

VR UI Design for Engineering Applications

Project plan

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List of figures/tables/symbols/definitions

NOTE: This template is a work in progress. When in doubt, please consult the project plan assignment document and associated grading rubric.

1 Introduction

1.1 ACKNOWLEDGEMENT

If a client, an organization, or an individual has contributed or will contribute significant assistance in the form of technical advice, equipment, financial aid, etc, an acknowledgement of this contribution shall be included in a separate section of the project plan.

1.2 PROBLEM AND PROJECT STATEMENT

Problem:

Virtual reality has the advantage of intuitive. Because of this advantage, many companies start to develop the application that are used for the engineering area in the virtual reality environment. Most of the user interfaces are difficult for the users to control. There are always too many functions in the user interface which will make the user interface look messy and make the user be difficult to control the application. An improved user interface is needed for the applications in the virtual reality environment.

Project statement:

Our project will focus on combine the functions and operations so that the user interface will be convenient for the users to operate.

The target:

The target of our project is making a new kinds of user interface that will suit for most of the engineering applications in the virtual reality environment. The output of our project will be a complete user interface for a specific application and this user interface will contain the features of convenient and clear control.

1.3 OPERATIONAL ENVIROMENT

The operational environment of our project is the virtual reality environment. In addition, we will focus on the applications that are used for engineering. We will demo the end product with the Oculus Rift which is a virtual reality headset.

1.4 INTENDED USERS AND USES

Our primary users are those engineers who use VR software to design cars or other type of machines, since in VR environment there is no cost for material and more straightforward.

However, our goal is to design such an user interface that is friendly to first-time-VR-users and make them find it easy to use(self-explained)

As I mentioned, the primary usage is to make design convenient and economic, so we introduce VR environment instead of real material. However, engineering application's user interface is not that friendly and first time user may hard to get familiar with it. We want people who use our user interface find it easy to operate.

1.5 ASSUMPTIONS AND LIMITATIONS

- Two separate lists, with a short justification as needed.
- Extremely important, as it can be one of the primary places where the client can go to determine if the end product will meet their needs.
- Examples of assumptions: The maximum number of simultaneous users/customers will be ten; Blue is the best background color and will be used; The end product will not be used outside the United States.
- Example of limitations: The end product shall be no larger than 5"x8"x3" (client requirement); The cost to produce the end product shall not exceed one hundred dollars (a market survey result); The system must operate at 120 or 220 volts and 50 or 60 Hertz (the most common household voltages worldwide).
- For limitations, include tests not performed, classes of users not included, budget/schedule limitations, geographical constraints, etc.

1.6 EXPECTED END PRODUCT AND DELIVERABLES

1. Research paper - September 2017
research paper include basic coding application knowledge and VR UI design process as well as background knowledge.
2. Design of UI on cardboard - October 2017
we will draw the UI that we design on the cardboard and color it. Because it's a easy way to express our idea as we currently aren't able to create on unity program.
3. literature survey - End of October 2017
After we have our design of UI ready, we will come out different ideas in our design. So we can make a survey, then choose the popular one to be our idea in design.
4. Design of UI on Unity - January 2018 Finish
all of the UI design including static and dynamic parts.
5. Final report - April 2018
the report will be like a purpose and it will include the problem, intended users, requirement, cost, process, result and so on.
6. Design of UI on Unity and combine with oculus development kit April 2018
So the final product will be using Oculus Kit which have two controller to operate the UI.

2. Specifications and Analysis

Include any/all possible methods of approach to solving the problem:

- Discuss what you have done so far – what have you tried/implemented/tested, etc?
- We want to know what you have done
- Approach methods should be inclusive of functional and non-functional requirements of the project, which can be repeated or just referred to in this section

The analysis should highlight both strengths, weaknesses, and any other observations of the proposed solution

If your project is relevant to any standards (e.g. IEEE standards, NIST standards) discuss the applicability of those standards here

2.1 PROPOSED DESIGN

We will design the VR UI for engineering application. In our project, the most challenging work is combine unity, the programming language we just learned with the design of UI to achieve the project. There are five steps to achieve design thinking, which are empathize, define, ideate, prototype and test. We need to empathize the user and innovate useful product for them. We designed two ideas and presented to client and advisor. With client's advise, we have planned to combine two ideas and figured out some issues of our current designs.

