Virtual Reality for Historical Education : VR-TRAVELLER

Project Team

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We declare that this project titled "*Virtual Reality for Historical Education : VR-TRAVELLER*", submitted as requirement for the award of degree of Bachelors in Computer Science, does not contain any material previously submitted for a degree in any university; and that to the best of our knowledge, it does not contain any materials previously published or written by another person except where due reference is made in the text.

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The Department of Computer Science, National University of Computer and Emerging Sciences, accepts this thesis titled *Virtual Reality for Historical Education : VR-TRAVELLER*, submitted by Abdul Wasey Basir (19P-0113), Ammar Ahmed Khan (19P-0016), and Muhammad Junaid (19P-0025), in its current form, and it is satisfying the dissertation requirements for the award of Bachelors Degree in Computer Science.

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Abstract

VR-TRAVELLER transforms historical research by integrating virtual reality (VR) technology into an immersive and rewarding experience. This decision allows users to travel in time and digitally access historical sites, pre-existing cultures and important moments. Using cutting-edge technology, users can participate in meaningful entertainment that brings history to life and creates a strong connection to the past. Besides education and entertainment, VR-TRAVELLER offers people a unique and fascinating way to interact and understand the vast data of human history. Our program uses virtual reality (VR) technology to try to change the way history is taught. Our VR studies are based on important contributions from the Roman or Gandhara civilizations and seek to transport students to an important period of history. This teaching aid is a balanced experience that integrates discussion with historical information to provide students with an integrated experience throughout history. It also has the best methods that support dynamic and interactive learning beyond traditional learning methods. This creative approach aims to transform teaching by allowing students to immerse themselves in the beauty of ancient Birka or the complexity of Gandhara culture. Our project aims to create a bridge between the rich historical texture and the modern world by intelligently combining historical realism with fascinating interaction. This creates many new opportunities for historical research.

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Chapter 1

Introduction

At the vanguard of transformational technologies is virtual reality (VR), which immerses users in remarkably lifelike simulations of environments. Virtual reality (VR) transforms how we see and engage with the digital environment by utilising cutting-edge computer visuals and interactive technologies. Users are immersed in other worlds by using specialised headphones and sensory feedback devices, which stimulate several senses and produce an incredibly immersive experience. VR applications are used in a wide range of industries, including gaming, entertainment, healthcare, education, and more, and they present unmatched chances for innovation. Virtual reality revolutionises how we learn, train, and engage with information by allowing users to explore, interact, and even create within these virtual settings. This ushers in a new era of experiential computing while also providing entertainment.

As technology evolves, the potential of virtual reality (VR) to transform business, improve learning opportunities and redefine human-computer interaction is immense and happy

The way we view and interact with digital environments has changed virtual reality (VR) is a revolutionary technology . It immerses users in an actual computer-generated simulation that simulates the sensory experience of the world, mostly through sound and vision. The main purpose of virtual reality (VR) is to give users a sense of presence by immersing them in a virtual environment, allowing them to explore, interact and learn like never before.

VR has achieved significant results in recent years and has applications in many fields; education emerges as one of the most promising fields. Virtual reality in education provides students with the opportunity to collaborate, interactively communicate with information, creating new opportunities for learning. Whether used to practice real-world skills, conduct science experiments, or visit historical sites, VR provides powerful and effective learning experiences that go beyond traditional methods. As technology continues to evolve, the potential for virtual reality to transform education and training seems limitless.

Three factors which are contribute to Virtual Reality system is immersive experience: multi-sensory feedback, Engagement, and immersion. Immersion is the state of being engulfed or encircled by one's surroundings. Immersion has the advantage of guaranteeing a sensation of presence, or the perception that one is actually in the reality being portrayed. The ability to manipulate simulation events by one's bodily motions, which in turn triggers responses in the simulation as a result of these movements, is known as interactivity. Since virtual reality is multi-sensory, information may be gleaned from several senses, contributing to the experience's realism, engagement, and sensation of presence. Additionally, the redundancy of information minimizes the possibility of ambiguity and misinterpretation[3].

1.1 Types of Virtual Reality

There are many different types of virtual reality (VR), and each one offers special uses and experiences.

1.1.1 Non-Immersive

The least immersive type of VR is this one, which is typically viewed on a desktop computer or a regular display. Without the full sensory immersion that is characteristic of other VR kinds, users observe virtual environments on a screen.

1.1.2 Immersive

More senses are involved with immersive VR, which is usually experienced using full-field VR headsets that occasionally have motion tracking capabilities. These headgear immerses users in more realistic virtual environments, offering a more immersive experi-

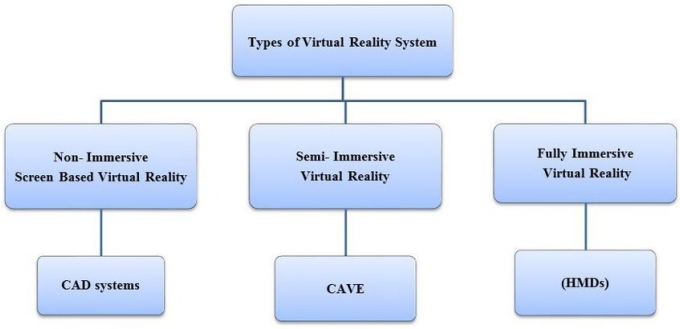

Figure 1.1: Types of Virtual Reality

ence.

1.1.3 Semi-Immersive

A level of virtual reality (VR) experience that is between completely immersive and non-immersive (desktop-based) is known as semi-immersive VR. While interacting with virtual environments in a semi-immersive VR system, users usually employ more sophisticated gear than regular desktop monitors, however they might not achieve total sensory immersion.

Our ambitious project, which makes use of the revolutionary potential of cutting-edge Virtual Reality (VR) technology, signifies a paradigm shift in the teaching of history. Our particular concentration is on two historically significant civilizations: the ancient Gandhara culture and the Viking civilization, with a particular emphasis on the well-known Birka Port. Our purpose and Goal is to thoroughly give a true immersive and captivating educational experience that goes beyond conventional teaching way by concentrating on these unique eras, areas and places.

The port of Birka is the center of the Viking Age, and the powerful virtual world allows players to experience authentic history, touch artifacts and witness key times in Viking history. Due to the advantages of VR, students can go back in time, which helps them understand the Viking economy, lifestyle and relationships. Additionally, the scope of our studies has been expanded to include the Gandhara civilization, giving students the opportunity to explore the fine arts, architecture and culture of this ancient culture. Our aim is to overcome the limitations of the traditional education system by bringing to life the richness of this culture through careful reconstruction of the site's history and institutional

support.

The purpose of the ending is to provide a good learning experience that makes students curious and engages with the historical narrative. Our mission is to revolutionize the teaching of history by combining the power of virtual reality with a focus on historical fact, ushering in a new era of dynamic and engaging learning education.

Chapter 2

Literature Review

This section aims to give a Complete review of the body of the research on the application of virtual reality (VR) in education, particularly when it is in the teaching of history. The application of augmented reality (AR) and virtual reality (VR) in education has drawn a lot of concentrationin this modern era of technology. As a result of technological developments and the increasing accessibility of VR and Augmented Reality tools, educators are taking steps to investigate how these tools can improve the learning process. AR adds digital data on top of physical environment to generate a more interactive experience than the experience in VR, that delivers a fully immersive experience. As a result, there is huge increasing interest in the creation of educational technological platforms that combine the advantages of augmented reality and virtual reality to make students enable to engage with computer-generated objects in a completely immersive learning environment.

The concept of the Virtual Reality gained significant attention in 2021-2022, [1]. In modern terms, the metaverse refers to a computer-generated, networked realm of extended reality (XR), encompassing augmented reality (AR), mixed reality (MR), and virtual reality (VR). Currently, the metaverse primarily consists of partially immersive XR spaces where interactions occur between humans and automated entities. These interactions range from everyday experiences with AR apps on computers and phones to more immersive interactions in gaming or fantasy worlds. Additionally, there are "mirror worlds" that replicate real-life environments [6].

2.1 A survey on Virtual Reality

Virtual reality (VR) has become more and more popular in a number of fields, including business, education, healthcare, and entertainment. The global market for virtual reality and augmented reality was predicted to reach 18.8 billion U.S. dollars in 2020, with a steady increase anticipated in the following years, according to a 2020 Statista poll that demonstrated the rising popularity of VR[9].

According to a 2019 Deloitte Insights survey, over half of educators thought virtual reality (VR) could significantly alter teaching strategies. Because VR is so immersive, it has been seen as a useful technique for producing interesting educational content.

Furthermore, a 2019 PwC poll discovered that the corporate sector was using VR for training and development reasons at an increasing pace. According to poll, the virtual reality training programs have the great potential to yield outstanding learning results than the traditional techniques[2].

It's compulsory to refer to recently research publications, industry reports, or polls done after 2022 from reliable internet or other sources like market research businesses, academic organizations, and technology organisations for the most latest and precise data.

2.2 Ancient Pompeii

In 2020, Caggianese created three virtual spaces to examine and experience Pompeii, the historic city destroyed by the eruption of Mount Vesuvius[10]. The authors suggest that virtual reality can be used to enhance students' understanding of historical sites and engage students. Thanks to the 3D environment, users can interact with the architecture of the city and experience their surroundings, just like in ancient times. Research has shown that virtual worlds are effective tools for student engagement and retention when combined with traditional teaching methods. This study adds to the body of research on the use of virtual reality in education and shows how revolutionary virtual reality can transform the way we teach history, not only improving student learning but also preserving the past.[10].

2.3 Medieval City of Lubeck, Germany

The historical German city of Lübeck is the subject of a 3D GIS site, as shown in research[12]. The aim of the system is to provide customers with an engaging and unique experience when visiting historical sites in the city. The analyst used 3D modeling and mapping technology to create a virtual world and accurately recreate the geography and architecture of the city. To enhance their learning, the system allows users to access more information about the historical value of specific sites. The authors show how these solutions can help preserve historic sites and promote historic tourism.[8].

2.4 VR for Language Learning

The use of virtual reality in education, especially in language teaching, is increasing. Kruger (2020) conducted a qualitative review to investigate the effectiveness of virtual reality in language acquisition. Research has shown that virtual reality can be a useful tool for language acquisition because it can provide a positive and fun experience. The evaluation also emphasizes that virtual reality should be included in the education process in order to reveal its full potential in language learning. The report also stated that more research is needed in this area to understand the potential of virtual reality in language acquisition.[11]. Overall, this study provides insight into the potential and effectiveness of virtual reality in language learning. To provide context for the discussion about 3D virtual spaces, this article discusses the historical development of virtual worlds and the concept of the metadata universe. This historical process also includes the impact of information and games on the advancement of the virtual world, as these pioneers often play a key role in creating later successes in the world of virtual technology. [4].

2.5 VR Training

The use of virtual reality (VR) in education also includes disaster management. By using digital technology, instructors can hone their skills in a safe and caring environment designed for problem-solving situations. Research has shown that incorporating virtual reality (VR) into crisis management training can reduce the risk of accidents and disasters while increasing students' confidence and effectiveness. The effectiveness of VR-based

training is measured through a case study, and the findings show that VR technology can be used in disaster management training. According to the report, disaster management training programs should use real-world tools to better prepare emergency responders for real-world disasters. [5].

2.6 VR Field Trips

Virtual Reality (VR) technology shows promise as an immersive and engaging experience. Educational assistance in many areas, including environmental education. To investigate the effectiveness of virtual reality field trips to teach students about the rocky desertification terrain in China, Xu et al. (2021) conducted the study. According to this study, virtual reality field trips enhance students' experiences by allowing them to enter an interactive, realistic environment where they can explore the landscape and ecological issues. The authors also stated that the disadvantages of traditional operations such as cost, time and security concerns will be eliminated with VR technology. All results of the research show how VR technology can improve the learning environment and support sustainable development.[13].

