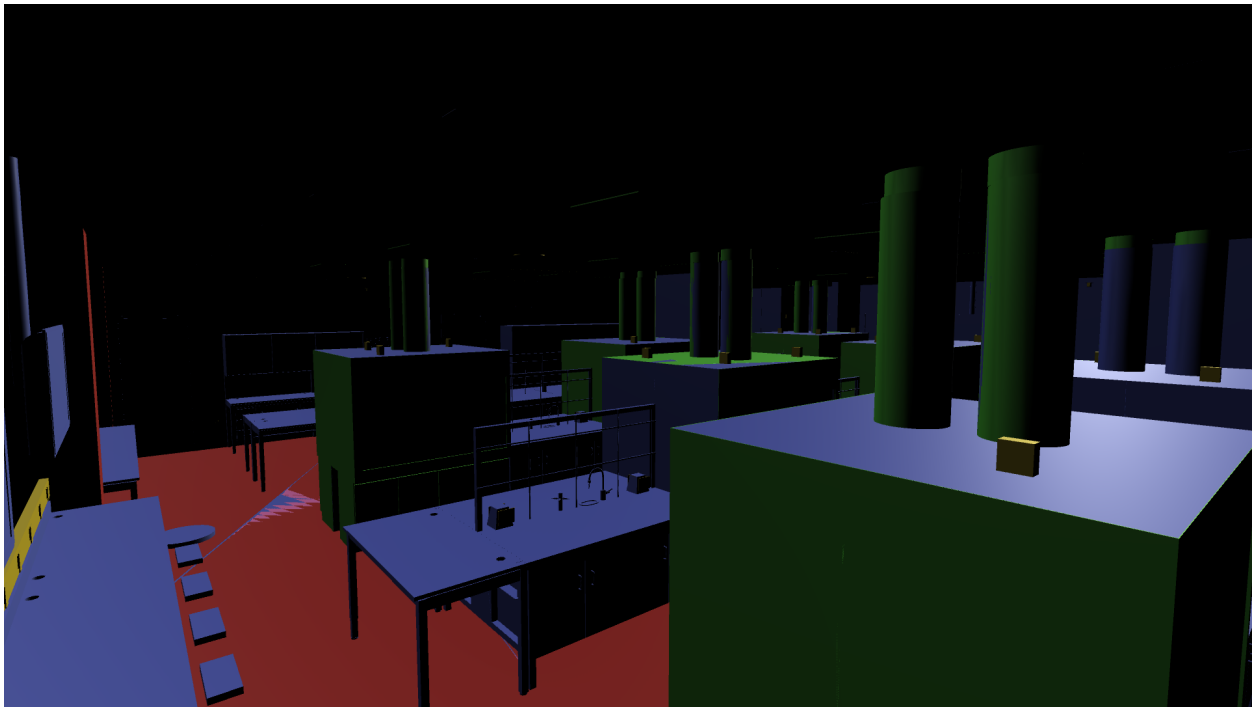

Figure 5: A physics classroom equipped with desks, airflow, and electricity

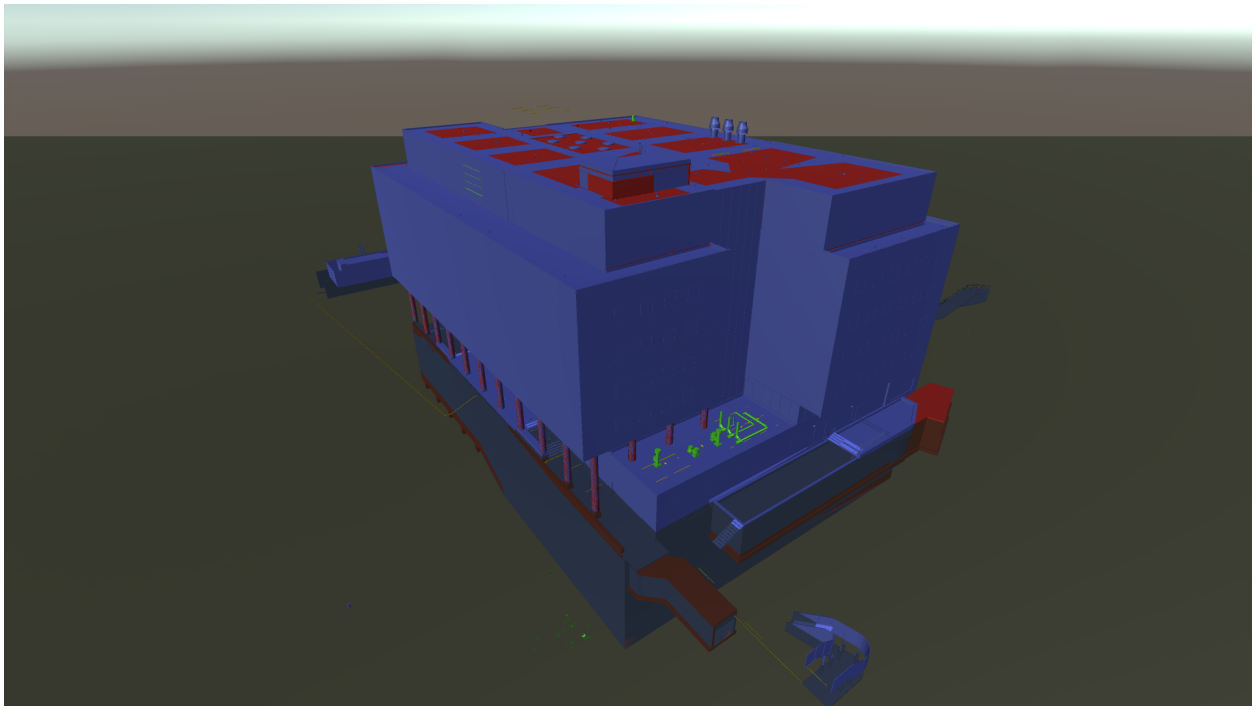

Figure 6: A fly-cam view of the entire STEM building rendering all four layers.

In addition to the rendering of the STEM model, this prototype includes a more aesthetically pleasing layout and other settings for a smoother user experience. The main settings implemented in this prototype were the french language option and the application tutorial. We also rearranged the user interface to make it easier to work with and more pleasant to look at then the other prototypes. This change was implemented by adding images in the form of sprites to give the application a more retro look. Debugging was also done for this prototype to make sure that everything implemented actually works. This debugging mainly included scripting buttons and making sure the transitions between screens was seamless. It is important to note that we cannot access the 3D rendering of the building from the user interface so any mention of it in the figures below is a representation of what the application is supposed to look like the two parts were linked.