2.1.1 Interface requirements

Our project is VR UI for engineering. Therefore, we focus on the design and utility of VR UI. The VR UI not only is helpful for engineers to work on their projects, but also is easy for people who are not familiar with VR to use.

2.1.2 Usability requirements

For using easily, we need to design a simple and clear VR UI. The operations of controllers should be easy.

2.1.3 Performance requirements

The VR UI should benefit for introducing, designing and measuring products.

2.1.4 Supportability requirements

We will use Unity and javascript to program. All of us did not know much about Unity and C# before. Therefore, four of group members have learned Unity and C#, and the other two members work on research about VR and VR UI.

2.2 DESIGN ANALYSIS

In September, we divided our team to two groups. One group had two people who worked on finding and summarize researches. The other group had four people who worked on learning

Unity. The research group had a presentation at the end of September. They talked about what was VR UI and how to design it. It provided us the basic ideas about our project. At the beginning of October, we visited client's office and tried their VR product. We learned more about UI for engineering application and what we needed to work on. Then, we began to design our project VR UI. At first, everyone made a design. We had a meeting and discussed about design of each one. Then we combined the design to two kinds of design and separated members to two groups again. When we spent two weeks to modify two designs and built 3d model to show our ideas better. After finishing the first version of designs, we met client again and got advices from him. The most significant issue of both designs is that we ignore the occlusion situation. Occlusion situation means that our UI cannot be seen or has conflict when we stand very close to object. Therefore, we will take time to figure out some new design to solve this issue.

3 Testing and Implementation

Testing is an **extremely** important component of most projects, whether it involves a circuit, a process, or a software library

Although the tooling is usually significantly different, the testing process is typically quite similar regardless of CprE, EE, or SE themed project:

1. Define the needed types of tests
2. Define the individual items to be tested
3. Define, design, and develop the actual test cases
4. Determine the anticipated test results for each test case
5. Perform the actual tests
6. Evaluate the actual test results
7. Make the necessary changes to the product being tested
8. Perform any necessary retesting
9. Document the entire testing process and its results

Include Functional and Non-Functional Testing, Modeling and Simulations, challenges you've determined.

3.1 INTERFACE SPECIFICATIONS

Because we are trying to make user interface for VR applications, so we do not really need an interface to test our project. However, a simulator and the actual VR devices would be used in future to test our project. The VR devices including Oculus development Kit 2 and Razer Hydra controllers are provided by our client.

3.2 HARDWARE AND SOFTWARE

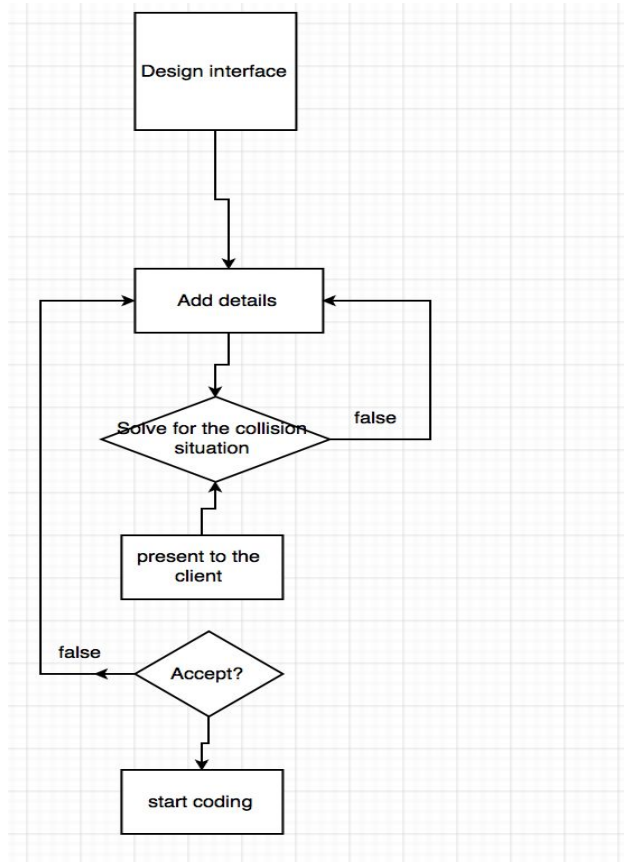
Hardware: Oculus, Razer Hydra PC Gaming Motion Sensing Controllers, PC, monitor