Year	Title	Achievement	Limitation
2018	Cástulo archaeological site in Spain (López-Menchero Bendicho et al.)	VR for archaeological visualization, 3D models, interactive VR experience	-
2019	Underwater archaeological sites (Bruno et al.)	VR and AR for enhancement, 3D reconstructions, immersive experiences	-
2019	Medieval city of Lübeck, Germany (Schröer & Schiewe)	Web-based 3D geo-information system, visualization of historical city development, interactive exploration	Data integration challenges
2020	Ancient Pompeii, Italy (Caggianese et al.)	3D virtual environment, accurate 3D models, interactive virtual experience	Limited to study and exploration
2020	Cultural heritage sites in Ethiopia (Lercari & Shiferaw)	VR and 3D modeling afor preservation and education, photogrammetry, VR experiences	-
2021	National Museum of Korea (Lee et al.)	VR for museum exhibitions and education	Limited user engagement with VR exhibits
2021	Reconstruction of a medieval bridge in Croatia (Ćulinović-Herc & Roguljić)	VR for historical reconstruction and preservation	Limited accuracy of historical data and models
2021	Virtual training for first responders in disaster management (Ibrahim et al.)	VR for training and education	Limited scalability of VR training programs
2021	Virtual reality field trips for environmental education (Xu et al.)	VR for immersive learning experiences	Limited access to VR equipment and technology
2021	3D reconstruction of a historic city in Turkey (Eser & Sarikaya)	VR for historical preservation and education	Limited availability of historical data and resources
2017	Using Virtual Reality to Enhance Learning Experiences in History Education	Improved student engagement and understanding of historical events	Limited availability of VR technology and resources for schools
2019	Virtual reality for training and assessment of clinical skills in nursing students	Improved training and assessment of clinical skills	Limited availability of VR technology and resources for schools
2020	Virtual reality for language learning	Improved language learning outcomes and motivation	Limited availability of VR technology and resources for schools
2017	Using Virtual Reality to Enhance Learning Experiences in History Education	Improved student engagement and understanding of historical events	Limited availability of VR technology and resources for schools

Figure 2.1: Literature Review Summary

Chapter 3

Methodology

3.1 Immersive VR

VR or virtual reality is a rapidly developing technology widely used in entertainment. VR has the power to transform education, but this potential has still not been realized. Virtual reality technology has the potential to improve learning outcomes by creating immersive experiences. In recent years, virtual reality (VR) has become more common in educational environments, especially in history education.

The Value of History Education An important issue that helps understand the past and how it affects the present is the use of virtual reality to bring history to life. However, traditional history teaching methods such as textbooks and lectures often do not attract students' attention and make learning boring. Virtual reality (VR) has the potential to enhance history education by providing students with immersive and unforgettable experiences as they explore historical events and places.

3.1.1 Motivation

The capacity of virtual reality (VR) to supply locks in and energetic learning situations is the driving drive behind its integration into history educational program. VR changes history instruction from a detached to an dynamic and customized encounter by permitting understudies to for all intents and purposes enter authentic settings, connected with artifacts, and lock in with the past on a multisensory level. Topographical boundaries are

broken by this innovation, making verifiably critical places that might not something else be available open. In addition, the uniqueness of virtual reality empowers expanded association, turning history instruction into an energizing and extraordinary encounter. VR eventually changes the instructive approach to instructing history by acting as a strong instrument to bridge the chronological crevice and set up a genuine and thoughtful association between understudies and chronicled occasions.

3.1.2 Problem Statement

- Traditional Techniques or method are not sufficient for providing a complete understanding of the history.
- A lack of interaction and involvement makes the students not so much interested.
- Traditional techniques shortcomings stop the students from developing their logical thinking abilities.

3.2 Business Opportunity

In terms of market size (US $ billion), the virtual reality market is expected to experience significant growth from 2022 to 2032. In 2022, the market will be worth 23.92 billion US dollars, and this figure is expected to reach 29.27 billion US dollars by 2023. is ongoing and the market is expected to be $35.86 billion in 2024, $43.97 billion in 2025, and $53.95 billion in 2026. Growth Trajectory During the forecast period, its value will reach USD 187.28 billion by 2032. This increase reflects increasing adoption and integration of VR technology across different industries, driving job growth over the next decade.

Figure 3.1: Virtual Reality Market Size (2022 to 2032) USD Billion.

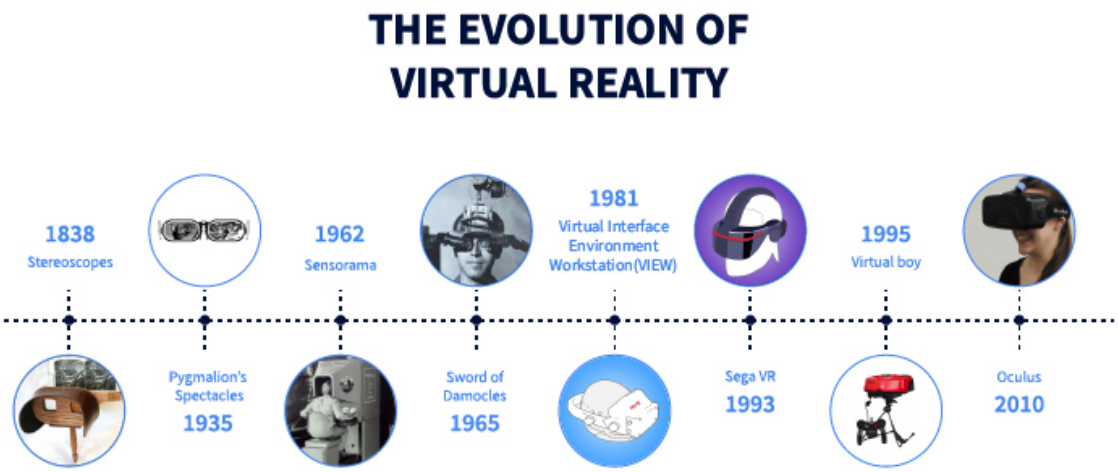

Figure 3.2: The evaluation of Virtual Reality

3.3 Objectives

1. Give a exhaustive plan for a virtual reality (VR) application that points to supply intuitively, immersive encounters with authentic locales and events.

2. Put the VR application into hone, making beyond any doubt it fulfills the necessities for verifiable precision, client inclusion, and interactivity.

3. Give the VR application with compatibility for a few VR equipment stages so that it can be sent with adaptability and be available to a wide run of users.

4. Give fabric for the VR application that takes watchers to distinctive verifiable times and gives them a assortment of encounters and experiences.

3.4 Project Scope

Our project's center is on using virtual reality (VR) to teach history through documentaries or gaming-like encounters. Through the program, clients will be able to remember noteworthy verifiable minutes, find verifiable identities and their commitments, and investigate authentic destinations and occasions. Through the utilize of VR innovation, individuals will be able to submerge themselves within the past and involvement it as in spite of the fact that they are physically there.

3.5 Stakeholders Description

1. Virtual reality is a highly emerging field in this era. In recent times there have been many development happening in this field of research[7].

2. Stakeholders in our VR history teaching initiative are diverse and include students, teachers, and educational institutions. Pupils will experience an engaging and dynamic learning environment that will immerse them in historical narratives that go beyond conventional teaching approaches. Teachers take on the role of facilitators of captivating lessons, using the VR application to pique students' interest and encourage critical thinking.

3. Adopting a state-of-the-art technology that fits in with current pedagogical trends might benefit educational institutions by improving their curriculum and possibly drawing in a more varied student body.

Chapter 4

Software Requirements Specifications

4.1 Functional Requirements

Priority	Description
Level 1	The topmost priority level requires complete fulfillment and ensuring that the software meets all necessary criteria.
Level 2	The requirements at this level do not necessarily have to be implemented for the software to remain viable.
Level 3	The lowest priority requirements are not anticipated to be implemented in the current release.

Table 4.1: Priority Levels for Software Requirements Specifications

4.1.1 Historical Content Repository

A vast archive of historically accurate material encompassing important occasions, locations, and personalities from the selected civilizations (Roman or Gandhara) should be included in the system. **Priority 1**

4.1.2 Immersive VR Environments

To increase the user's sensation of presence and involvement, offer a range of realistic virtual environments that faithfully recreate historical locales, natural landscapes, and architectural buildings.**Priority 1**

4.1.3 Interactive Learning Modules

In order to create a dynamic and captivating learning environment, include interactive modules that let users actively engage in historical scenarios while resolving problems, making choices, and feeling the repercussions.**Priority 1**

4.1.4 User Progress Tracking

Install a tracking system to keep track of user progress, accomplishments, and interactions with the VR historical teaching platform. This part will provide educators and students meaningful information.**Priority 1**

4.1.5 Customization Options

1.Provide justifiable highlights that let instructors alter the VR encounter to fit certain learning objectives, curricular prerequisites, and understudy aptitude levels.**Priority 2**

4.1.6 Multi-Platform Accessibility

Make beyond any doubt the framework works with diverse VR equipment stages so that it can be coordinates into differing instructive situations and is accessible to a more extensive audience.**Priority 2**

4.1.7 Real-time Assessments

Include real-time assessment innovations that let instructors gage how well understudies caught on and taken an interest in VR verifiable occasions. This way, they may allow understudies fast criticism for individualized instruction.**Priority 2**

4.1.8 Collaborative Learning Features

Incorporate agreeable components, like multiplayer settings or shared encounters, to advance bunch discussions, participation, and social engagement among understudies within the virtual reality setting.**Priority 2**

4.1.9 Historical Accuracy Verification

Establish a framework to affirm chronicled rightness from tried and true sources, ensuring that the data is in line with scholastic standards and inquire about discoveries. **Priority 1**

4.1.10 User-Friendly Interface

Provide an easy-to-use interface that facilitates engagement, navigation, and access to additional learning resources, all of which contribute to a seamless and joyful learning process.**Priority 1**

4.1.11 Accessibility and Inclusivity

In order to provide a diversified learning environment for all users—including those with disabilities—take accessibility elements into account.**Priority 2**

4.1.12 Regular Updates and Expansion

As part of your commitment to maintaining the VR educational experience up to date, interesting, and representative of continuing historical study, promise to regularly update the historical information and add new modules, civilizations, or features.**Priority 3**

4.2 Non-Functional Requirements

4.2.1 Performance

Even with less powerful gear, guarantee low latency and high frame rates to provide a fluid and engaging VR experience.**Priority 1**

4.2.2 Scalability

Without sacrificing performance, build the system architecture to handle a growing user population and more historical content.**Priority 2**

4.2.3 Security

Put strong security measures in place to safeguard user data, guarantee privacy, and stop illegal access to private data.**Priority 1**

4.2.4 Reliability

Assure the stability and dependability of the VR application, reducing crashes or system malfunctions during teaching sessions.**Priority 1**

4.2.5 Compatibility

Make sure it works with a variety of VR hardware and platforms so that different users may access it more easily.**Priority 1**

4.2.6 Usability

Give top priority to an interface that is simple to use and intuitive so that users with different levels of technical expertise may navigate and interact with it with ease.**Priority 1**

4.2.7 Sustainability

The VR historical education platform should take into account resource efficiency and environmental impact throughout creation, even though these factors are not necessary for immediate functionality.**Priority 3**

4.2.8 Training and Support

Provide educators and users with training materials and a support system to help them make the most of the VR historical teaching platform.**Priority 2**

4.2.9 Regulatory Compliance

Respect the applicable laws, rules, and guidelines pertaining to educational software to guarantee both moral and legal usage.**Priority 1**

4.3 Use Cases Diagram

A use case diagram for a Virtual Reality for Historical Education represents the main use case activities and the interaction between actors and the system. It helps to identify the main processes involved in it and visualizes them as ovals, known as use cases.It focuses on the functional requirements of a system from an external perspective, showcasing the different use cases and actors involved in the system's operation.

