



Technische Hochschule Ingolstadt

User Experience Design

Winter Semester 2022/23

Augmented and Virtual Reality

Project Report

“GRABTOR”

THE LEARNING PLATFORM



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Team Grabtor

I'm **Sabrina Hoffer** and until recently I worked as a frontend developer. Through this experience I worked with various source code management tools. Therefore, I primarily took over the management and initial setup of our repository.

At the same time, I also set up the project in Unity, modeled various 3d-objects and with Blender I also cut an already existing real 3D model of the Eiffel Tower into 3 parts, with which the user could interact later. The implementation of the movement, the grabbing and the teleportation and the participation in the quiz were also implemented by me.

Since we didn't use the base project from Multiuser-VR-Starter Kit, I also set up the server using Photon for the players and the voice chat, which was also my biggest challenge as a developer. Because the movement suddenly behaved differently and the player moved depending on the head movement.

I'm **Aramalla Saipriya Reddy**, in the past I worked as a Lead Generation Executive. Based on my experience, my role in Grabtor application was as a Researcher, Developer and User Interface Designer.

My learning aspect from the project is that I learned different software platforms and tools which include Unity, Blender, and GitHub. Apart from this, I came up with learning some basics of C# language for the basic scripts used in the project.

In Unity, I made the scene more interactive, informative, and added help assistance throughout the VR application. I have added the introduction Scene which includes Login, Logout, About, and Guidance (Help) screens. And in blender, I created 3D characters for multiplayer purposes. And then add the informative pop-up screens in the Grabtor scene to gain detailed information about the architecture. And at last, the Quiz questions were added accordingly to check whether the user gained knowledge and can answer the questions. Lastly, I hold the major part in preparing the presentations presented for describing the progress of the application.

I'm **Nallamai Raman** and I worked as a Senior System Engineer. I have good experience in Adobe XD through my certification course in UI/UX Design. Based on my experience and interest, I took up the role as a UI designer and Researcher in our project.

As a part of Research, I did all three User Personas based on user pain points. This project gave me an opportunity to learn new tools such as Blender, Unity and GitHub.

As a part of Design, I have created various 3D models for our environment using Blender which includes trees, bushes, Flyer map, ground base (grass), Visual Design Mood board, flow and mind map of the project. In Unity, I integrated background sound for our project. In our Usability test, I contributed as a writer. In documentation, I took up the major role in writing the main concept of our final report and presentation.

GITHUB LINK

Final Version

This is the final working project with the multiplayer set-up which we have set-up on our own.

<https://github.com/RinaAshelia/Grabtor-v2/tree/missing-terrain>

Old Version

In this version of application we used the multi-user starter kit, but due to some issues we decided to set-up the new version without the starter kit

<https://github.com/RinaAshelia/Grabtor-VR/tree/develop>

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References

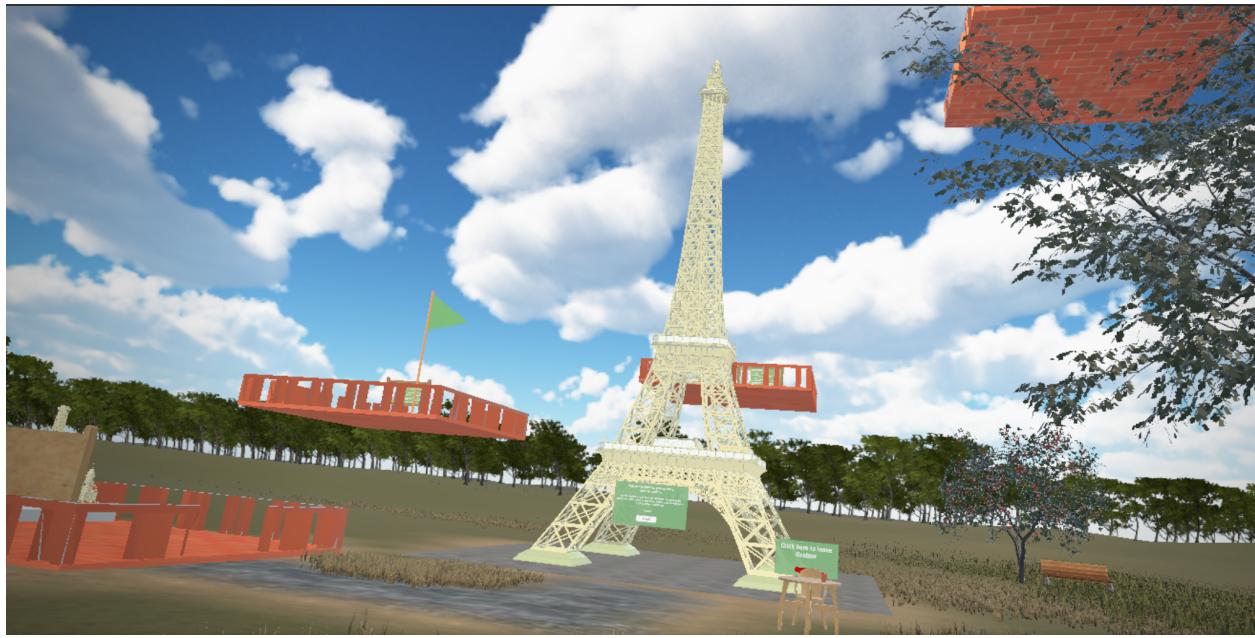
1. Overview

1.1. Introduction

Grabtor is a Virtual Reality Application designed to be highly reliable, flexible, and easy for architectural and civil engineers. This is an online learning platform in which users can travel around the world to some famous architects and gain information about how and when it was built with just one click. Elements that stand out for Grabtor is that it sets the virtual world (Virtual Environment that replicates the stimuli of the physical world and allows the user to interact with it on a real-time basis), immersive scene (making the experience closer to reality using immersive scene content and sound) and interactive nature (real-time interaction on screen gives a sense of inclusion and immersion between the user and the scene). The application is set up with a very easy and smooth flow of steps. It enables you to get a feeling for space and design and perceive the actual scale of the monument chosen.