Software: Unity, sketch

Design and test on Unity, vision by Oculus, controlled by controllers, motion captured by monitor and the whole process is done by PC(high performance)

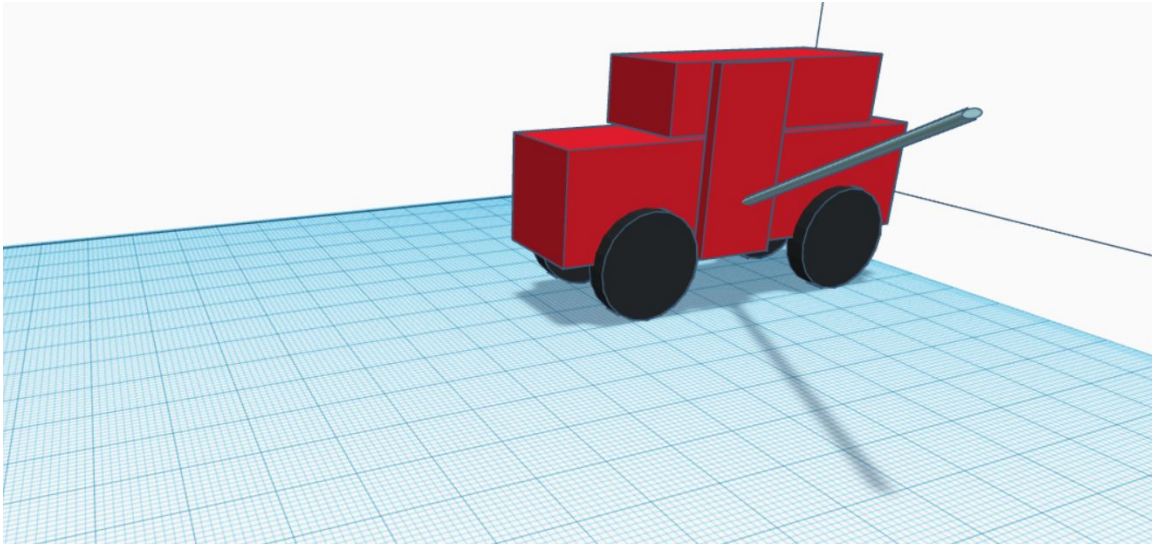
3.3 PROCESS

Currently, we still work on the design which fits the client's demand. Each two weeks, we have meeting with the client, we will have presentation for him. Then, the client gives the feedback for us.



3.4 RESULTS

- Our team successfully build Interface in Unity.
- We present two ideas to the client.
- We fail to consider the collision between user and the object.
- Currently, we try to find a way to avoid the collision situation. In addition, we have more ideas and designs for the project.



4 Closing Material

4.1 CONCLUSION

For now, we are discussing what our User Interface shall look like with our client, what function do we need to have. After we decide what we should do in specific this month, we will start to do the coding part. Hopefully, the static part including the graphic and text part will be done within next month.

All in all, our goal is to make a user interface to help both the customers and engineers to operate efficiently within VR environment. At the mean time, this UI would be easy to be understood and used. By doing so, we shall first decide what the UI should look like and what the function it should have. Then we separate it with static and dynamic part and finish them one by one. It is steady and safe by doing so, and we still have chance to fit any changes that we might make in future.

4.2 REFERENCES

This website helps us learn the use of the application Unity which will be used in our project:

<https://unity3d.com/learn>

This video introduces what kind of application we should create in our project:

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

This is a sample application in computer that we can learn for:

<https://www.youtube.com/watch?v=oeou-mVnUII\>

Getting Started With VR Interface Design:

<https://www.smashingmagazine.com/2017/02/getting-started-with-vr-interface-design/>

A useful website to learn Unity for design VR UI

<https://www.uxofvr.com/>

4.3 APPENDICES

Any additional information that would be helpful to the evaluation of your design document.

If you have any large graphs, tables, or similar that does not directly pertain to the problem but helps support it, include that here. This would also be a good area to include hardware/software manuals used. May include CAD files, circuit schematics, layout etc. PCB testing issues etc. Software bugs etc.