Deliverable C

Design Criteria and Target Specifications

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Abstract

This document sets out the requirements for design, technical performance requirements, and desired virtual reality/extended reality climate awareness simulation parameters. Overall, it aims to develop a scientifically sound and effective simulation that raises awareness about climate change through immersive user experiences. Important factors in consideration include

proper depiction of information, a compelling narrative, and usability-related factors. In addition, this report expands both on functional and non-functional requirements, performance constraints, and an updated timeline that incorporates feedback received from the client. As a simulation, it aims to become a new and powerful tool for raising awareness and driving action regarding climate change in its users.

Table of Contents

1.0 Introduction 4

2.0 Prioritized Design Criteria 4

2.1 Functional Requirements 4

2.2 Non-functional Requirements 5

2.3 Constraints 6

3.0 Technical Benchmarking 6

3.1 Existing VR/XR Climate Awareness Simulation..... 6

3.2 User Perceptions 6

4.0 Target Specifications 7

5.0 Conclusions and recommendations 7

6.0 Updated Task Plan 8

7.0 References 8

1.0 Introduction

Climate change is a critical worldwide issue that requires immediate and thorough educational interventions. Traditional educational approaches often lack in offering the critical emotional stimulation that can drive proactive behavior. By utilizing VR/XR technology, one can become totally submerged in experiences depicting the consequences of climate change, allowing them to see firsthand the catastrophic consequences of elevated temperatures, melting ice caps, and increased occurrences of extreme weather events.

Following is a ranked list of design requirements, technical performance requirements, and operational requirements critical for developing an effective and scientifically proven VR/XR simulation for raising awareness about climate change. In an effort towards balancing factuality, participant motivation, and overall system effectiveness, observations gained through consultation with the client have been incorporated to make them relevant and applicable according to stakeholder requirements

2.0 Prioritized Design Criteria

The design requirements form the basis for our virtual reality and extended reality simulation for raising awareness about climate change. The requirements ensure that the project adheres to both functional and non-functional requirements and real-world constraints. Formulation of these requirements involved in-depth studies, consultation with stakeholders, and usability testing with actual users for best effectiveness.

2.1 Functional Requirements:

Need	Priority	Description
Realistic and scientifically accurate	High	Ensure the simulation reflects factual and verifiable climate change data.
Emotional engagement	High	Create scenarios that evoke empathy and motivate users to take meaningful actions.
Inclusive design	High	Address diversity, equity, and inclusion to cater to a wide range of users.
Clear educational purpose	High	Educate users about climate change impacts and provide actionable knowledge.
Pre- and post-simulation surveys	Medium	Integrate tools to measure user awareness and emotional impact before and after the simulation.
Accessible content	Medium	Include opt-out options and content warnings to ensure user comfort.

Story-driven experience	Medium	Connect scenarios through a cohesive narrative for better user engagement.
Interactive Feedback	Medium	Offer real-time responses to user decisions, reinforcing learning outcomes.
Sustainability	Low	Reflect sustainable values in the simulation design and message.
Gamification Elements	Low	Introduce optional game-like mechanics such as achievements or leaderboards to encourage engagement.
Aesthetic Appeal	Low	Ensure the simulation has visually pleasing graphics and animations without compromising performance.

2.2 Non-Functional Requirements:

Priorities are organized from 5-1 for each section, 5 being critical and 1 being undesirable.

	Design Specifications	Priority	Relation	Value	Units	Verification Method
	Functional Requirements					
1	Pre- and post-simulation surveys	5	=	Yes	N/A	Analysis
2	3D Virtual environment	5	<	500	m^2	Test
3	Present climate change impact	5	=	Yes	N/A	Test
4	Accessible content (opt-out option)	4	=	Yes	N/A	Test
	Non-Functional Requirements					
1	Emotional engagement	5	=	Yes	N/A	Survey
2	Story-driven experience	4	=	Yes	N/A	Test
3	Sustainability message	3	=	Yes	N/A	Survey
	Constraints					
1	Duration	4	>; <	3; 4	min.	Test
2	Scientific accuracy	4	=	Yes	N/A	Cross Reference

2.3 Constraints:

- The simulation must not exceed 1-3 minutes to maintain user engagement and effectiveness.