The features which Grabtor has are to explore in the scene, grabbing of the object, teleportation to different points, gain dimensional information, and quiz solving. After exploring all the features in the application, the user is ready with all the information for the monument chosen. As of now, we have just added one monument i.e., the Eiffel tower. At present we have two versions of our application in which one version is set up just for one user and the other version of the application is set up for multi-users.

The Grabtor application consists of three different phases which includes the introduction scene, main scene, and the quiz scene. In the introduction scene there is different general information, Help (Guidance), information about how to use the controllers, and the different tasks that need to be completed to gain information about the architect in the application. The different tasks are to explore the monument (Eiffel tower) and travel to different points (Flags) and platforms to have a better view and view of the monument. Different platforms have different information about the monument and the flags are marked to be a special point which needs to be visited or hovered on to get more detailed information about the monument. At the same time the final platform marks to be the final one to gain information and to test the knowledge acquired. On this platform the user must solve or answer the quiz questions to know whether the information was sufficient to understand about the monument (Eiffel tower).



Grabtor has many improvements in the future. The features available in the application makes Grabtor the best than any other existing application because the applications available aren't free to use and not so user friendly as it works. Grabtor is designed mainly for the students to have a practical knowledge about the architecture and construction.

1.2. Problem Statement

In the existing set-up, students in different fields of architectural and construction projects are facing many problems in their day-to-day life. Several technical and standard criteria have been taken into consideration while developing this application. These criteria are not structural behavior, spatial flexibility, and environmental impact. At the beginning of the course, students get their first hands-on or practical experience late. Due to this, students find difficulty in modeling the structure. It's difficult to imagine 2D models in the form of 3D models in real-time. Whereas in Virtual reality users can observe the 3D model. Group projects are complex to work on with a different set of group members irrespective of their field of interest. No proper communication within the group as everything needs to be done on-site. Making changes in the modeling at the later stage is very difficult and a lot of time-consuming and a waste of resources.

1.3. Goals

The main goal of this application is to help students pursuing architectural or civil engineering by providing the users with a full 360° view enabling them to get a feeling of 3D models and know more information in detail about their dimensions and the material it is made up of. Grabtor is creating simulated environments (different famous architects around the world) in which architects, engineers, and designers can work together from all corners of the earth on the same 3D model at a time by exploring the monuments and gaining knowledge about how it's being built. This application provides an intuitive design and information on famous architectures to anyone accessing the Grabtor application. Other than these students and the professor can collaborate in the application and have a better communication of understanding the concept of 3D modeling. Based on the information gained the student or the user should try to have a first hands-on experience with 3D modeling. After moving around and gaining knowledge from famous architectures, the user will have reliability in the decision-making process and have very less or decreased negative iteration done while constructing any kind of 3D model.

2. Design Considerations

The methodology we have done for the design process consist of four phases:

- Discover: Understand the issue rather than merely assuming it. It involves speaking to and spending time with people who are affected by the issues.
- Define and Design: The insight gathered from the discovery phase can help to define and design the challenge in a different way.
- Develop: Give different answers to the clearly defined problem, seeking inspiration from elsewhere and co-designing with a range of different people.
- Deliver: Involves testing out different solutions at small-scale, rejecting those that will not work and improving the ones that will.

2.1. Discover

As we already mentioned our problem statements and ideas in the above, now the time is to dive into the next phase.

Our team decided to collect more insights about the architectural students, how their learning standards are, what their likes and dislikes are about the architecture and also what approach or process does the professor follow to make students understand the architecture concept better and in such an interesting way. We luckily have some friends from architecture we have called and interviewed them personally and also did some research work through the internet about their frustrations recently they are facing.

Before doing an interview with some of our architecture friends we have done some research from the internet resources to get a better understanding about what we are trying to achieve. Based on that, we made a workflow assuming this would be our proposed solution to the problem we are addressing. Our approach was to create a virtual reality application where the students can go into a virtual world wearing the VR headset.

