

VR Tour - Man and the Living World Museum

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Summary

This document describes the literature review, statement of work, project architecture, and GANT of the VR tour project for our client - Man and the Living World Museum.

Background:

Virtual reality (VR) is a simulated experience that employs pose tracking and 3D near-eye displays to give the user an immersive feel of a virtual world. Applications of virtual reality include entertainment (particularly video games), education (such as medical or military training) and business (such as virtual meetings).

VR in education

In the field of education, VR offers learners an immersive and interactive learning experience, allowing them to comprehend challenging concepts and ideas more efficiently and effectively. VR technology has enabled educators to develop a wide range of learning experiences, from virtual field trips to complex simulations, that may be utilized to engage students and help them learn.

Our Goal:

- To develop a new unique experience for the museum in order to attract new and diverse audiences.
- To give a new and accessible way to enjoy some of the museum's content.
- To perform a "remaster" for some outdated content in the museum and deliver said content in a fresh and innovative way.
- To give the museum the ability to continue accepting audience and present it's content in a creative manner once it will be closed for renovations.

Literature Review

Introduction:

What is Virtual Reality (VR)?

Currently, standard virtual reality systems use either virtual reality headsets or multi-projected environments to generate some realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. A person using virtual reality equipment is able to look around the artificial world, move around in it, and interact with virtual features or items using handheld controllers.

How Virtual Reality Technology Has Changed Our Lives:

An Overview of the Current and Potential Applications and Limitations (Xudong Huang, Paul B. Tchounwou, 2022)

Introduction:

This study delves into the diverse applications of virtual reality (VR) beyond gaming, examining its potential in education, training, healthcare, simulations, prototyping and beyond. It also addresses gaps in understanding VR's strengths and limitations, offering insights into its future uses and ways to enhance its effectiveness across various domains.

Methodology:

The methodology involved conducting an extensive search across prominent journal search engines/websites like Google Scholar, JSTOR, MDPI, ResearchGate, PubMed, and Science Direct. Keywords such as "VR," "virtual reality," and specific application domains were used to gather peer-reviewed studies and articles. Papers were selected to provide a comprehensive overview of VR applications, focusing on representative and up-to-date evidence rather than exhaustive coverage. A total of 82 sources were utilized, encompassing specific VR applications and domains while excluding studies focusing solely on hardware components or repetitive content. The subsequent sections offer detailed reviews based on various VR applications and domains.

Challenges and Limitations:

Current VR technology faces several limitations. Technological standardization is lacking, leading to difficulties in compatibility and support. Hardware requirements are demanding, causing physical discomfort and potential long-term health concerns. Issues like lag and "cybersickness" persist, hindering user experience. Additionally, accessibility remains a challenge due to high costs and the need for specialized equipment, although augmented and mixed reality offer more accessible alternatives.

Results:

This literature review highlights the vast potential of virtual reality (VR) technology across various fields like engineering, education, medicine, and entertainment. As VR gains popularity, its applications are expected to expand, addressing current limitations and issues. Despite being in its early stages, increasing interest and ongoing development suggest VR could become a commonplace technology in households, akin to personal computers and smartphones. Continued advancements in VR technology hold promise for overcoming current challenges, making long-term usage more accessible and beneficial to a wider audience.

Virtual reality in education: The promise, progress, and challenge: An Overview of the Current and Potential Applications and Limitations (Ryan Lege, Euan Bonner, 2022)

Introduction:

Virtual Reality (VR) presents a promising tool for language educators, yet its evolving nature poses challenges in understanding its potential classroom applications. Initially, differing definitions of VR existed in consumer and academic spheres. While academic literature encompassed various 3D avatar-based interactive experiences, consumer materials predominantly referred to head-mounted displays (HMDs). Despite academic references to non-headset VR experiences, recent focus has shifted towards headset-powered VR. The rapid technological advancements since 2013 have brought new levels of immersion, accessibility, and affordability to VR, particularly in education. However, this rapid innovation renders older research outdated, emphasizing the need for current information. The paper aims to review the benefits and challenges of VR in education, examining both scientific and informal publications from 2017 to 2020 to provide a comprehensive understanding of VR's current state in education.