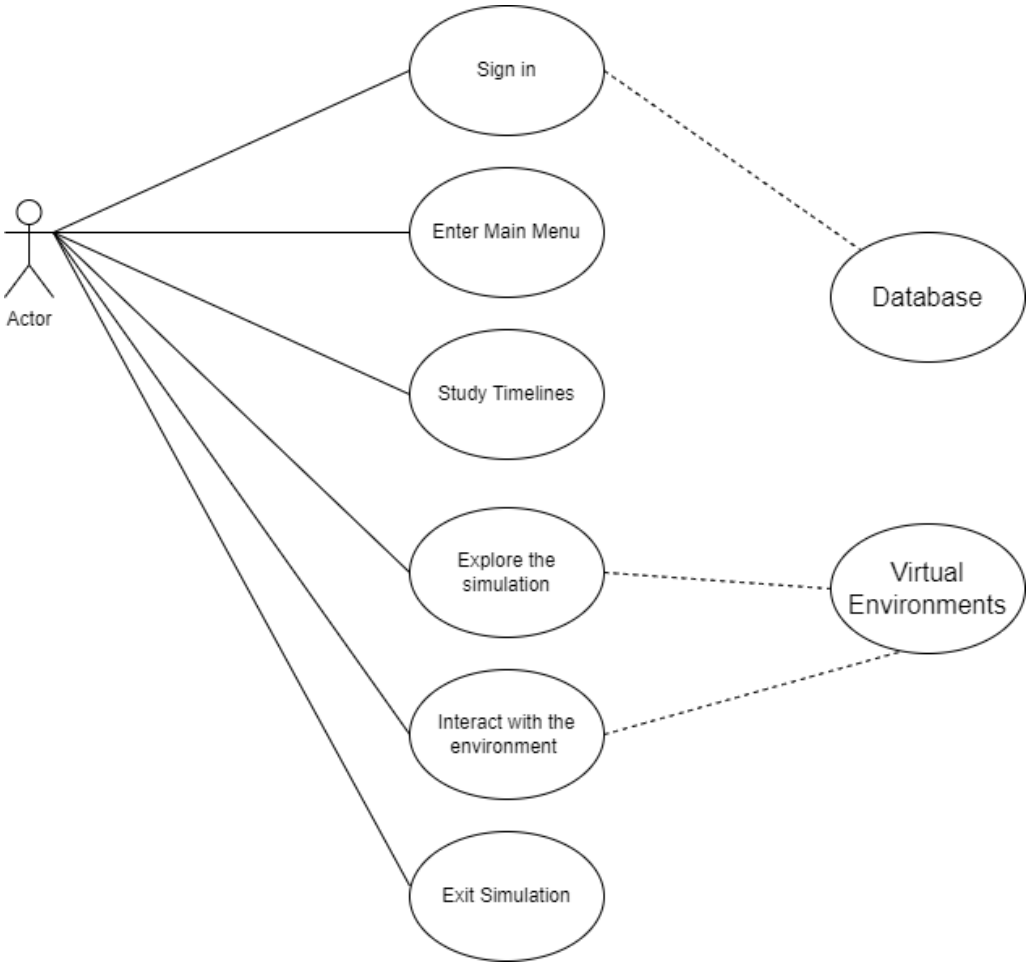

Figure 4.1: Use Cases Diagram

4.4 Swimlane

The Swimlane diagram in section 4.2 represents the flow of activities in a specific order within the context of the virtual Reality. This UML diagram provides a visual representation of the activities and their sequence, along with the details and conditions associated with each step. By utilizing swimlanes, the diagram clearly indicates which activities are initiated by each actor involved in the system. This helps in understanding the overall flow of activities and enables the identification of potential parallel activities that can enhance the efficiency of the system.

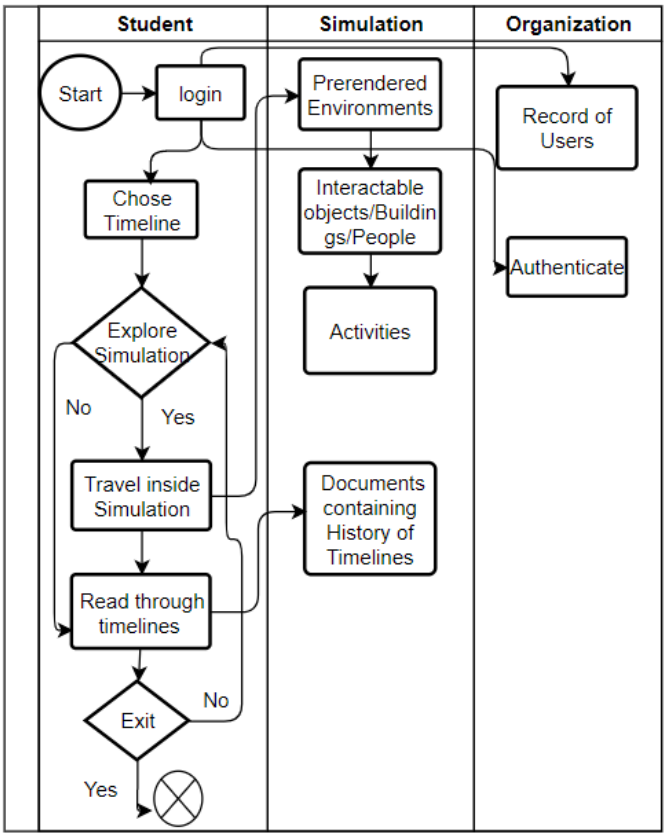

Figure 4.2: Swimlane Diagram

4.5 Flowchart

The flowchart for the VR-Travellers project starts with the user logging in or registering if not already logged in. After successful login/registration, the user will see the timeline

and select the timeline. after selecting timeline user will enter into the Virtual Reality and study the relevent event which he?she wants to visit or study and then explore the timeline and quit from the simulation. The flowchart outlines a streamlined user journey, ensuring a seamless transition from login to VR historical study and eventual session conclusion.

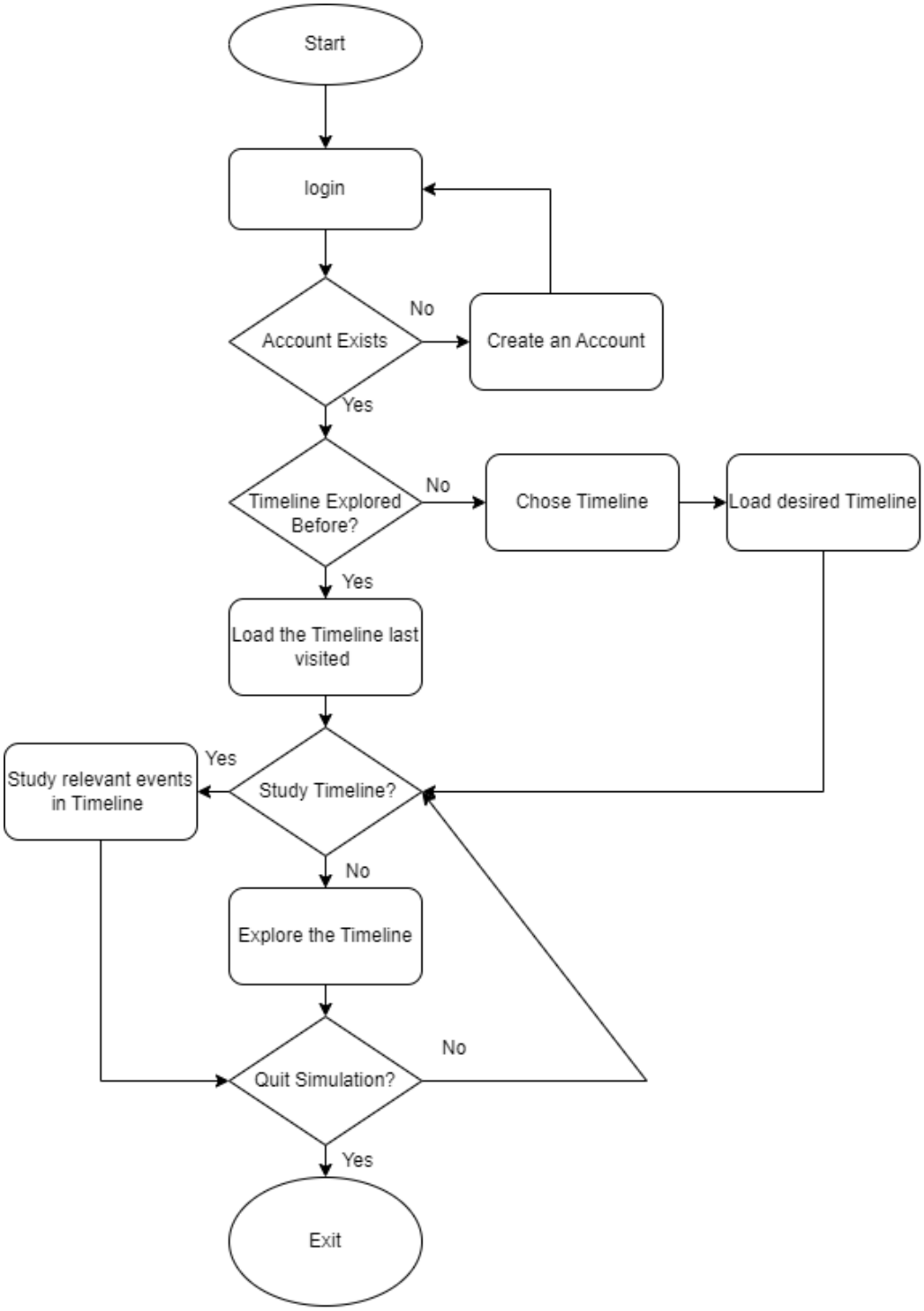

Figure 4.3: flowchart

4.6 Software Development Plan

- Flow chart of the sequence:

  - Login the system

  - Choosing Timeline

  - Load time Last Verified

  - Study the relevent event.

  - Quit from VR simulation.

- Resources

  - VR Headset

  - PC

- Work Breakdown Structure

  - Each person's key areas of interest and work division and summarized in the table below

Task Name	Duration	Start	Finish	Completed	Assigned To
Project Proposal	5	1-25-2023	1-30-2023	100%	Ammaar,M.Junaid,Wasey
Proposal Defense	1	2-20-2023	2-20-2023	100%	Ammaar,M.Junaid,Wasey
Literature Review	29	1-23-2023	2-21-2023	100%	Ammaar,M.Junaid,Wasey
Asset creation	36	2-21-2023	4-22-2023	36%	Ammaar
Initial Environment creation	59	3-10-2023	4-30-2023	20%	Ammaar, M.Junaid
Testing and Debugging	21	4-17-2023	5-8-2023	0%	Ammaar,M.Junaid,Wasey Wasey
Documentation	45	3-20-2023	5-4-2023	23%	Wasey
Prototype of environment	20	5-8-2023	5-28-2023	21%	Ammaar,M.Junaid,Wasey

Figure 4.4: Teamwork Distribution

- Gantt chart

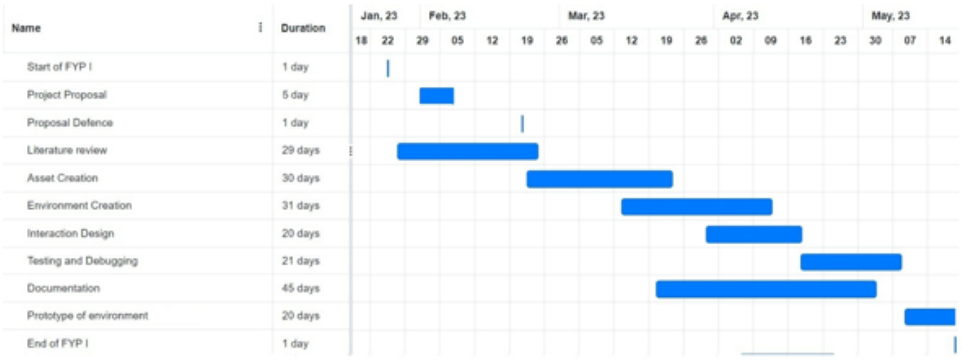

Figure 4.5: FYP-1 Gantt Chart

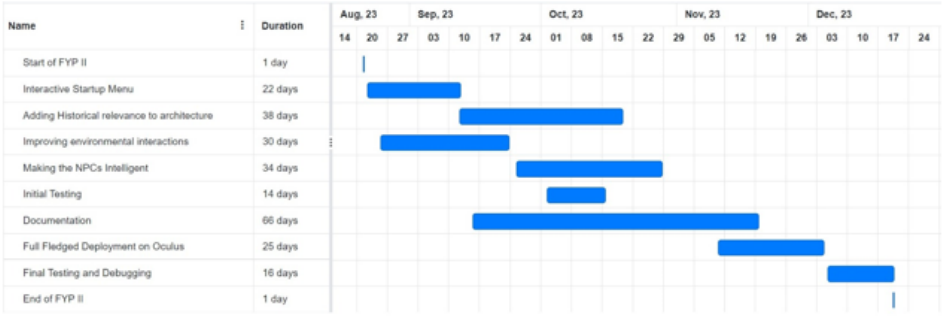

Figure 4.6: FYP-2 Gantt Chart

- Difficulties Faced

Difficulty	**Mitigation strategy**
Accurate use of VR Headset	Provide a user manual for basic instructions.
Gathering data	Request KP-Tourism for data.
Asset Creation	Making assets with high quality on a high-end rig.
Server performance	Using optimized settings for the server for smooth operation.
Environment Prototype	Use iterative development process

Table 4.2: Difficulties Faced

Chapter 5

Iteration Plan

5.1 Proposal

In planning the renewal of the Historical Education Virtual Reality project, the approval phase played an important role in determining the main objectives and explaining the project. In this first phase, Our team worked together to define a proposal that outlined the program's overall goals, specific objectives, and learning outcomes it hoped to achieve. The concept reflects the purpose of historical progress, preparation for the VR experience, and the overall vision for the evolution of educational history. These phases clearly define priorities and deliverable, providing a path for subsequent iterations. Additionally, during the implementation phase, participants will have feedback and practicality in relating to educational goals and receiving support for the course of the project. By refining the recommendations based on feedback and changes in vision, the team created a solid foundation for the next phase, supporting the right approach and working towards the history learning VR development project.