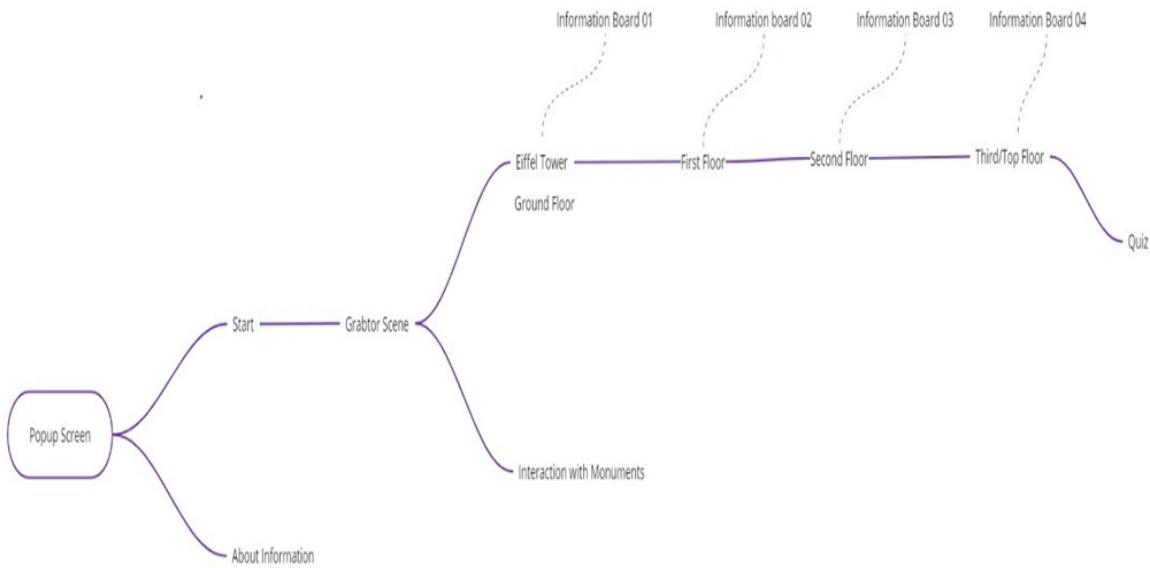
Our first plan was to show the welcome screen which basically had a help and some tips , where the user can see their status of learning and other options to explore the Eiffel tower. In addition to that, we thought of making it a more gamified experience, so we also have a game feature and the pop quiz. These would help a student learn in a more gamified way.

2.2. Define and Design

we get to know some useful insights after listening to some of our architectural friends. The students seemed to be interested a lot in our concept. They discussed their likes and dislikes about studies. Then we also discussed with them about their learning and understanding approach to the concepts. Got to know about their pain points as well. The way of learning concepts is somewhat similar all the time and unable to understand sometimes.

Based on the insights we gathered in this session, we decided to modify our approach by providing the information in a more understandable way so that it would properly align with what the students are being taught by the professor and also be beneficial for them at the same time. Although a VR based approach would be more enjoyable.

2.2.1. Flow & Mind map



2.2.2. User Personas

After having an interactive session with some architectural students and with some research through the Internet we got to know about the architectural students and professor facing frustration and in general we got a lot of information on how the concept is being taught and also how the students are perceiving it. We introduced Augmented Reality to the class and conveyed what we are trying to achieve. We also demonstrated a few examples of Augmented Reality using our smartphones, the students seemed very much excited. The session really helped us understand them, some of their pain points, expectations, etc. and created user personas based on the conclusions achieved for further work to be done.

“I think never stop learning”



User Story

Prathana is a confident student who runs her own freelance business. Mainly she works for interior designing. She always wanted to share her learning to others but not interested to be a teacher or mentor.

Prathana

Age: 28 **Canada** **Personality**

Master Student **Organized** **Punctuate**

Goals

- Learn new skills
- To learn all the necessities which is required to survive in this field.
- Work for specific organization
- Communication skill related to the field
- To improve problem solving

Frustrations

- Not finding a proper way and group to share her ideas
- Time consuming
- Too much of work

Interests

- Architecture modeling
- Dancing

“Sharing knowledge will make you a better person”



User Story

Martina is an assistant professor of architecture and design and very much interested in teaching and mentoring. Whatever she has learned from her experience and education, she wants to share it with the growing architects.

Martina

Age: 40 **Dubai** **Personality**

Professor Married **Helpful** **Resourceful**

Independent

Goals

- To share her knowledge and experience in architecture and designing
- To bring fun to learning
- To inspire a love of architectural designing
- Planning the learning environment
- To prepare students to challenge conventions through innovative thinking and technology

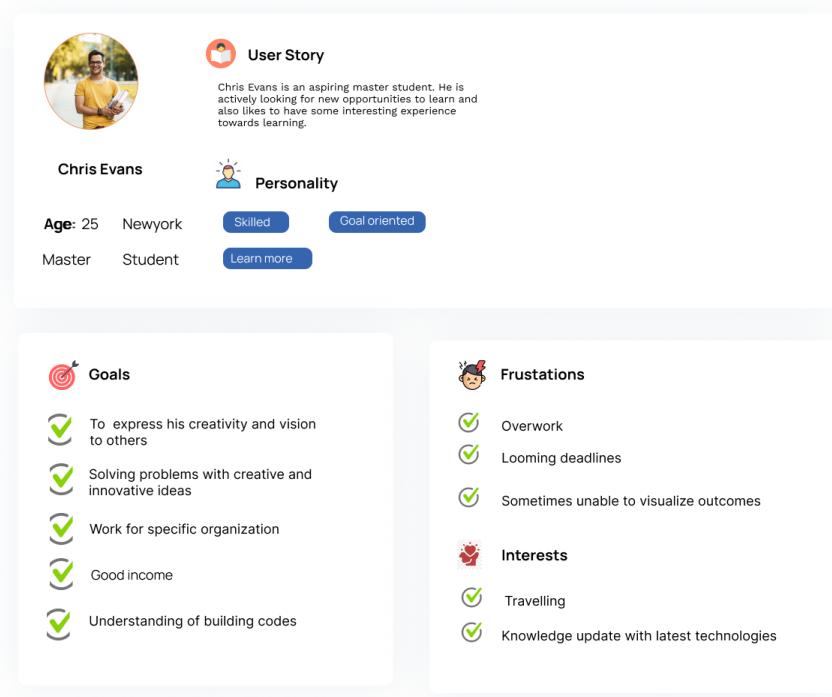
Frustrations

- Time management
- Unable to conduct more architectural visits to different places
- Dealing with personal and professional works

Interests

- Reading Novels
- Learning new design trends and tools

"I always believe in what we try"



User Story

Chris Evans is an aspiring master student. He is actively looking for new opportunities to learn and also likes to have some interesting experience towards learning.