Benefits:

The benefits of integrating Virtual Reality (VR) into education that are discussed in the paper include:

1. Engagement Enhancement: VR captivates students with immersive experiences, boosting motivation and interest in learning.
2. Access to Inaccessible Environments: VR enables exploration of distant or hazardous locations, providing hands-on learning opportunities.
3. Spatial Memory Enhancement: VR enhances spatial cognition and memory retention through interactive virtual environments.
4. Empathy Training: VR fosters empathy by allowing users to experience different perspectives and social situations.
5. Distance Learning Enhancement: VR facilitates interactive distance learning, enabling collaboration and engagement among remote learners.

These benefits highlight VR's potential to revolutionize education by making learning more engaging, accessible, and impactful.

Challenges and Limitations:

Challenges in applying VR to education arise from the absence of tailored pedagogy for VR environments. While integrating VR into existing educational models is feasible, lacking specific pedagogical frameworks hampers its full potential. Attempting to replicate traditional teaching methods in VR may lead to ineffective outcomes. The difficulty in evaluating VR activities without informed pedagogy contributes to mixed research findings.

Moreover, cognitive demands pose hurdles, as immersive VR experiences can overload working memory, hindering learning. Effective instructional design is crucial to manage cognitive load and optimize learning outcomes in VR settings. Additionally, maintaining immersion is essential; factors like visual aberrations or discomfort can disrupt the learning experience.

Furthermore, introducing VR into classrooms requires a measured approach, allowing students time to acclimate to the technology's unique features. Gender-related considerations, such as discomfort with VR headsets, particularly impact participation in secondary education. Addressing these challenges is paramount for leveraging VR's potential in education effectively.

Conclusion:

The conclusion of the article emphasizes the rapid evolution of technology and its profound impact on human life, including education. It highlights the transition of Virtual Reality (VR) from a fringe technology to a practical tool with clear applications in mainstream education. Despite the initial novelty and engagement of VR, educators must move beyond surface-level benefits and focus on integrating it effectively into pedagogy to avoid it becoming a mere distraction. Additionally, the COVID-19 pandemic has accelerated interest in VR for distance education, potentially reshaping educational paradigms in a post-pandemic era where VR may play a significant role alongside traditional devices.

Why scientists are delving into the virtual world: (Rachael Pells, 2023)

Introduction:

Scientists are increasingly turning to virtual reality (VR) technology to enhance collaboration and remote work. Stephen Hilton, a researcher at University College London, has created a virtual laboratory that mirrors his real-life wet lab, allowing users to interact with equipment and conduct experiments. VR headsets like the Oculus Quest 2 have become more accessible and affordable, enabling researchers to monitor experiments, collaborate internationally, and train students. Hilton's virtual lab, built using software like Unreal Engine, features AI assistants to guide users and offer support. This technology not only improves scientific engagement but also makes science more accessible, particularly in remote or under-resourced areas. The COVID-19 pandemic has accelerated the adoption of VR technology for remote collaboration and training purposes.

Methodology:

Researchers are leveraging virtual reality (VR) technology to enhance training and education in various fields. Koos De Beer from the University of Pretoria utilizes XR-based training tools to create immersive learning experiences that transcend language barriers. De Beer's work focuses on enabling remote visits to hazardous environments like mines and tunnels, particularly benefiting rural areas in South Africa. Meanwhile, Simran Sharma from Cardiff University uses VR to train medical students in recognizing and treating conditions like sepsis, offering a standardized and repeatable method for clinical training. Beyond education, chemist Lee Cronin from the University of Glasgow employs VR to remotely control robots in his lab, streamlining chemical experiments and enhancing productivity. Additionally, neuroscientist Olaf Blanke from EPFL explores the use of VR as a tool for studying human brain functions and perceptions, such as memory and out-of-body experiences, with the aim of advancing treatments for neurological disorders. While VR presents exciting possibilities for scientific research, challenges such as user discomfort and programming limitations persist.