5.2 Midterm FYP 1

We have made great strides toward developing our project, "Virtual Reality for Historical Education," during the midterm part of our (FYP1). As of right now, our team has successfully finished producing the necessary assets that are vital to the project's success as a whole. This entails the painstaking creation of virtual landscapes, historical relics,

and 3D models—all essential elements of the immersive historical experience we hope to provide. With meticulous attention to detail, the assets have been created to ensure historical authenticity and visual quality, hence augmenting the educational value of the virtual reality (VR) environment.

In addition, a thorough literature analysis that delved deeply into the body of knowledge already available on virtual reality in historical teaching was carried out during this phase. Our group has picked up important information, best hones, and a firm get a handle on of the academic angles of utilizing virtual reality (VR) for verifiable instruction much obliged to this careful survey. The educating approaches and fabric conveyance strategies we arrange to utilize afterward within the venture are based on this center study.

Besides, figuring it out the significance of a ideal setting for the successful execution of a virtual reality authentic instruction stage, our bunch has contributed a incredible bargain of time and vitality in building a solid mechanical establishment. This involves planning the equipment and program situations required to back the VR application easily. The joining of resources into this setting ensures clients a consistent and locks in involvement, which is steady with our project's point to convert history instruction through state-of-the-art innovation. These crucial components set us up for victory as we move into the project's afterward stages of improvement, testing, and refinement.

5.3 Final FYP 1

The final quarter of FYP1 was went through concentrating on the testing and investigating stages of our large-scale venture, "Virtual Reality for Verifiable Instruction." This organize of the improvement prepare was basic since it gave us the chance to assess the system's usefulness, spot conceivable issues, and move forward the client involvement. We unraveled a number of specialized issues through careful testing and investigating, ensuring that the VR environment and directions modules worked without a hitch and gave clients a tried and true and immersive chronicled investigation experience.

Concurrently, a incredible bargain of work was put into wrapping up the vital printed material required to keep the venture moving forward. This documentation offers bits of knowledge into the framework design, plan choices, and strategies utilized, and acts as a

careful direct for up and coming advancement stages. It builds up the establishment for collaboration and is an priceless device for investigating and future improvements.

A key component within the completion of FYP1 was the creation of a working virtual environment model. This prototype represented a critical breakthrough as we unveiled the primary version of our extend conjointly illustrated the discernible advance made amid the primary stage. The model gave us a physical representation of the expecting VR authentic instruction stage, empowering us to see the result of all of our difficult work. We are presently one step closer to completing our venture, and this introduction was a major achievement that laid the basis for future iterative improvement, criticism integration, and refinement within the coming stages.

5.4 Midterm FYP 2

Amid our moment year of consider, we made critical advance with our inventive extend, "Virtual Reality for Authentic Instruction." The fruitful usage of an intelligently startup menu—a basic component that acts as the user's section point into the immersive authentic learning environment—was a major center point amid this stage. The startup menu was meticulously made to move forward client involvement and engagement. It offers a straightforward interface through which clients can effectively get to the plenty of chronicled materials and encounters that our venture must offer.

In addition, we made a noteworthy exertion to consolidate authentic importance into the project's design itself. This required coordinating the VR environment's crucial engineering with the verifiable periods and civilizations that were being explored. We looked for to provide clients a smooth and veritable verifiable involvement by joining verifiable precision into the center engineering, making beyond any doubt that each aspect of the virtual environment reflects the profundity of the chosen chronicled contexts.

A center on upgrading the system's natural intuitive was made in an exertion to make strides the client experience overall. To encourage charm clients within the authentic accounts, this included improving the tangible involvement by and large, including reasonable natural components, and fine-tuning the flow of client engagement with the virtual environment. A major progression was too made within the creation of Non-Player Char-

acters (NPCs), with an accentuation on raising their level of insights. With this overhaul, the virtual characters ought to be more energetic, responsive, and similar, which ought to increment client interaction and engagement with the chronicled instruction stage. As this stage came to an conclusion, all of these headways made a difference our venture to develop and took us one step closer to figuring it out an locks in and wealthy virtual history investigation.

5.5 Final FYP 2

During the final steps of our (FYP2), the group attentively went over the crucial testing part once more and conducted complete evaluations to guarantee the strongest operation of our team's project, "Virtual Reality for Historical Education." As we rigorously tested and refined the system's various components, this phase served as a critical checkpoint. Resolving any outstanding issues was essential to ensuring a smooth user experience and bolstering the dependability of the historical education platform.

Concurrently, a great deal of focus was placed on improving and finishing the project documentation. We thoroughly revised and enhanced our documentation, which captured the nuances of the architecture, choices made during design, and techniques used throughout the system. The thorough documentation provided by this project guarantees that the knowledge gained during development, troubleshooting, and maintenance is efficiently transferred and available to all parties involved.

The complete launch of our project on the Oculus platform marked a significant turning point in the last stage. Our enormous efforts to translate theoretical ideas and developmental advancements into a concrete, usable application came to a head with this deployment. Thorough testing and debugging were carried out after deployment to optimise the system's functionality. In addition to signifying the accomplishment of our project objectives, these milestones pave the way for the wider adoption and influence of our Virtual Reality for Historical Education platform.

Chapter 6

Iteration 1

6.1 Use Cases Diagram and Explanation

The "Virtual Reality for Historical Education" Use Case Diagram lists all of the players and use cases that are involved in the system, along with its main functions and interactions.

6.1.1 Sign In

The first point of engagement where users authenticate into the VR historical education platform is represented by the "Sign In" use case. This crucial phase guarantees customised interactions, progress monitoring, and profile access.

Description	**Details**
Goal	Verify users' identity on the virtual reality historical learning platform.
Preconditions	The VR gear is connected, and the user has an account.
Successful End Conditions	The user can access features and content that are tailored to them.
Primary Actor	User
Secondary Actor	Authentication System
Trigger	The sign-in process is started by the user.
Main Flow	The user inputs their credentials. Credentials are verified by the system. User access is granted if authentication is successful.

Table 6.1: Use Case description for Sign in

6.1.2 Enter Main Menu

After completing the authentication process, users are sent to the platform's primary hub through the "Enter Main Menu" use case. Users can explore a variety of options under the main menu, such as analysing timelines, interacting with historical content, and investigating simulations.

Description	**Details**
Goal	Reach the VR platform's central hub.
Preconditions	The user is logged in.
Successful End Conditions	The user is in the primary menu system.
Primary Actor	User
Secondary Actor	Main Menu Interface
Trigger	The user successfully logs in.
Main Flow	The "Enter Main Menu" option is selected by the user. The interface of the main menu is shown.

Table 6.2: Use Case description for Main Menu

6.1.3 Study Timelines

Users can explore historical timelines in chronological order with the "Study Timelines" use case. Through the use of this interactive feature, users can access educational content that is organised around particular historical eras, occasions, or civilizations, promoting an organised and educational learning environment.

Description	**Details**
Goal	Investigate educational materials and historical timelines.
Preconditions	User is currently in the main menu.
Successful End Conditions	The user learns about the Historical Knowledge
Primary Actor	User
Secondary Actor	Historical Information Database
Trigger	"Study Timelines" is chosen by the user from the main menu.
Main Flow	The user chooses a particular historical chronology. Presented is instructional material pertaining to the selected timeline.

Table 6.3: Use Case description for Study Timelines

6.1.4 Explore the Simulation

The platform's immersive feature, which enables users to virtually explore historical environments, is centred around the "Explore the Simulation" use case. Users can engage in captivating and interactive experiences with historical settings, landmarks, and scenarios thanks to this functionality.

Description	**Details**
Goal	The objective is to submerge users in historical contexts.
Preconditions	User is currently in the main menu.
Successful End Conditions	The chosen historical simulation is experienced by the user.
Primary Actor	User
Secondary Actor	Engine for VR Simulation
Trigger	The user clicks on the "Explore the Simulation" option in the menu.
Main Flow	The user selects a simulation from history. An environment for virtual reality is introduced.

Table 6.4: Use Case description for Explore the Simulation

6.1.5 Interact with the Environment

Users interact with the VR environment and its components in the "Interact with the Environment" use case. Through object manipulation, historical role-playing, or decision-making that affects the story as it develops, this interaction can enhance the educational

value of experiential learning.

Description	**Details**
Goal	The objective is to involve users in interactive VR elements.
Preconditions	The user is in a simulation of the past.
Successful End Conditions	The user engages with historically accurate simulations.
Primary Actor	User
Secondary Actor	Engine for VR Simulation
Trigger	The user starts a simulation interaction.
Main Flow	The user makes choices or interacts with objects. The simulation reacts to user actions in a dynamic way.

Table 6.5: Use Case description for Interact with the Environment

6.1.6 Exit Simulation

The use case "Exit Simulation" denotes the end of the user's virtual encounter. Users start this use case to gracefully exit the VR simulation and go back to the main menu or log out of the system, whether they are wrapping up a study session or exploring.

Description	**Details**
Goal	Finish the VR simulation and go back to the main menu.
Preconditions	The user is in a simulation of the past.
Successful End Conditions	The user goes back to the home screen.
Primary Actor	User
Secondary Actor	Engine for VR Simulation
Trigger	When a user decides to end a simulation.
Main Flow	The user chooses "Exit Simulation." The user is brought back to the main menu screen.

Table 6.6: Use Case description for Exit Simulation

Together, these use cases provide an overview of the fundamental features of the VR historical education platform and show users how to interact, explore, and learn about

historical content in an engaging virtual setting. Users actively engage in the various use cases to improve their comprehension of historical events and civilizations, making them actors in these interactions.