Chris Evans

Age: 25 **Newyork** **Skilled** **Goal oriented**
Master **Student** **Learn more**

Goals

- To express his creativity and vision to others
- Solving problems with creative and innovative ideas
- Work for specific organization
- Good income
- Understanding of building codes

Frustrations

- Overwork
- Looming deadlines
- Sometimes unable to visualize outcomes

Interests

- Travelling
- Knowledge update with latest technologies

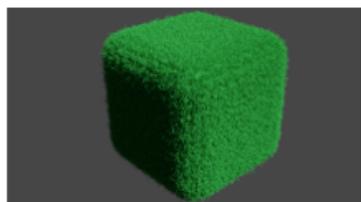
2.2.3. Mood board



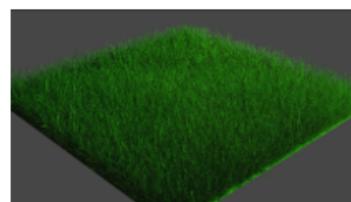
2.2.4. Design for Environment



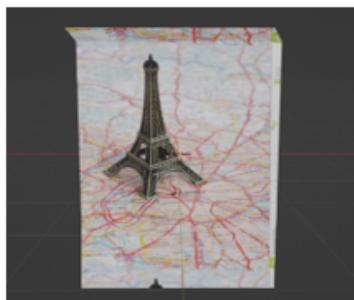
Tree



Bush



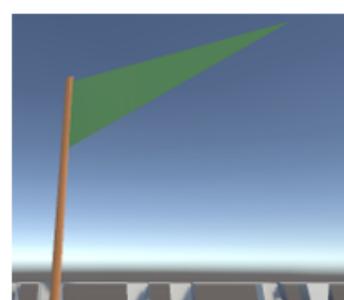
Grass for Ground



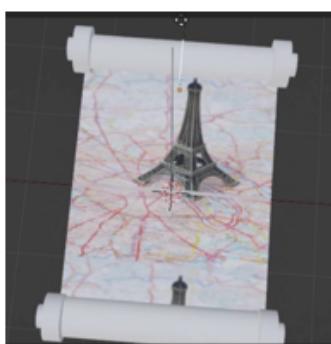
Flyer map



Sky Box



Flag



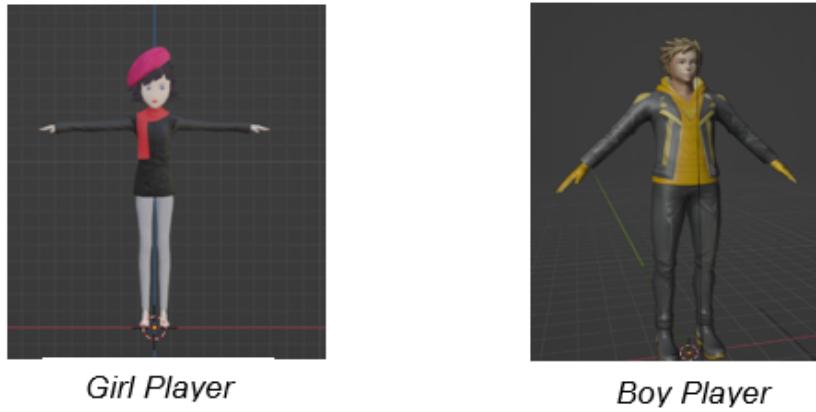
Animated Flyer map



Information Board

These are some designs which we made in a blender from scratch for the environment to make it more realistic. Trees, bushes, Grass, Flyer map, Roller Flyer map, Flag(Point of interest), Information Board are made for our Grabtor application. Later we decided not to have two of our designs (Animated Flyer map and bushes).

2.2.5. Multiplayer Design



To make the application as realistic as possible for the user, we came up with the idea of modeling our 3D models with special clothing. They should always change according to the location of the building. Since we are in Paris with the Eiffel Tower, we decided to dress the models in something typically French. In order not to ignore the multiplayer model and to make it more interesting, we modeled two models.

2.3. Development Phase

2.3.1. Software

Blender: For modeling the Players and environment objects for our application

UNITY: As a game engine that hosts all models, audios, scripts, UI components, etc.

C#: As a programming language to add the logic for all required interactions.

GitHub: As a code hosting platform for version control and collaboration.

2.3.2. Features

Intro Scene: a feature that has start, Info and help button where it helps the user to get information about the application via UI panel and also can enter into the scene through the start button.

Interaction with monuments: a game where the students can interact with the monuments by grabbing it. For this we have sliced the Eiffel tower into 4 parts and placed it on the ground floor to interact with it.

Information Board/ Pop-up screens: a feature that gives information about the Eiffel Tower and its dimensions.

Flag: placed at the level of each tower. Where students can reach the next level by teleportation. We placed this flag for the students to identify the next level and to have little gamification.

Sound: a feature that we created for our application to make it more engaging when entering into the scene. Also we have added feedback sounds for our application(For Example : footstep sound and grabbing sounds).

Quiz: a game where the students can take when reached to the top layer of the application.

Multiplayer: a feature where users can walk through the environment together. That's the reason we set up a server to connect and also a voice server.



