GNG-1103 Deliverable C

Philippe Rollin, Camila Florez, Lily Couture, Joshua Li, and Jiayi Zhang

February 2nd, 2025

Abstract:

The following report, created Feb 2nd, 2025, consists of prioritized design criterion, established by analyzing and doing research to clarify the design’s functionality and constraints. Technical benchmarking examples from The University of Texas, Dennis Danfung and Eric Strauss, and “IE Climate Change VR: Eye In the Storm” are included to provide a starting point for the project and an idea of what works well and what does not for extended reality simulations. Target specifications are established with respect to the outlined needs of the client as referenced in Deliverable B. Finally, the report terminates with a reflection regarding the client meeting and updating any new information from Deliverable B.

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# 1 Introduction

Based on the team interpreted lists, the client needs are that the VR-simulation must be immersive and educational. Firstly, a prioritized design criterion is beneficial to understand the client's needs, to understand the product functionality and constraint. Secondly, technical benchmarking on various sources was consulted for reference. Thirdly, a target specifications of our product like marginal values. Lastly, the impact that the first client meeting had on our target specification of our product.

# 2 Prioritized Design Criteria

During the first client meeting, we gathered our notes together and made a list of the client's functional requirements and constraints for the simulation.

# 2.1 Functional Requirements

The functional requirement that our design must meet is that the simulation must be a XR or VR simulation. This simulation must be based on real climate data, and it must focus only on one topic. This simulation must have interactive elements where the users must make decisions and keep the user engaged into this simulation. It must include a short introductory video to explain the simulations’ purpose and data used. Also, it must follow is to create pre-simulation empathy survey and a post-simulation empathy survey. The pre-simulation must gauge the user’s empathy before the simulation starts. These questions must be related to climate change and the survey responses must be “Not surprised, Median, surprised.” The post-simulation survey must assess how the user’s understanding of climate change has evolved after the simulation. Furthermore, a warning disclaimer needs to be implemented which provides the user with a warning about intense experiences like graphic content. Also, must have a safe button for the user if ever they feel uncomfortable, they can leave the simulation. The simulation needs to be bilingual (French and English). Lastly, at the end of the simulation it must have a reference list and our emails in case the users have further questions or wants to do more research on what they experienced.

The non-functional requirement of the simulation is that it must work within a time constraint of 1-3 minutes in length. The simulation must be engaging and impactful by immersing the user in the experience. There must be an educational goal to our simulation like our primary goal is to educate the user, ensuring the understand the effects of climate change happening around the user. They must be actively interacting in the simulation and experiencing the consequences of being in a disaster. The accessibility of our simulation must be of a certain age (16+ years old) and be usable in French and English.

# 2.2 Constraints

The constraint of the simulation is that it must work within a time constraint of 1-3 minutes in length. Also, the simulation must have real data of real-climate change effects. The simulation cannot be off topic, it must stay on topic throughout the simulation. The VR experience must work for the platform it is built for. For example, VR headsets and be accessible online.

# 2.3 Metrics

The metrics for the simulation is that we can measure how each user responds to the pre, and post simulations survey is which helps us know the empathy change. Alos we can measure on average how long each user spends to completed the simulation. Lastly, we can track how well the user’s decision making based on the simulation climate change scenario.

# 3 Technical Benchmarking

Various projects were consulted to construct a frame of reference for the project. The University of Texas in San Antonio, led by Dr. Zhai and his research team, used virtual reality to take the user through a natural disaster in Galveston. Other than the proof that simulations with similar objectives can be done, the lack of quantitative data from the product makes it difficult to compare (as we are only given a general description of its functions).

Additionally, Dennis Danfung and Eric Strauss developed a collection of interactive videos that emphasize the impacts of climate change in four distinct locations (California wildfires, a Somalian village, the Amazon Rainforest, and the icebergs of Greenland) using VR cameras in specific locations instead of an interactive simulation. It is only available in the English language and can only be viewed by one person using a headset at a time. It also requires an internet connection to properly function. It has been praised for its realism.