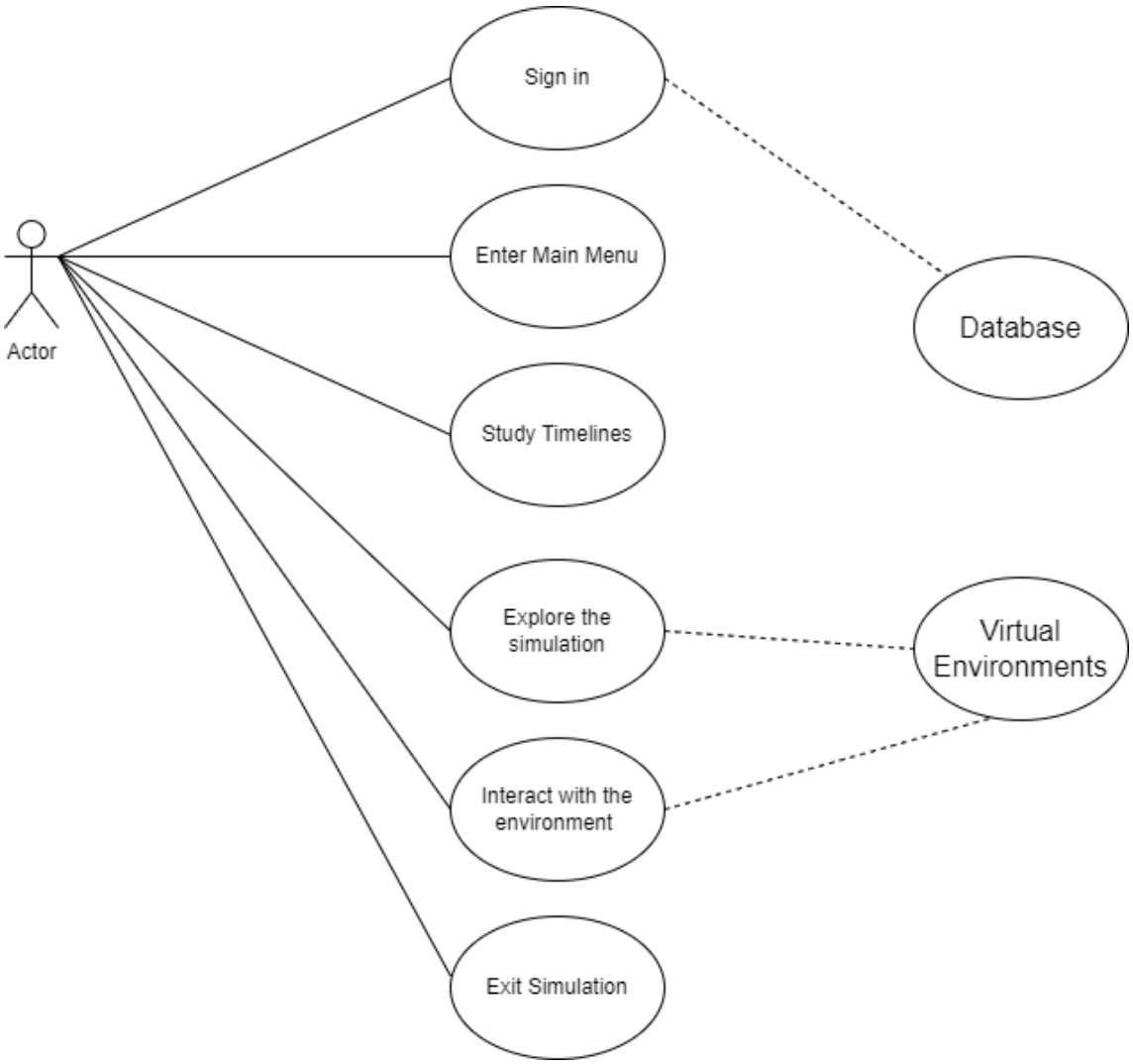

Figure 6.1: Detailed Use Case Diagram

6.2 System Diagram

A system diagram, sometimes referred to as a system architecture diagram, is a picture that shows the various parts of a system as well as their interactions and relationships. It demonstrates the high-level organisation and structure of a complex system and how different components work together to accomplish particular functions. Typically, the diagram consists of blocks or modules that represent various subsystems, parts, or services, with arrows showing the data, control, or communication flows that connect them.

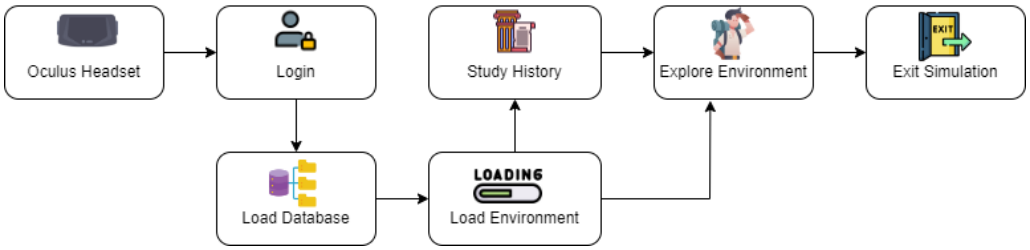

Figure 6.2: System Diagram

6.3 Component Diagram

The Virtual Reality for Historical Education system's component diagram shows the essential elements that work together to create a seamless and engaging experience.The Unity game environment is at the center and cornerstone of the system. Player controls facilitate participation and navigation by controlling how the user moves through the virtual environment. NPC elements describe bad behavior of non-player characters and increase the accuracy and functionality of historical figures. It includes subcomponents such as patrol and artificial intelligence. In-game chat is partially managed by a chat manager, making it easier for players and NPCs to have meaningful conversations. Finally, the VR User Interface (UI) is the main element that provides the user with a beautiful and engaging experience of exploring the culture, choosing and interacting with the curriculum. When these elements are brought together, they form an inseparable combination and thrive in the virtual environment.

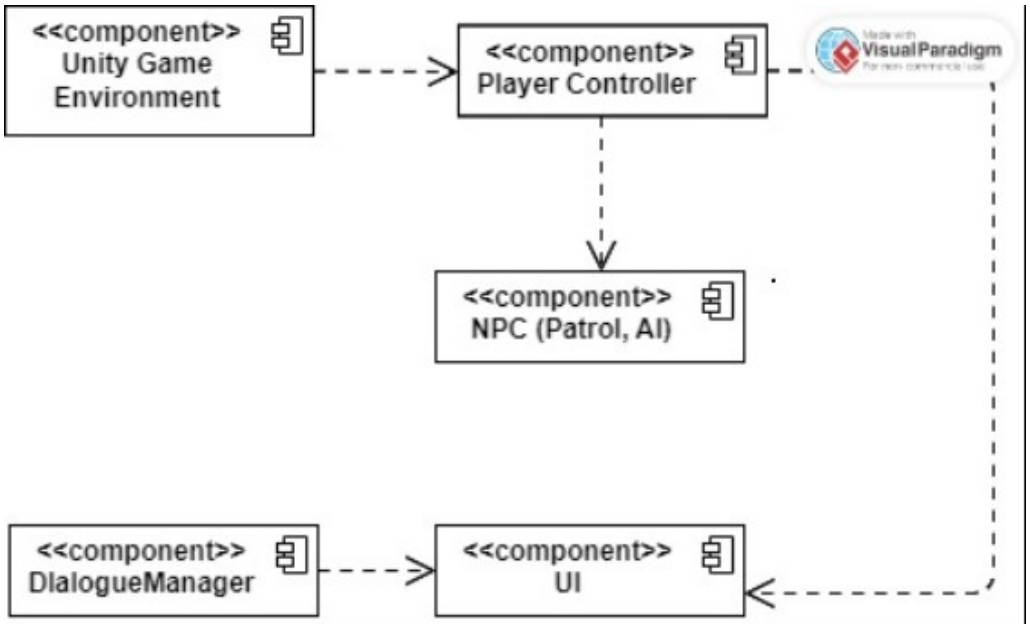

Figure 6.3: Component Diagram

Chapter 7

Iteration 2

7.1 Activity Diagrams

In the Unified Modeling Language (UML), a diagram represents an activity through a function, process, or function. It explains the decision-making process, the sequential process, and the interaction of various processes to express the characteristics of the body. Activities are represented by nodes and transitions between them are indicated by arrows. Different symbols are used to represent execution points, concurrency, and cycles, providing a graphical representation of changes over time. Diagrams provide clarity and understanding of the steps and decision-making processes in a dynamic system, making them useful in software development, business modeling, and systems analysis.

7.1.1 Activity Diagram for the Player

The player's map game begins by choosing a civilization, begins exploring events, exploring the virtual world, and finding historical details. At various decision points, players must decide whether to talk to NPCs or investigate historical sites they encounter. Players interact with in-game characters if they choose to talk to NPCs, and learn more about the site's history if they choose to explore the site. The final task is to examine the selection of NPCs or citizens from historical places that enhance understanding and application in the virtual environment. Connections between players are captured in the event map, which provides a clear picture of the dynamics.

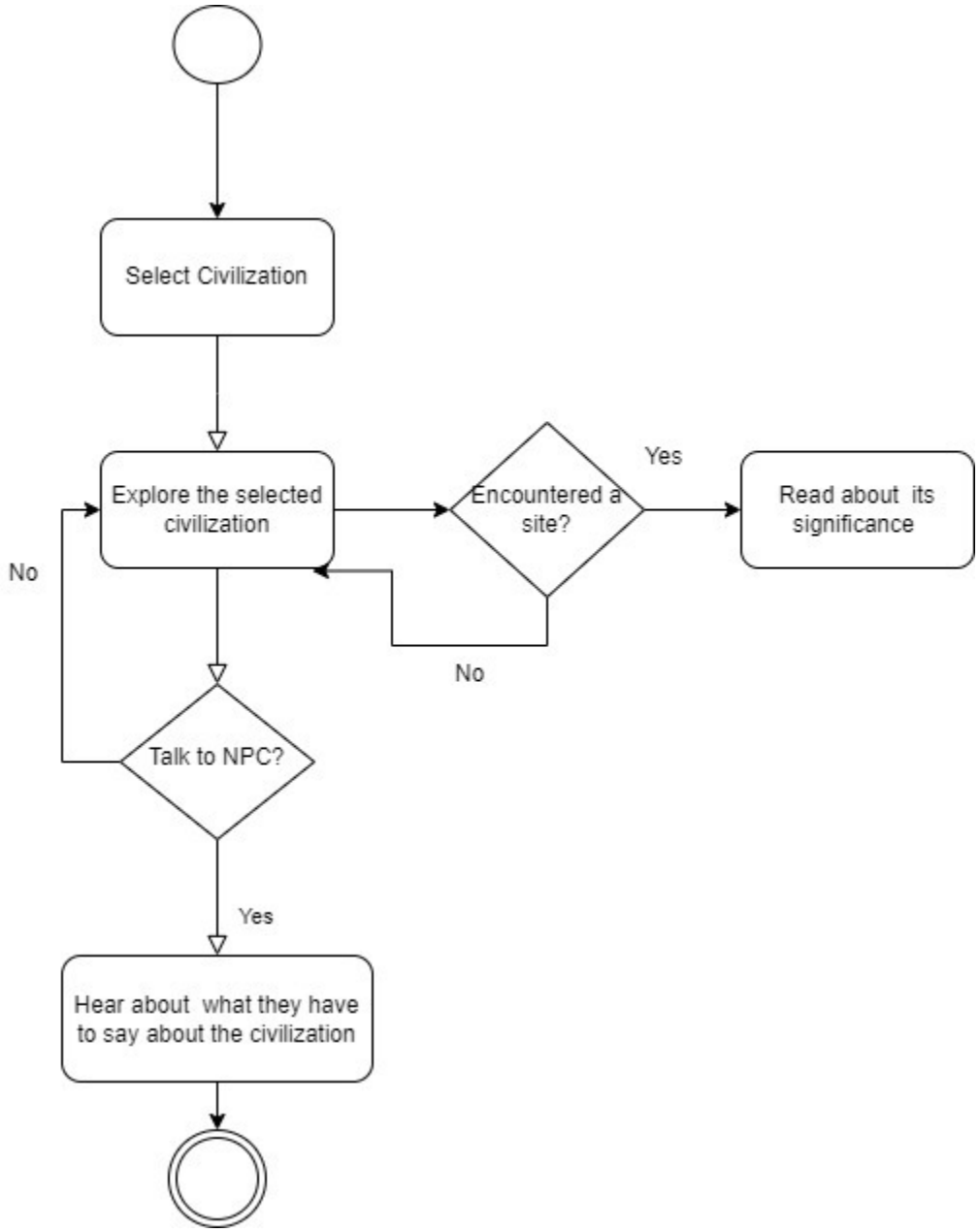

Figure 7.1: Activity diagram for the Player

7.1.2 Updated Player Activity Diagram

The player's game map is updated to include the initial goal of choosing to progress, followed by an exploration phase in which the player explores the virtual world to find historical context. During certain stages, players can choose to talk to NPCs or explore historical sites they encounter. If the player chooses to talk to an NPC, the player interacts with an in-game character; Instead, choose to explore where to start doing background

research. The new map adds a new quest called "Learn About", which is different from the option to visit historical sites. With this new project, players can go deep into space and make their virtual space more familiar and educational.