3. Usability Test

3.1. Our Usability Tests

In the course of our project we conducted two usability tests. The first one was with two testers and without much preparation, just a short introduction of what the goal of Grabtor is. Our focus was primarily on the interaction with the setup provided by us. The version used here was Grabtor 1.0 and built on the existing base functionality. The idea for our first version was to be able to interact with a large Eiffel Tower and take out individual components to get relevant information about the construct. The insights we wanted to gain were how well the user would cope with controlling our application, whether they liked the idea of Grabtor and whether they could learn something in the process.

Unfortunately, users had difficulty with the controls in the first test. Since we couldn't pinpoint the problem with the Multiuser-VR-Starter Kit environment, we decided to completely rebuild the project. No prefabricated help environment was used for it then. This resulted in Grabtor-2.0, in which we implemented the user feedback from the first test and conducted a second user test. This one was then with preparation.

We came up with a concept, a questionnaire and tasks for the users.

3.2. Usability test 1.0

3.2.1. The goal of the test

The goal of our first user test was to gain early feedback for the already existing application. We wanted to compare the feedback with our goals for Grabtor to see how they matched. We also wanted to know how users were getting on with the interaction options already implemented and what we could or even needed to improve.

3.2.2. What was the process?

In the first test, there was a short introduction to Grabtor. What the application is, what it was built for, and who and by what it could help.

After the short introduction, the user was allowed to enter the application and move around the environment completely freely. There were no specific instructions from the test team conducting the test, only questions from the test subject were answered. When the user entered

Grabtor, he found himself in front of a large virtual Eiffel Tower with which he could interact. Movement and interaction was only possible by using the controllers.

3.2.3. The result of the test

Shortly after the test began, both users had problems with the controls. The users did not know which buttons to press in order to grab an object, or to move forward, as well as to rotate the camera. This was visibly difficult for both participants, even after testing the different buttons they needed support. In addition, it was not clear to the users exactly with which parts of the Eiffel Tower they could interact. The color of the Objects did change to other colors when hovering and grabbing, but without guidance, users were not sure what the color change of the individual object meant. In addition, they seemed unsettled when, after removing a piece from the Eiffel Tower, it collapsed or even flew through the environment. Since the individual parts of the tower were quite large, users also struggled to grab the object and view it in front of them, since they could not be scaled smaller.

Another thing we learned from the test was that we didn't provide enough information about the Eiffel Tower. The reason for this was that we had divided it into three parts and this was the only interaction option for the user.

3.2.4. Conclusion of the test

The conclusion after the first test was that Grabtor was fun for both testers, but there was still room for improvement. Since the control was not understood without a manual and only through long trial and error, we should provide assistance here. The objects would also have to be adjusted, as they proved to be awkward to interact with and the color change was incomprehensible. Users also struggled with the size of the objects and did not know why they should interact with them in the first place. There was a lack of a task or a recognizable goal. The fact that only three components of the Eiffel Tower existed also meant that there was a lack of information that users could learn by exploring Grabtor. Therefore, more 3D models would have to be created to increase the interaction possibilities with the objects and the environment. Finally, we compared the findings with our vision of Grabtor and realized that the goal of making the application a learning platform for architecture students had not yet been achieved. It was possible to find information about the building, but it was not possible to verify or even consolidate what had been learned in any way. That's why the idea of a quiz was born.

3.3. Usability test 2.0

3.3.1. The goal of the test

After problems with the Multi User-VR-Starter Kit, the application was completely rebuilt. The goal of the second user test was firstly to test the improvements based on the first user test and secondly to see if the testers could complete the given task without any help.

In addition, we also wanted to check whether the objects we created were sufficient for interaction, the user received enough help for the control, information about the Eiffel Tower and the actual task, and felt that the environment we created was real enough.

At the same time, it was also important for us to check whether the application would now fulfill the vision of Grabtor. That we had developed a helpful, as well as interesting learning platform for architecture students, their professors.

3.3.2. What was the process?

Before we began the user survey, we reviewed the application and VR equipment. This included making sure that the controls worked and that the character's spawn point was correct.

Then we started with the actual user testing. First, there was a short introduction about what and for whom the application is. After that, the testers were asked more personal questions. We wanted to find out how old the person was and if they had any experience with VR applications, as it was important for the evaluation at the end. For example, did an experienced player cope better with the controls than a completely inexperienced one?

After the first round of questions, the application was tested. The test team simply indicated that the main task and information about the interaction were in the application.

Once the user had made it to the last platform and finished the quiz, more questions followed. This time about Grabtor itself. We specifically recorded the user's experience, suggestions for improvement, and problems.

Usability-Test for Grabtor- Questionnaire for the test person

Introduction:

"Grabtor is a learning platform which is mainly aimed at architecture students and their professors."

Do you think architecture students might have difficulties at the beginning of their studies? (If yes, which ones?)

What about the professors? Do you think they might also have difficulty teaching the material? (If so, what might they be?)

Explanation:
 Grabtor is designed to help students and professors to consolidate the learning material. Get first experience with 3D models and real building objects, improve spatial thinking.

Questions about the test subject

Your Age? _____

Your Highest degree? _____

What is your current occupation? _____

What is your level of confidence in Virtual Reality?
 1 2 3 4 5

Follow up question: In which VR-Games do you have experience?

Questions after the user test

How did you like Grabtor? _____

Was in the App enough help given for the Gameplay? _____

Did you understand the task? _____

Did you get enough information about Grabtor? _____

Were you able to access all the features via Gameplay? _____

Did you have any impacts while using Grabtor? _____

What was your overall experience with Grabtor?
 1 2 3 4 5

What was your learning experience with Grabtor?