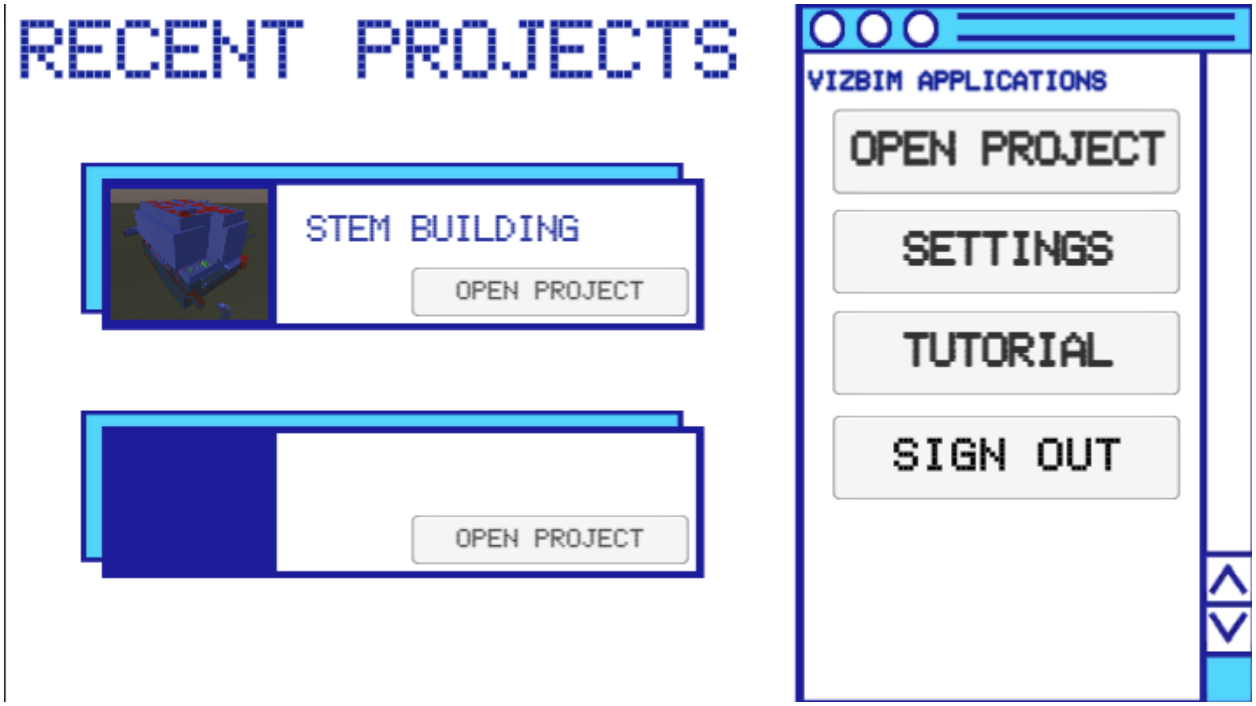

Figure 7: The applications main menu with the STEM building as a recent project

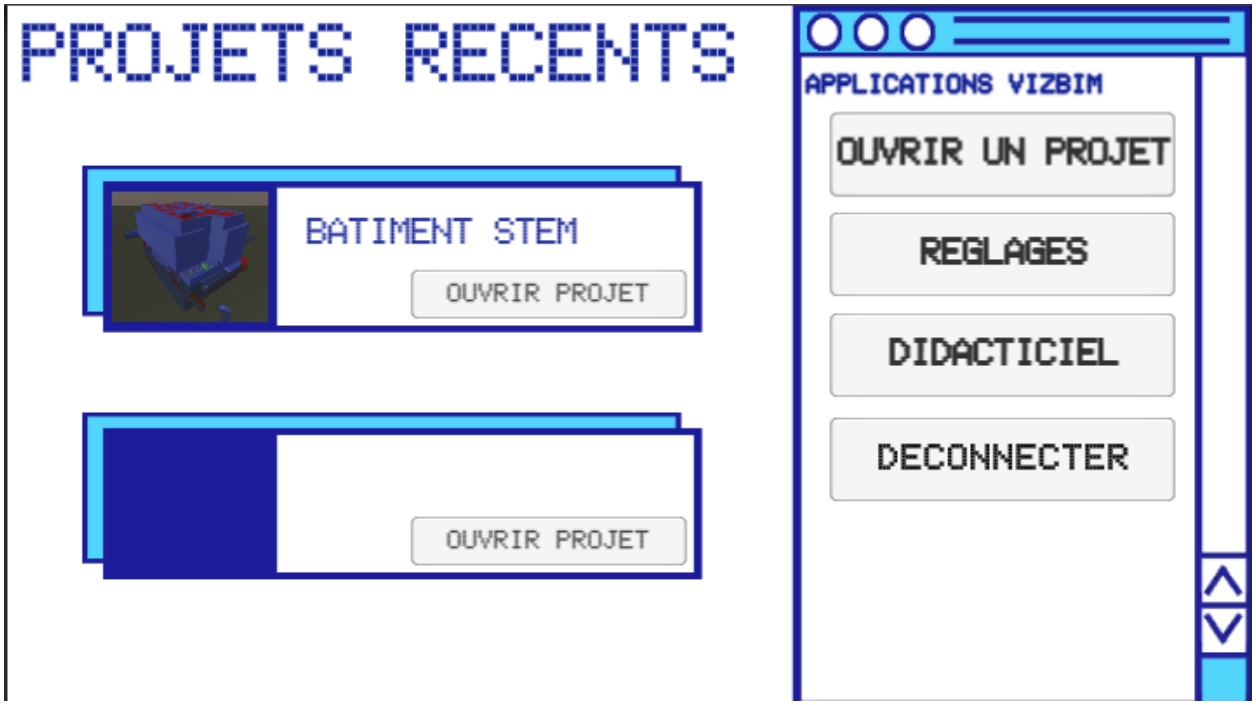

Figure 8: The main menu in French

Figure 9: The settings screen of the application, showing an English and French option

Figure 10: The starting screen for the tutorial

Conclusion

In conclusion, we have tested our third and last prototype and followed every step given above. We have written down our results. We are able to login and to successfully open the BIM file.

This means that we can see a colored building from different angles with the added plane but also the inside of it thanks to the improved camera. We can also see those features in french which makes our prototype accessible to all companies in Canada and we have successfully added a tutorial to help anyone who would need help finding something on our app which works well. We are now ready to prepare ourselves for the final presentation which will happen in a few days. However, no purchase for this prototype was required, so our budget is still intact. Regarding the final presentation, our group has decided that we would eventually allow 1 or 2 people to talk since it is a very short presentation that only lasts a couple of minutes. We will be ready by then and have already started working on it. However until then, we will still try to work on the tutorial development and do our best to have one ready so that users can use it anytime if they can’t find a feature for example.