- Must adhere to scientifically accurate data sourced from reputable organizations (e.g., NASA, NOAA, WWF).
- Must be accessible to users with different needs (e.g., subtitles, audio descriptions, intuitive controls).
- Should function effectively across various VR/XR platforms with minimal performance issues.
- Content should avoid excessive distressing imagery while remaining impactful.

3.0 Technical Benchmarking

3.1 Existing VR/XR Climate Awareness Simulations

Product	Features	Strength	Weaknesses
"The Climate Trail"	Interactive storytelling, multiple scenarios	Strong narrative, high emotional impact	Limited scientific data integration
"Sea level rise Explorer"	Immersive visualization of rising sea levels	Highly realistic simulations	Lacks emotional storytelling
"Our Planet in VR"	Focuses on different ecosystems affected by climate change	Visually impressive, strong data integration	Less interactive engagement

3.2 User Perceptions

- Users appreciate **realistic visuals** and **engaging narratives** that foster an emotional connection.
- Overuse of **scientific jargon** can make content overwhelming, necessitating a balance between accuracy and accessibility.
- **Interactivity** significantly enhances engagement and learning, making user choices a crucial design aspect.

4.0 Target Specifications

Defining clear target specifications allows us to set measurable goals for the project.

Attribute	Target Specification
Duration	1-3min
Resolution	1080p per eye
Latency	Below 20ms for smooth experience
User Controls	Simple, accessible menu (voice & hand tracking)

Compatibility	VR Headsets
Sound Design	Spatial Audio
Accessibility	Subtitles with an opt-out option

A VR simulation allows the user to deepen their understanding of climate change by immersing themselves in impactful scenarios that inspire empathy and action. The VR simulation will foster empathy towards a rising issue of rising sea levels, extreme weather events, and resource shortages, which continue to be neglected due to the limitations of traditional education methods.

5.0 Conclusions and Recommendations

The VR/XR simulation, designed with a view to raising awareness about climate change, has been particularly designed to bridge gaps between educational approaches and emotional impact through purely immersive experiences that mimic real-life scenarios of climate change. In meticulous detail, this report outlines technical requirements, design constraints, and benchmark testing evaluations to validate that the simulation meets minimum requirements predefined for it.

The future development phases will involve enhancing overall user experience, compliance with user requirements, and usability in a variety of VR/XR platforms. Future work will include thorough testing with actual users and incorporation of feedback to make it more accessible, interactive, and emotionally powerful.

By seamlessly combining scientific information with narrative, this project aims to become a powerful tool for raising awareness and eliciting actions towards countering climate change.

6.0 Updated Task Plan

The task plan has been revised to account for newly identified project priorities and technical refinements.

Task	Status	Owner	Changes
Develop Initial Scene Concepts	Completed	Team	Finalized key scenarios
Refine Story Telling	In progress	Raphael, Janna	Integrating feedback from client
Implement VR environments	Upcoming	Alexander, Joey	Based on finalized specifications
Add interactive elements	Upcoming	Jaeden	Ensuring user engagement
Conduct user testing	Scheduled	All	To collect feedback and refine simulation

The process of developing a VR simulation based on climate change is shaped by the clients' criteria and needs. The client meeting significantly shaped the development of the simulation and the specifications. The client emphasized on fostering empathy within the user and shaping their ideologies based off advocacy and education. The priority for the simulation is to emotionally engage the user. The client stressed the importance of invoking an emotional response that will allow the user to develop a sense of urgency to act towards the ongoing issue of climate change. This emphasizes the priority of storytelling, illustrating the environmental degradation effects, and allowing the user to make decisions. Moreover, the educational elements of the simulation should highlight interactive learning moments, where the user will observe real-world case studies and concepts. Additionally, the client highlights the importance of accessibility, ensuring the simulation is accessible to a wide audience, considering user experience. For instance, this can be done by adding subtitles for users who have a hard time hearing.

Modifications are to be done from deliverable B, where the narrative can include personal stories or first-person perspectives to create a stronger emotional tie. Considering an emotional response, an interactive feature will engage the user, allowing them to have authority over their decisions, encouraging them to act. Additionally, the visuals must be realistic, based on research and data collected.

Therefore, meeting with the client clarified the direction of this simulation and refined the teams' priorities. The VR simulation will remain both, emotionally compelling and educationally effective. Moving forward, this update will be integrated to align with the client's vision.

7.0 Refrences

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