What did you like the most in Grabtor? _____

What did you not like? _____

Were you surprised about anything via the Gameplay? _____

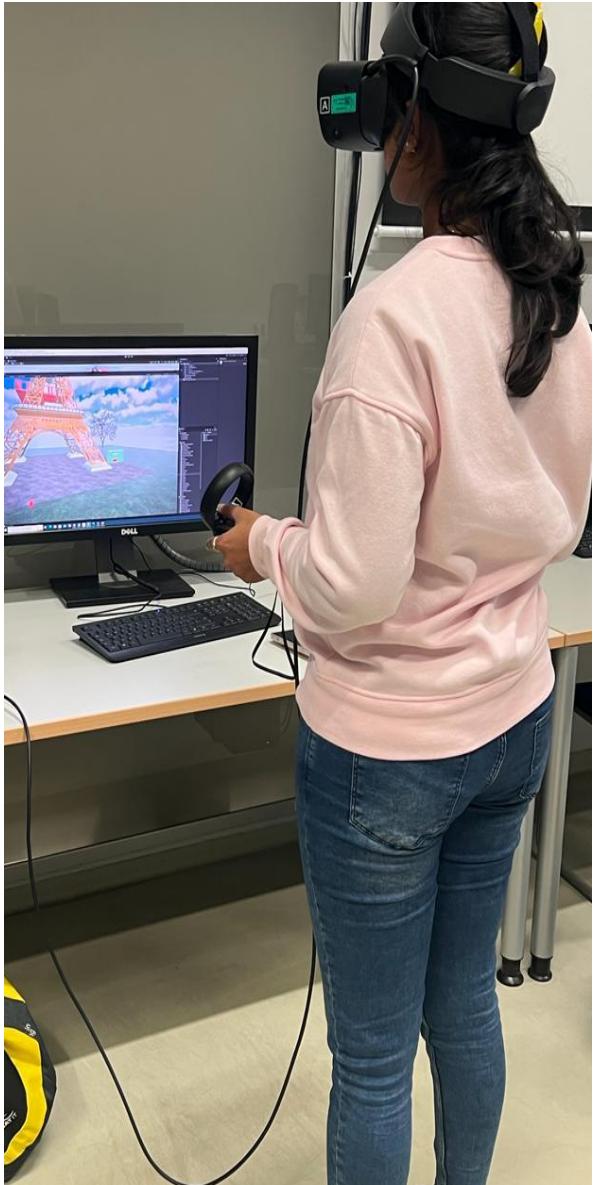
Did you have any frustrations? _____

Would you recommend Grabtor?
 1 2 3 4 5

Would you use Grabtor regularly?

What do you think about the design? _____

The Grabtor team would like to thank you once again for your assistance and would be pleased if we could welcome you again to one of our tests.



3.3.3. The result of the Test

In general, none of the users showed any signs of dizziness, headaches, or discomfort while using our application. Only one user had blurry eyes for a moment.

In the application itself, the testers noticed the welcome screen first, but found it too small.

The buttons did not work immediately or were difficult to push.

The next screen, with instructions on how to move and teleport, was difficult to read and contained too much information at once. From this, we concluded that the signs were generally too small.

The new controls, especially teleportation, which consisted of a combination of two buttons, were also not understood, despite the help screen at the beginning. First steps, where the user should move to, were unclear for most testers. Nevertheless, the platforms were recognized by the testers as an interaction environment and most testers moved there after a short hesitation. It was noted with most of the information panels that they were also too small.

When interacting with the smaller objects of the Eiffel Tower, it was noticeable this time that there was significantly more trial and error. 2 out of 5 testers even tried to assemble the Eiffel Tower. However, everyone still had a hard time with the handling because the objects behaved differently. Some were very far away after being grabbed, others completely in front of the user. There were several requests to be able to rotate the objects if they were held.

Although the testers had a hard time with teleporting at first, they still found it fun and challenging. Each of the users had successfully made it to the last platform and 4 out of 5 were able to finish the quiz and complete the task for the user test.

3.3.4. Conclusion of the test

In general, Grabtor was liked by almost all participants and they would play it again. All of them were able to learn something about the Eiffel Tower and liked the quiz as a conclusion. Which brought us closer to Grabtor's vision of making the application a learning platform.