Poor decision making, interactivity of learning, and recently added Learn This activities are all represented in this Activity diagram.

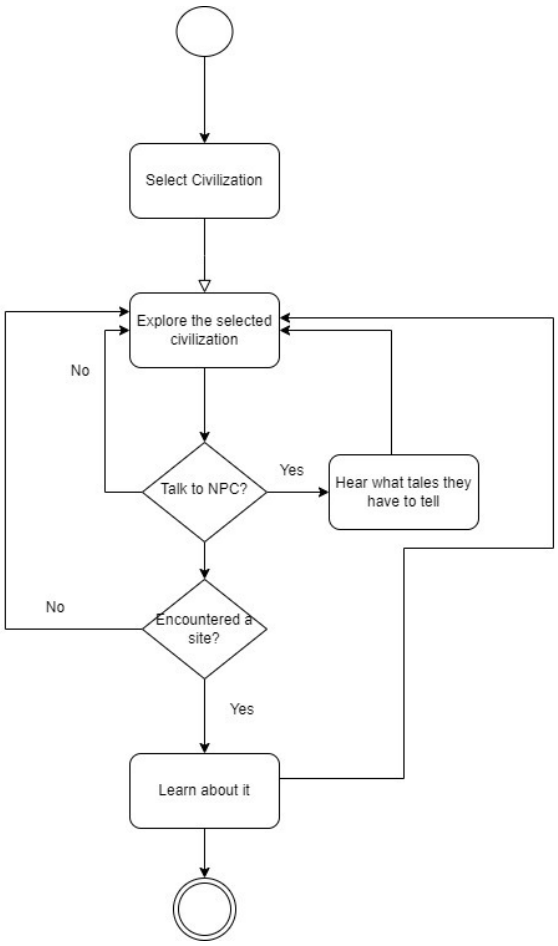

Figure 7.2: Updated Activity Diagram for Player

7.1.3 Activity Diagram for NPC's

The NPC activity diagram summarizes a complete looping procedure in which the NPCs patrol the virtual environment at the designated intervals. The routine entails passing through pre-designated areas, which adds to the historical setting's dynamic and immersive quality. There is also a decision point that assesses if the player has communicated with the NPC. The NPC moves on to telling the player about the civilization if the answer

is in the affirmative.

This decision-making procedure guarantees that NPCs react to player interactions in a dynamic manner, providing insightful commentary and making the virtual historical context more engaging and educational overall. The loop of NPC patrols, decision-making points, and educational exchanges are graphically represented by the activity diagram, which increases the overall richness of the NPC behavior in the virtual Environment.

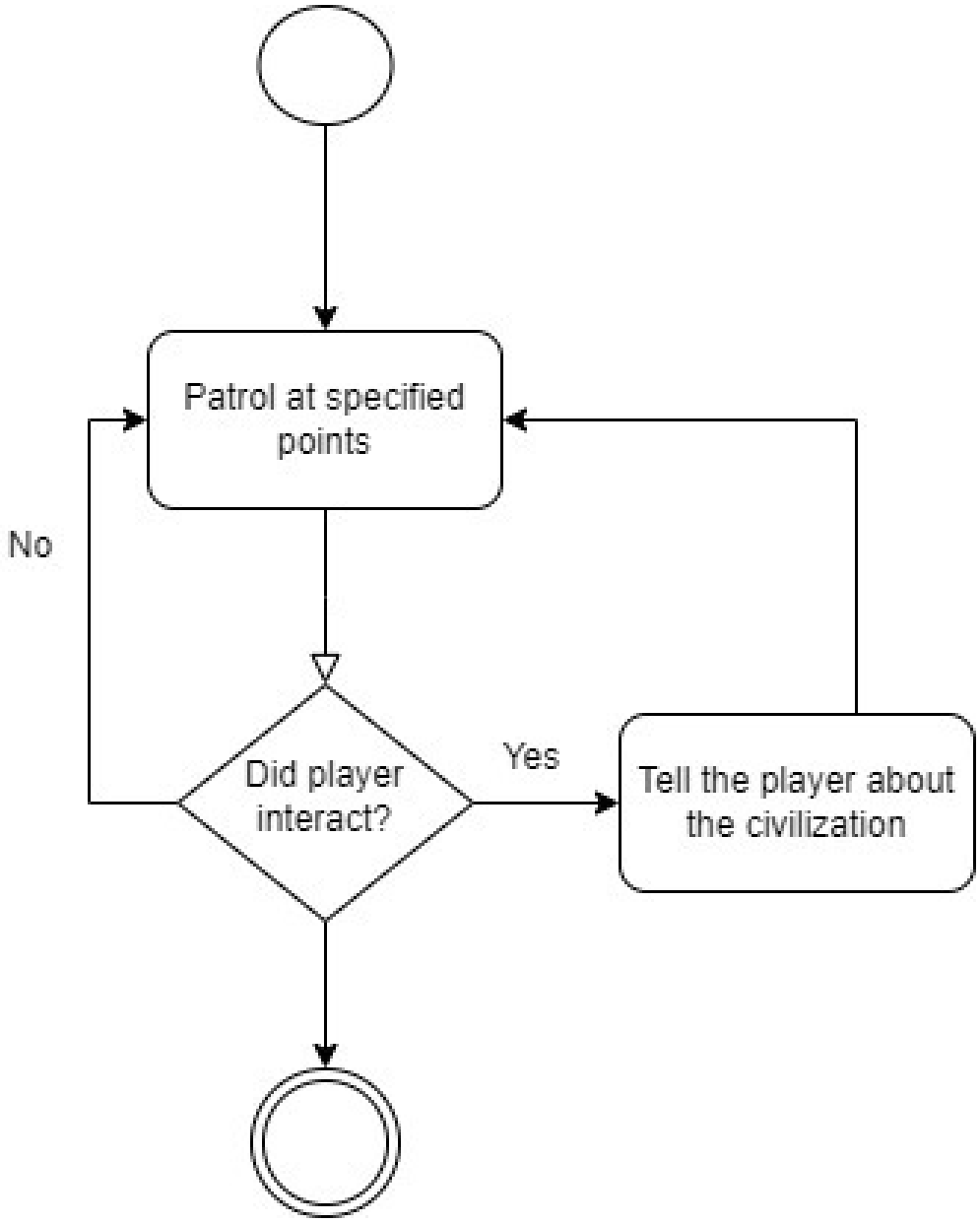

Figure 7.3: Activity diagram for NPC's

7.2 Class Diagram

A class diagram is a kind of UML diagram that shows the classes that make up a system, their attributes, methods, and the relationships between them, in order to depict the structure of the system. A class diagram could be used to illustrate the main classes involved in a virtual reality (VR) application for historical education, including the VR application, user interface, VR environment, and interaction system.

7.2.1 VR Application Class

This class is a representation of the main features of the application. It contains settings for the application as well as functions. In order to oversee the whole application lifecycle, this class of our project may communicate with the other classes.

7.2.2 User Interface Class

The VR application's graphical client interface (GUI) is contained inside the Client Interface class. It has highlights like menus, boards, and buttons in expansion to ways to render and overhaul the client interface. To prepare client inputs and start related activities, this class works closely with the VR Application class.

7.2.3 VR Environment Class

This class serves as a representation of the application's virtual environment. It has components such as surfaces, natural settings, and 3D models. The stacking of verifiable substance and the rendering of the virtual environment may be dealt with by strategies in this Class . To arrange the whole involvement, it communicates with the VR application.

7.2.4 Interaction System Class

This class of the diagram controls howthe students interact with the virtual reality environment. Controllers and interaction points, and student's actions are within its attributes. This class's methods deal with user inputs like selecting or grabbing objects, and they communicate with the VR environment to make adjustments in response to user inputs.

The associations between these classes show the dependencies and relationships between

them. To coordinate the overall functionality, the VR Application class might, for instance, be associated with the User Interface, VR Environment, and Interaction System classes. While the Interaction System class interacts with both the User Interface and VR Environment classes to create a seamless and interactive VR experience for historical education, the User Interface class may communicate with the VR Environment class to display pertinent information.

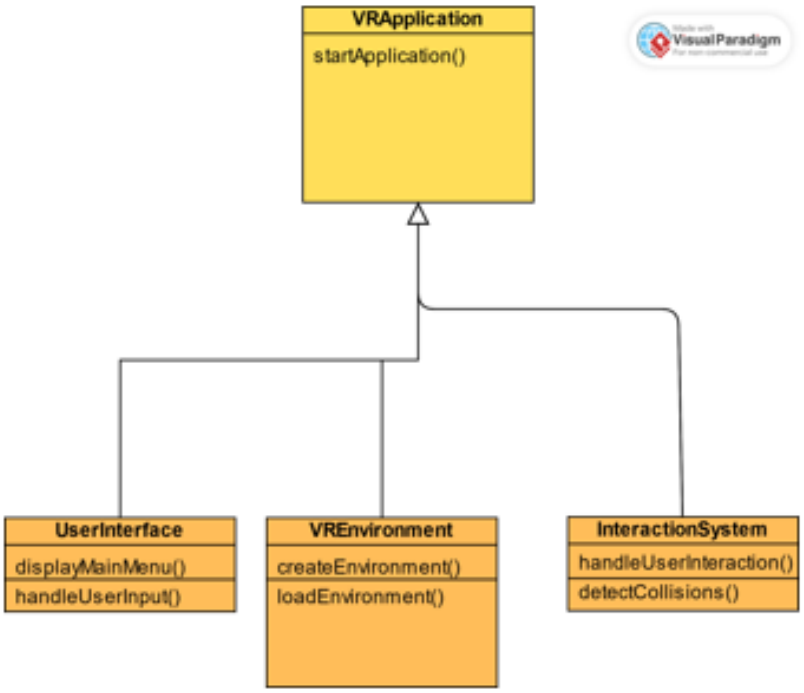

Figure 7.4: Partial class Diagram of VR-Traveller

7.3 Detailed Class Diagram

7.3.1 Dialogue

represents the manner in which conversations take place within the system. includes characteristics and techniques for managing and presenting conversations during interactions.

7.3.2 Dialogue Manager

Oversees the general direction and implementation of dialogues. In charge of organizing interactions between various dialogue instances and making sure that the conversation

experience is fluid and appropriate for the given context.

7.3.3 Player Controller

Specifies how the player character is controlled. includes features and operations for player movement, input handling, and general game environment interaction.

7.3.4 Player Looking

symbolizes the functionality related to the player's line of sight or gaze. includes features and techniques for figuring out what the player is looking at or observing in the game at any given time.

7.3.5 Trigger Area Place

represents particular areas or locations in the game that have the ability to start certain actions or events. includes details regarding the physical attributes of trigger areas and how specific in-game locations are related to them.

7.3.6 Trigger Area

embodies the general trigger area structure. includes properties and methods for specifying the circumstances and actions that are triggered when a player approaches or engages with the designated area.

7.3.7 Patrol

represents the objects or parts that make up the game's patrol routes or patterns. includes characteristics and techniques pertaining to the actions and demeanor of entities that are patrolling particular regions.

This section on class diagrams provides an organized depiction of the roles and connections between the important classes in the system, acting as a visual guide for the creation and integration of these software elements.