A third VR simulation*: “*IE Climate Change VR: Eye In the Storm” is available on the Meta Oculus. It forces the user to experience a hurricane event and escape from the simulation. It is also only available in English and is exclusively single player. There is only one location, and it is the house you are trying to escape. Internet connection is not required. The only review from a user is a complaint about the number of bugs present in the software.

# 4 Target Specifications

The following target specifications are established to clarify parameters and keep the project’s scale realistic. For simplicity, the target specifications have been separated into two categories: the simulation, and the survey. They outline the minimum and may be built upon should time allow (those subject to change are indicated with an asterisk).

# 4.1 Simulation Specifications

The simulation will last two minutes and thirty seconds in length\*. For accessibility purposes, Arial, one of the most accessible fonts (Sandu, 2024), will be used in the size 60-100px. To prioritize education, the elements of the story will be based off a historical disaster, and context will be provided by using a twenty second clip of a news broadcast\*. The plane of play is proportional to the disaster being experienced (ex: Hurricane Katrina had an area of approximately 1.55million km^2 (Gibbens, 2024), so the ratio of our simulation would be proportional to this). Interactivity will be achieved by providing three right-or-wrong decisions with “answers” following\*. Five additional elements will be clickable for either context or story building\*.

# 4.2 Survey Specifications

The survey will provide three links for further research. There will be three spectrum-based questions on the scale from “Strongly Disagree” to “Strongly Agree”. The first question will be about how knowledgeable they think they are on climate change, the second is about how much they think climate change currently affects them, and the last is specific to the chosen natural disaster\*. Data will be represented using a chart for comparison between users’ initial and final responses. Two additional questions will gather information about age and place of origin to understand the effectiveness of the simulation for various audiences.

# 5 Reflection

By listening to the client during the meeting, we determined their needs for this project. The client put emphasis on certain points during the meeting. For example, they mentioned that the VR simulation must being educational through interactive learning multiple times during the meeting. Our team made notes of any repeated or stressed points which determined which needs were more important than others. The design criteria and specifications above are based on the needs that we noted during the client meeting. Our team determined the relative importance of each design criteria based on the relative importance of each need.

# 5.1 Updated Client Needs

The needs listed in Deliverable B were general and while they have not changed, our team has created a list of more specific subcategories for each need. The list follows:

## Need 1: Bilingual

In deliverable B, our team did not specify which the languages need to be offered. The software must offer English and French.

## Need 2: Accessibility

To state that the software must be accessible is a very broad statement. Our team determined that for the product to be “accessible” to as many users as possible, it should have:

1. Captions that are in a large and easily readable font, such as arial
2. Adjustable brightness and audio
3. A disclaimer and a warning for those who might have a reaction to the content (visual or audio)

## Need 3: Educational

To state that the simulation must be educational is also a very broad statement, our team produced the following list of needs to ensure that the software is educational:

1. Research based and realistic story
2. Realistic visuals and audio
3. Provides some background information before the simulation so that the user understands
4. Provides sources for further learning after the simulation is over

# Conclusion

The report outlines the key steps for creating an educational and easy-to-use VR climate change simulation. Based on the client’s needs, the simulation will be short, interactive, and bilingual. Other projects were consulted to avoid mistakes and improve this design.

First, the simulation’s functions were outlined. For example, users should make choices during the experience, see real climate data, and answer surveys before and after to measure their understanding. All features revolve around the client’s needs.

Next, existing VR projects about climate change were examined. These projects will help define what will be included in the design, like using a real disaster to make the experience feel more realistic.

Finally, feedback from the client was considered. Features were added based on what they emphasized (such as education and accessibility), like adjustable brightness and a reference list at the end for users to learn more. The surveys were simplified to ask clear questions about climate change, knowledge, and feelings.

In the future, the project should be tested with users and improved based on their feedback.

Overall, this project teaches us how to balance education, technology, and user needs to create something meaningful. By following the outlined steps and criteria, the simulation will help people better understand climate change and ideally, inspire them to act.

# References

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