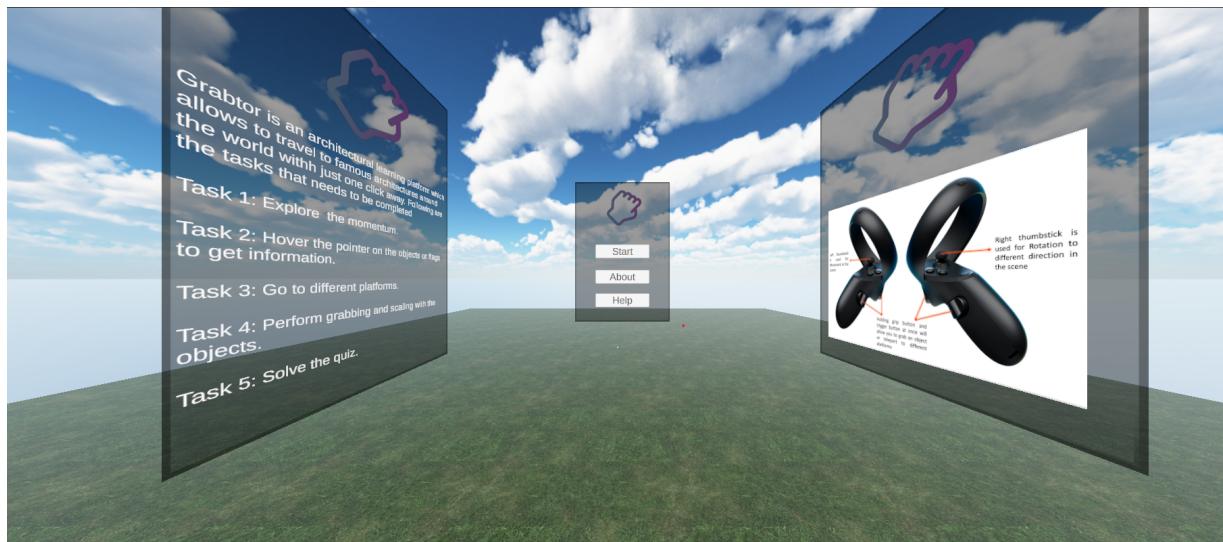
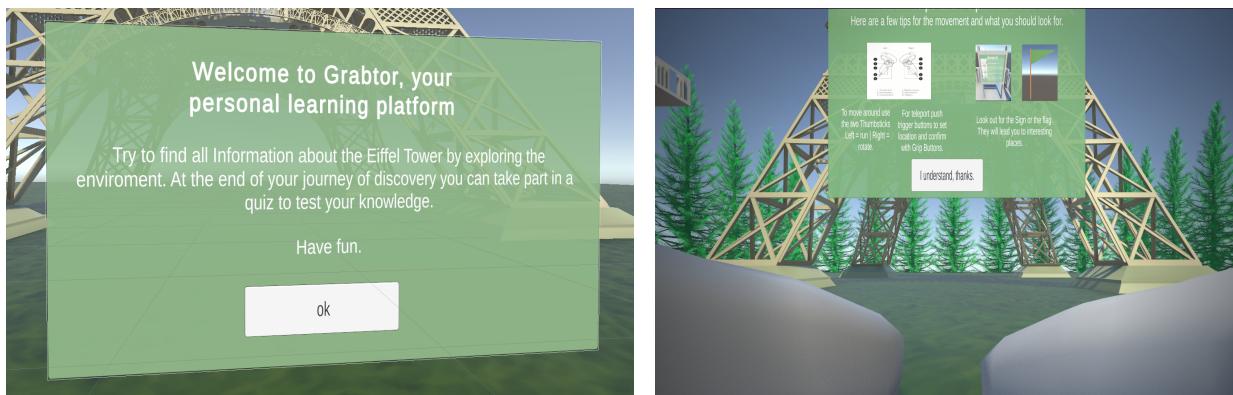
Despite the welcome pop-up where the task of the test was given and the follow up pop-up with explanations of the controls, users still had a hard time finding their way or moving around at first. The Pop-Up with information was noticeably too small and sometimes difficult to read. Therefore, the size of the pop-ups as well as the amount of information given per one would have to be adjusted. In addition, the interaction with the components of the Eiffel Tower should be revised and all objects should behave the same when you grab them. For better viewing, it would be good to include a rotation option.

Regarding the design, we received feedback that many users wished for a more realistic environment. For example, there was a lack of textures for the objects or a more realistic background.

3.4. Adapted based on the user study

3.4.1. Intro Scene

Since the testers quickly focused on the large Eiffel Tower when entering the application, many did not read through the welcome text, nor the help on the controls and the task. Therefore we decided to divide Grabtor into several scenes. When starting the application, the user is first brought to a kind of intro screen. This is deliberately kept small, as the user should only look around and not move. In the intro screen, he then finds information on both sides about the controls and the tasks. In the middle canvas, he can finally choose what he wants to do. Whether he wants to learn more about Grabtor in "About", or whether he needs help in "Help" - which leads him to another scene with the tax declaration - or whether he finally wants to enter the application.



3.4.2. Adjustment of the Size

We also change the Size of the whole environment. Make the platforms, planes and Canvas bigger and added to the last a new ground with the terrain Object of unity to give more space to walk around and changed the font-size to make it better readable.

3.4.3. Make the scene more realistic

3.4.3.1. Textures to the objects

To make the scene more realistic, we added free Assets from the Assets Store. Therefore we focused on Nature and Park elements to make the scene more suitable for paris. For our objects which we created in blender, we give realistic looking textures, like brickwall or wood optic.

3.4.3.2. Added more models

To make the scene more interesting and because we decided on all the important models by ourselves, we used other models and assets from the Asset Store. Like trees, flowers, a bank. And we created a new ground for the eiffel tower to let it stand out more.

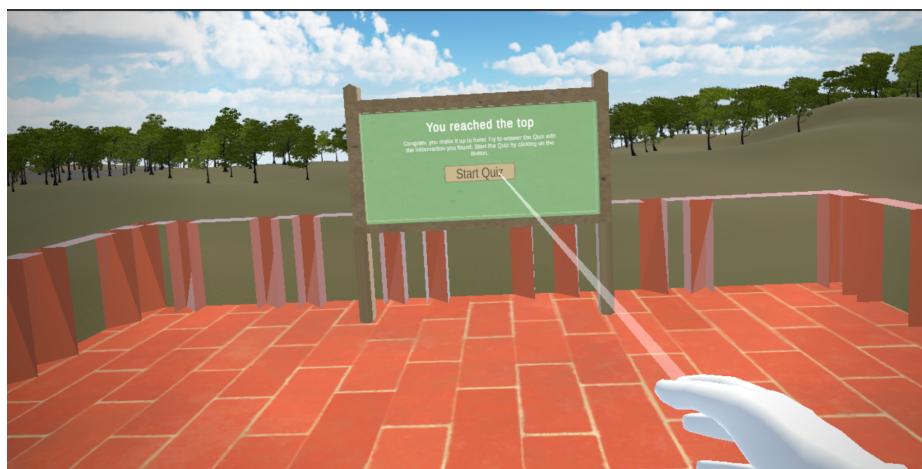
3.4.3.3. Added Sounds

Added environment sound when entering into the scene and also added some feedback sounds like footstep sound and grabbing sound , to make the application more enjoyable. This sound was open source.