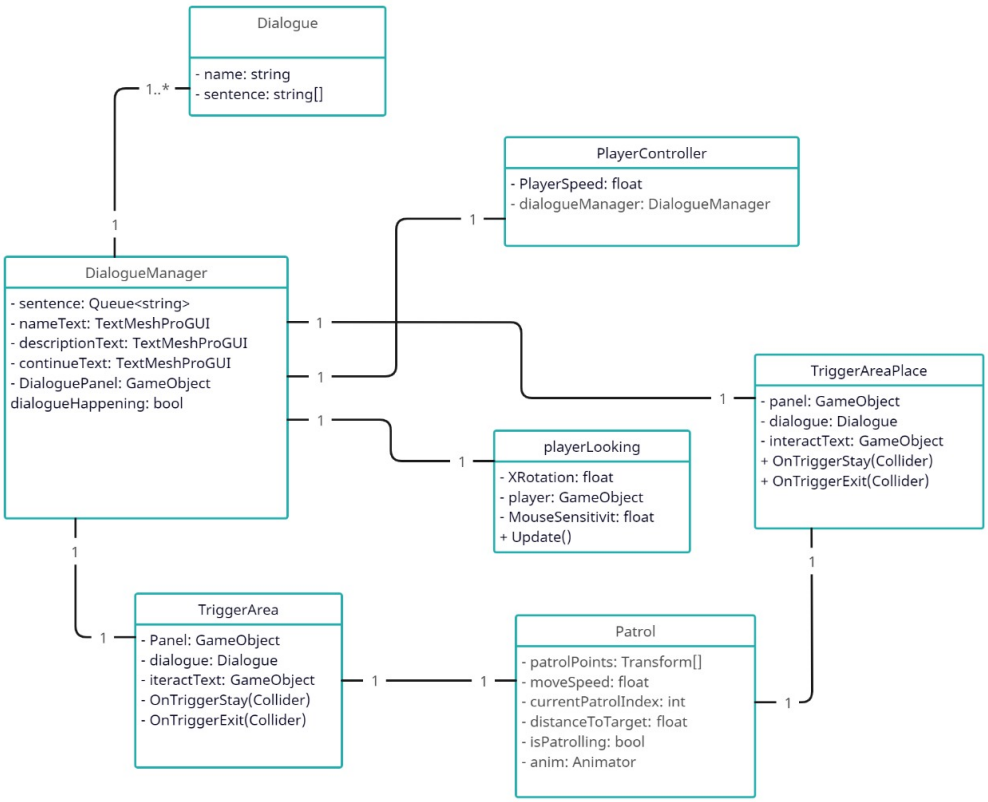

Figure 7.5: Detailed class Diagram of VR-Traveller

Chapter 8

Iteration 3

8.1 Menu Screen Interface

Our system's menu screen offers users a dynamic and visually appealing interface, making it an inviting starting point for historical research. Users are welcomed by a dynamic menu upon system entry, which features two notable historical locations: Gandhara and Birka. In order to provide users with a visual preview of the rich historical landscapes that are waiting to be explored, the menu design has been painstakingly created to highlight these locations as they appear on the map.

Show in a kaleidoscope of tints, Gandhara and Birka each speak to the unmistakable social and authentic lavishness of their particular areas. The interface consolidates creative components that bring out the substance of each put, in expansion to advertising a see of the geological format. The menu is made into an stylishly satisfying and immersive encounter through the utilize of distinctive tones and complicated enumerating, which too sets the organize for a intriguing authentic journey.

The menu is made to be simple to utilize and engaging for the client to connected with. Based on their chronicled interface, clients can select between Gandhara and Birka through a direct determination handle. Clients can effectively move from the menu screen to the immersive verifiable situations much obliged to the design's responsiveness and user-friendliness, which ensures that the menu route moves forward the generally encounter. Basically, the menu screen welcomes clients to connect it on a colorful and enlightening

travel through the ages, acting as a outwardly captivating prelude.

Figure 8.1: UI Screen Menu

8.2 Gandhara Interfaces

Our system's Gandhara interface offers clients an immersive and intelligently encounter that goes past customary boundaries of interaction. By utilizing state-of-the-art Virtual Reality (VR) innovation, clients are taken to the center of Gandhara, with the interface precisely reproducing the initial zones. The interface is aiming to be more than fair a picture; it's an intelligently portal that takes clients on a energetic visit of Gandhara's verifiable treasures.

Figure 8.2: Gandhara Historical Spot 3D model (a)

Figure 8.3: Gandhara Historical Spot 3D model (b)

The interface's 3D representations of Gandhara are meticulously outlined to typify the soul of this terminated society. These models offer clients the impression of being physically show within the unique Gandhara spaces in expansion to displaying verifiable precision. Clients can explore through distinctive verifiable areas in Gandhara much obliged

to the intelligently nature of the interface, which offers a intensive investigation of this critical and socially wealthy chronicled point.

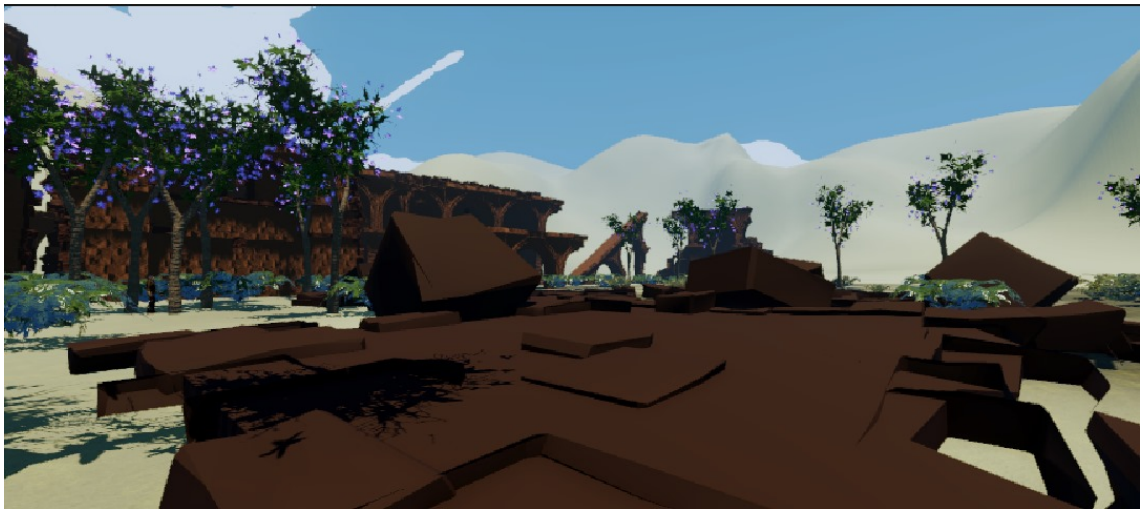

Figure 8.4: Gandhara Historical Spot 3D model (c)

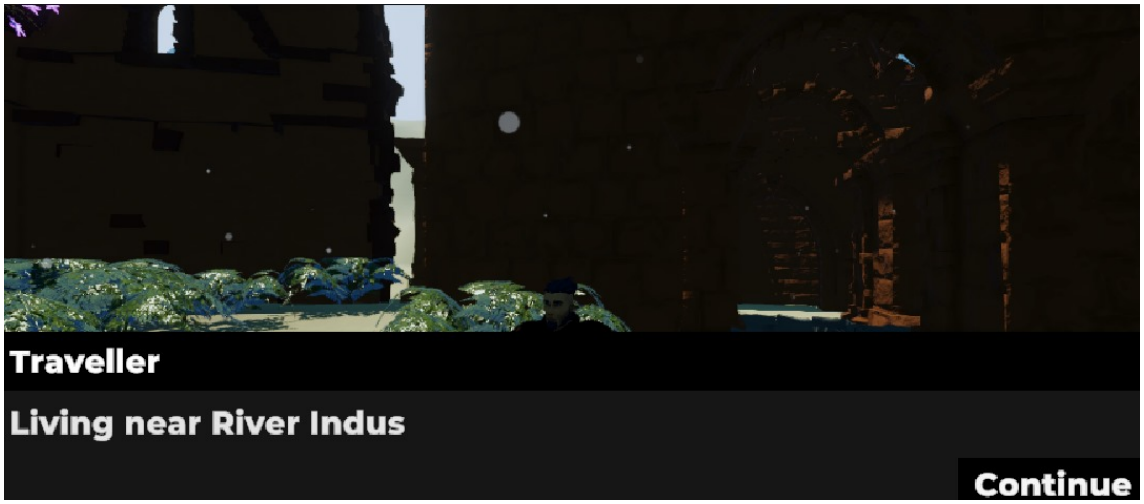

Figure 8.5: Gandhara Historical Spot 3D model (d)

Clients submerge themselves in an instructive travel that rises above routine learning strategies as they investigate the Gandhara interface through virtual reality. The proficient consolidation of three-dimensional models and intelligently highlights ensures that guests not as it were watch but too effectively take part with the authentic destinations, obtaining a profound comprehension of the social and chronicled significance of Gandhara. The Gandhara interface gives clients with an locks in and educator involvement that goes

past the impediments of a conventional learning environment, serving as a confirmation to the potential of virtual reality in chronicled instruction.

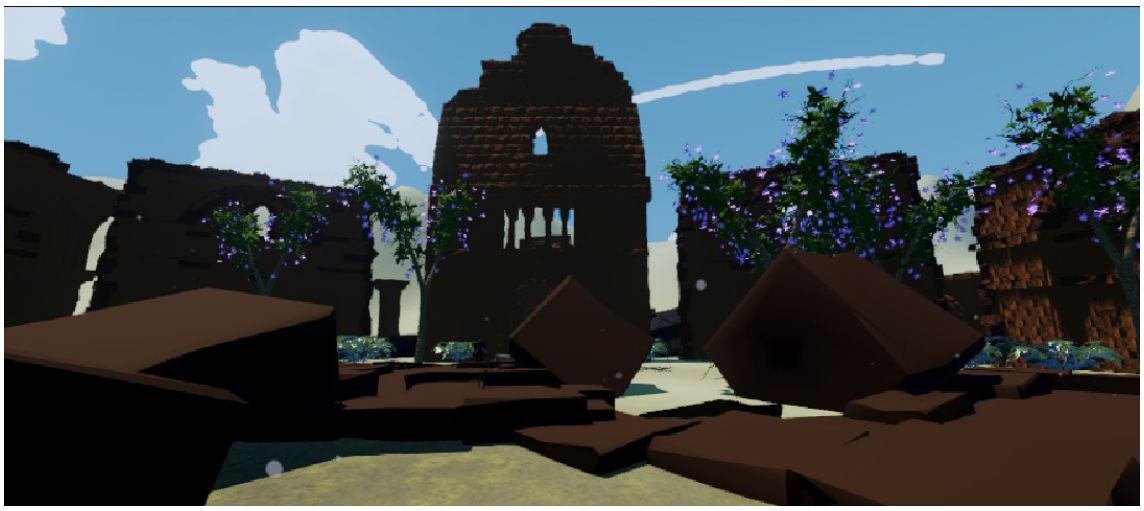

Figure 8.6: Gandhara Historical Spot 3D model (e)

Figure 8.7: Gandhara Historical Spot 3D model (f)

8.3 Birka

Our system's Birka interface pushes the boundaries of interactivity by advertising clients an charming and immersive visit of Birka's authentic scene. Clients encounter an unmatched sense of nearness and association with this old verifiable location as they are transported to the true spaces of Birka through the utilize of cutting-edge Virtual Reality (VR) innovation. Since of the interface's careful intelligently plan, clients are energized

to effectively associated with and learn around Birka culture.

Figure 8.8: Birka Historical Spot 3D model (a)

Beyond fair being outwardly exact, the 3D models of Birka within the interface capture the soul of the first chronicled point. By encountering Birka's sights and sounds through virtual reality, clients can superior appreciate the city's chronicled centrality. These point by point 3D representations of diverse chronicled areas in Birka give a exhaustive and educator see into this notable community.