Challenges and Limitations:

Developing VR programs for scientific and research purposes poses significant challenges. Stephen Hilton's experience highlights the complexity involved in creating high-quality VR software, requiring years of development and expertise in fields like 3D computer-aided design (CAD) and artificial intelligence (AI) programming. Limited resources and expertise in labs make it difficult to replicate such efforts elsewhere. While VR holds promise for training and educational outreach, barriers to access persist, including the need for a fast Internet connection, which is lacking in many regions worldwide. In South Africa, for example, connectivity issues are exacerbated by energy blackouts, particularly affecting rural areas. Additionally, there's a lack of understanding and acceptance of VR technologies among some academic circles, hindering wider adoption. To address these challenges, proactive efforts to familiarize people with VR technology are essential, such as creating dedicated spaces like the "XR toy box" at the University of Pretoria to expose students and staff to VR experiences.

Conclusion:

"Is VR merely a fancy toy for scientists to indulge in within the lab?" Cronin candidly acknowledges, "Certainly, it can be seen that way. However, it represents much more than mere play. Throughout history, humans have leveraged tools to drive new discoveries, and VR is simply the latest addition to our toolkit. I don't believe it diminishes human knowledge; rather, it has the potential to transform the very nature of our work, hopefully for the better."

Market Search:

Brief:

The VR museums market search involves an exploration into the growing trend of virtual reality (VR) technology being used to create immersive museum experiences. With the advancement of VR technology in the world, museums and cultural institutions are increasingly leveraging virtual platforms to offer visitors unique and interactive ways to engage with art, history, and science.

In our market search, we are exploring on other honorable museums had that have embraced VR technology to offer immersive experiences, in order to get new insights during our development.

1. The British Museum, UK:

The British Museum has collaborated with Oculus to create a VR experience called "Curators' Corner: Animal Mummies." This VR tour allows users to explore the museum's collection of animal mummies and learn about ancient Egyptian beliefs and practices related to animals and the afterlife. Users can interact with 3D models of the artifacts and listen to expert commentary from museum curators.

2. National Natural History Museum Paris:

In 2018, the National Museum of Natural History unveiled its inaugural permanent VR exhibition, focusing on evolution, a key theme within the museum's broader scope. Upon entering the "Cabinet of Virtual Reality" and donning VR headsets, visitors embark on an immersive journey of exploration. They have the opportunity to closely examine various species, observing them up close and to scale, while uncovering the interconnectedness between them.

3. The Louvre, France:

The Louvre has developed a VR experience in partnership with HTC Vive Arts called "Mona Lisa: Beyond the Glass." This VR tour takes users on a journey through the history and mysteries surrounding Leonardo da Vinci's iconic painting, the Mona Lisa. Users can explore the painting up close in high resolution and learn about its creation and significance through immersive storytelling.

4. Smithsonian American Art Museum, USA:

The Smithsonian American Art Museum offers a VR experience called "Renwick Gallery WONDER 360." This VR tour allows users to explore the Renwick Gallery's renowned exhibition, WONDER, which featured immersive installations by contemporary artists. Users can navigate through the gallery spaces, interact with the artworks, and learn about the artists' creative processes.

5. National Museum of Natural History, USA:

The National Museum of Natural History has created a VR experience called "Virtual Reality Dinosaur Exhibit." This VR tour transports users back in time to the Mesozoic Era to explore a virtual dinosaur exhibit. Users can encounter life-sized dinosaurs in their natural habitats, interact with educational content about dinosaur anatomy and behavior, and even participate in virtual paleontological excavations.

Conclusion:

These examples demonstrate how museums around the world are leveraging virtual reality technology to enhance visitor engagement and provide immersive educational experiences. By embracing VR, museums can reach wider audiences, offer unique perspectives on their collections, and bring history and culture to life in innovative ways.

Bibliography

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