3.4.4. Improve Interaction and Interaction Feedback

3.4.4.1. Buttons

We User will now get more feedback by using the Ui elements, because the modified the colors by hovering and also by clicking on it.



3.4.4.2. Objects

Then the user is grabbing one of the components from the eiffel tower, it will no longer flow to him. Instead, he has to pull it with the right joystick to himself. And If he drops the Object, it will go straight back to the position, there it was. So the user will not have difficulties to grab again, if something went not so well by the first grab.

For the objects, we also changed the hover effect to only one color and deleted the grab color which confused the users. We also added sound feedback, if the user is interacting with one of the eiffel tower parts.

3.4.4.3. Informational popup-screens

To give more Information about the eiffel tower and make the application more playful, we added popup-screens which appear by hovering about certain models.



4. Goals

4.1 Reflect on which goals you met.

Based on the user tests, we were able to achieve one of our most important goals, namely that Grabtor is perceived as a learning platform and that the user has learned something about the object and its construction at the end of his session.

Another goal we wanted to achieve and also had was to strengthen spatial thinking with Grabtor. This was achieved by interacting with the components or just looking at the large object with the information provided, such as the dimensions of the construction.

4.2 Which goals were changed during the project?

Actually, we wanted the users to have only one big object to interact with and to be able to take out the single components from it. Unfortunately, it was not possible to guarantee the stability, which made the testers unsure, so we decided to go with the current variant.

In addition, we wanted to make the application as realistic as possible and planned to use a background that, when entering the application, would make the user really believe that he was in the familiar building. In our case, that would be Paris. Unfortunately, it was difficult to find a suitable panorama image that was open source, had a good resolution and did not represent the object itself.

4.3 Which goals would need to be worked on in future iteration?

To increase the interaction possibilities for the user, we would want to make sure that you actually only have 1 main object, from which you can take the individual parts. When grabbing the object, this part should simply be copied and not pulled out, which would guarantee the stability of the object. In addition, it should then also be possible to run in and on the building to collect more relevant information there.

In the multiplayer part, the players should be able to complete the quiz at the same time and not one after the other and more parts of the construct should be available to rebuild. Since one could then better together or even against each other and perhaps build the building on time.

5. Conclusion

Our goal was to have a learning platform for those who are facing difficulties in the architectural field, which will help the user to gain knowledge and information about spatial abilities. We have improved the interaction and added the environment elements to have a more realistic view when the user explores monuments in Grabtor. We also added the multiplayer server for interaction. But at the moment only the connection to the server is successful. So we want to improve our multiplayer server, where the user could be able to check or see the status and communicate with other players. In addition to grabtor would be to include more monuments in the application and create a 3D modeling platform where the user could do their own 3D modeling based on the information gained in the application. The platform where the user could perform 3D modeling will have a palette of elements to have a first hands on practical knowledge.

5.1 Future Enhancements

Although a VR based approach would be more interesting and enjoyable, we had limitations here like VR headsets are more expensive. Apart from this, the development for this application would require a complex technological scale up. Given the nature of the learning and the context of usage we have decided to go with AR in future to keep the application light for both the architectural students and the professor. Already we have it in virtual reality so all the students would not be able to access it and also getting a VR headset is difficult. That too just for the purpose of learning didn't make any sense. To overcome this we thought of switching to Augmented Reality in future to make it easier for students to get use of the application then and there. This approach had a lot of advantages as compared to Virtual Reality. Buying something new was not required. Just downloading an application would get them access to enjoy this way of learning the architecture.

REFERENCES

Script: Reset the position for the objects

<https://www.youtube.com/watch?v=tM8II28rnd8>

PlayOnAudioTriggerScript

<https://www.youtube.com/watch?v=sCObQSNRqN4>

3D Model Eiffel Tower

<https://sketchfab.com/3d-models/eiffel-tower-france-e44fab278b9a4963ad98d2dbd2446d5>

4

Multiplayer setup

[How to Make a VR Multiplayer Game - PART 1](#)

Design Methodology

[https://en.wikipedia.org/wiki/Double_Diamond_\(design_process_model\)](https://en.wikipedia.org/wiki/Double_Diamond_(design_process_model))

Environment Audio Sound

https://www.youtube.com/watch?v=RmnRF_INDbA

Assets we used from the Asset Store

For the Design:

- Realistic Tree 9 [Rainbow Tree]
- Wooden table and chair
- Grass Flowers Pack Free
- Terrain Sample Asset Pack
- Yughues Free Ground Materials
- 3D Nature AssetsPack
- Parks and Nature Pack - Lite
- Nature Renderer Subscription
- Real Materials Vol.0 [FREE]
- Yughues Free Pavement Materials
- World Materials Free
- Wood Textures - 4K

For the Multiplayer setup:

- Photon Voice 2
- PUN 2 - FREE

For the Sounds we used:

<https://pixabay.com/sound-effects/search/grab/>