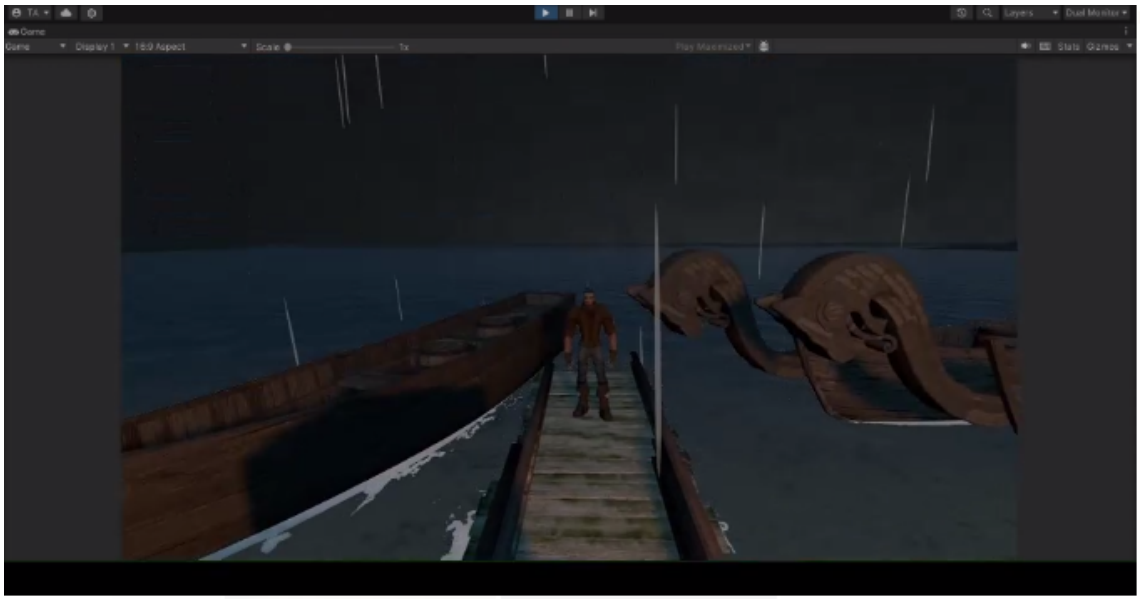

Figure 8.9: Birka Historical Spot 3D model (b)

Figure 8.10: Birka Historical Spot 3D model (c)

Also, energetic components presented by the interface include to the in general authenticity. The virtual space is given an barometrical touch by the rain, which is spoken to as a captivating shower of stars. The models smoothly portray the occasions that once took put in Birka, counting intriguing portrayals of chronicled occasions like blazes. This immersive strategy makes the past come to life whereas moreover teaching clients almost the verifiable foundation and advertising a sensory-rich involvement. The Birka inter-

face, which offers a really intuitively and multi sensory travel through time, could be a landmark to the potential of virtual reality in authentic instruction.

Figure 8.11: Birka Historical Spot 3D model (d)

Chapter 9

Results

The Virtual Reality for Authentic Instruction, created utilizing Oculus VR innovation, pointed to supply an immersive and intuitively Encounter of the understudies and clients. This chapter presents the comes about of the venture, highlighting the key accomplishments, challenges confronted, and client feedback.

In our examination into the creation of "Virtual Reality for Verifiable Instruction," we set forward the project's grand targets and benchmarks in Chapter 3. As we see back on the project's progress and achievements, ready to say with awesome fulfillment that these objectives have been effectively realised.

The prior chapters secured the foundational components, which included resource creation, VR environment advancement, and joining chronicled exactness into the venture engineering. Through constant work and cooperation, we have surpassed these starting objectives in expansion to assembly them. The resources, which deliver life to the virtual chronicled settings, incorporate scenes, authentic antiques, and 3D models that have been consistently coordinates. The instructive encounter has been expertly outlined to combine curiously interaction with exact authentic data.

9.1 Achieving Immersive VR in Education

Through the successful application of the immersive Virtual Reality (VR), our project has completely changed the field of Historical education. We have given the students access

to the previously unheard-of possibilities for the interactive and hands-on learning by incorporating the immersive virtual reality (VR) experiences into this educational settings. With the help of our platform, students can virtually enter historical events, investigate prehistoric societies, and observe significant historical events. By providing a dynamic and captivating educational experience that promotes a deeper comprehension and retention of historical content, this immersive approach goes beyond traditional learning methodologies.

9.2 Oculus Integration for Historical Exploration

Our project has reached a significant milestone with the system's smooth integration on the Oculus platform. With this accomplishment, users can now explore historical locations and events in a realistic and fully immersive virtual reality setting, opening up a world of possibilities. By utilising Oculus technology, users can virtually travel to different eras and experience historical locations with a never-before-seen level of detail. Our Oculus integration enhances the historical exploration journey, making it informative and visually captivating—whether you're walking through historical landscapes, exploring ancient ruins, or interacting with significant artefacts.

9.3 Interactive and Intuitive User Interface

Given the significance of the user experience, our project focuses a great deal of attention on offering an interactive and user-friendly interface. We are aware that a seamless and productive VR experience depends on easy navigation and user-friendly design. We have created an interface that skillfully leads users through the interactive simulations, historical timelines, and instructional content via careful design and development. The system's easy navigation, educational modules, and historical element interaction guarantee that learning is both educational and entertaining for users.

9.4 Challenges Faced

9.4.1 Technical Complexity

The integration of VR and multiplayer functionality presented a significant technical challenge. Its successful implementation necessitated expertise in 3D graphics, hand tracking, and minimizing latency to ensure an optimal user experience. Achieving network synchronization proved to be a formidable task, as it required addressing ongoing delays between servers.

9.4.2 User Adaptation

Although the incorporation of virtual reality provided an immersive experience, some users or students who were unfamiliar with virtual reality required guidance and time to become accustomed to the VR technology. This shows a learning curve for the users or students. To assist the users, we provide tutorials that helped them in giving idea about this.

9.4.3 Gathering Data

Collecting historical data proved to be a difficult task. Historical data is often divided among different sources, each of which varies in reliability and availability. Constraints in creating a solid foundation for our VR history education platform include the diversity of archival materials, the limitations of digitization, and the need for accurate and comprehensive information. Solving these problems requires decisions that include working with historians, using online data, and addressing data analysis and design issues.

9.4.4 Asset Creation

The process of creating heritage, including the creation of 3D models, artifacts and experiences, presents many challenges. Creating a legacy that clearly illustrates various historical periods requires a balance between historical integrity and creativity; because the nuances of historical truth must be carefully considered to be clear. The project was made more challenging due to the resourcefulness of the design assets, including mod-

elling, texturing and research. To overcome these problems, a comprehensive plan needs to be carried out, including collaboration with experts and historians, and possibly further research on human samples to improve property production.

9.4.5 Development of Environmental Prototype

The development of the environmental model encountered difficulties in creating a virtual environment that faithfully reproduced the historical environment. In a virtual reality environment, a balance must be struck between achieving a high level of realism and maintaining operational efficiency. Limitations relate to the development of the model, such as complexity and user interaction considerations. A dynamic development approach is needed to overcome these problems. This requires user feedback, ongoing testing, and collaboration between developers and designers to improve the environment and ensure the project meets learning objectives.

9.5 User Feedback

User feedback played a very interesting and important role in evaluation every system and new developed technologies.

9.5.1 Immersive Learning Experience

Users praise VR's immersive qualities, pointing out that it greatly improves education by giving them a feeling of presence in historical environments.

9.5.2 Increased Engagement

Positive comments highlight how much user engagement has increased with VR use in historical education. Students are becoming more engaged with historical accounts and occurrences.

9.5.3 Enhanced Retention of Information

When learning through virtual reality, users claim to retain historical information better. An educational experience that is more memorable is enhanced by the interactive and

experiential components.

9.5.4 Suggestion For Content Expansion

To further enhance the educational value of the VR experience, some users propose adding more timelines, civilizations, or historical events to the mix of historical content.

9.5.5 Technical Considerations

Feedback covers technical aspects like headset comfort, system performance, and the significance of guaranteeing a seamless VR experience for the best possible learning results.

Chapter 10

Discussions

This chapter delves into the discussions surrounding the challenges encountered during the development and implementation of the VR Traveller using Oculus VR technology. It highlights the various problems faced by the development team and presents the strategies and solutions employed to address them effectively.

10.1 Gathering the Historical data:

Obtaining historical data created significant challenges for our project and hindered the development of our virtual history education platform. This difficulty arises from the complex system of historical documents, which are often dispersed in many places and suffer from accessibility problems. The difficulty of collecting good and accurate historical data is compounded by issues such as digitization, different archival formats, and the diversity of formats available for historical data.

In the process of collecting historical data about our education platform, we have to search many online documents, databases and repositories. Although there is a lot of information in these resources, it can be difficult to identify large files and obtain the necessary permission to process and use them correctly.

The project also needs to solve the ongoing problem of linking various documents together. Background knowledge creates a harmonious and engaging learning environment. This requires not only collecting reliable data but also transforming raw data into stories,

simulations and reports. We are constantly looking for creative solutions to overcome these challenges, such as crowdsourcing, working with experts, and updating published content. Although there are problems in collecting historical data, our aim in using this strategy is to increase the scope and accuracy of history education on our platform.

The assistance provided by the KP (Khyber Pakhtunkhwa) Tourism Department has proven to be very useful in resolving data collection issues. Our team is aware of the importance of original, comprehensive historical information and has contacted KP Turizm to benefit from their knowledge and resources. The aim of the collaboration is to complete the process and provide unique and reliable historical data on the region.

10.2 Creation of 3D Model

Creating heritage is an important process that involves the creation of complex 3D models, historical artifacts and beautiful landscapes, which poses a great challenge for our project. The actual history of these assets must be carefully considered to meet the needs. Creating representations that faithfully capture the spirit of each historical moment requires a careful balance between artistic creativity and a deep commitment to historical integrity. In order to provide a good learning experience to the users of our VR history learning platform, all 3D models and artifacts need to be visualized to follow the instructions of the specific time it is ready to explain.

Also, the legacy creation process requires a lot of resources, which adds complexity to our project. Extensive research, clear representation and synthesis require a lot of effort and knowledge. A comprehensive plan that goes beyond the confines of our immediate project team is required to overcome these obstacles. Working in tandem with knowledgeable historians and artists becomes essential because they bring a variety of viewpoints and specialties to the table. Additionally, exploring new ideas, such as the integration of production models, appears to be an easy way to increase the value and reach of heritage. This multi-purpose challenge aims to support our educational VR back-end work by improving the overall quality and accuracy of assets and tackling current challenges.

10.3 Creation of Environmental Prototype

When we started developing an environmental prototype for our virtual reality historical education platform, we ran into a number of issues that were closely related to the process of accurately recreating historical environments in a virtual environment.A careful balance must be struck between creating a visual environment in pursuit of truth and showcasing excellence in the dynamic world of virtual reality. This small balance is particularly difficult to meet the inherent constraints of the VR environment, such as the flexibility of user interaction and the complexity of operation. These issues have led to continuous development where our team has to update and improve the model.

When it comes to eliminating under performance, our dynamic development is the key to overcoming these challenges. The key is continuous analysis, which helps us measure the performance of the model, identify conflicts, and improve the definition of the environment to improve the user experience. Additionally, user feedback is important because it provides insight into user expectations and insights. Our designers and developers work closely together, and this testing and feedback loop forms the basis for improving the environment. As these efforts relate to the program's learning objectives, we seek to ensure that the historic district creates engagement with users and fosters significant learning while meeting the challenges of competition through adaptation.

Chapter 11

Conclusions and Future Work

11.1 Conclusion

With the success of the "Virtual Reality in History Education" project, the field of immersive education has taken a significant turn. Using VR technology to bring history to life is a difficult but valuable process. The program demonstrates a commitment to historical accuracy and high academic standards by solving problems in data collection, property development, and environmental design.

The use of VR changes the way students interact with historical materials, providing a dynamic and flexible environment. User feedback on the benefits of history education on motivation, retention, and engagement. In addition to supporting our resources, our collaboration with organizations such as KP Tourism has strengthened the project's connections with local experts and strengthened the sense of community involvement.

11.2 Future Work

Looking to the future, the Virtual Reality for History Education project lays the foundations of another exciting initiative in the field of technology and education. Key areas for future development include continued development of historical content, integration of new VR technologies, and exploration of new opportunities and developments. Collaborations with other schools, historians, and VR enthusiasts may be possible to enhance the

depth and scope of the project.

It is important to explore potential directions for further research and development, such as advances in artificial intelligence to guide historical simulation and increase communication with each other. In addition, the program will have a greater impact on history education by broadcasting the events, collaborating with schools and making them accessible on VR platforms.

In summary, the success of this program creates opportunities for the future. Students around the world will find that historical research is not only a valuable lesson, but also a wonderful life-changing experience. This journey continues as an interesting path for the continued development and growth of Virtual Reality in History Education.

"The Future Belongs to Those Who Believe in the Beauty of Their Dreams"

-Eleanor Roosevelt

Appendix A

Furthur details

User Interface Designs:A selection of the VR historical education platform's user interface designs are shown in this section. These designs highlight the navigational components, menu screens, and interactive interfaces for historical destinations that all work together to create a smooth and interesting user experience.

3D Models Catalog:An extensive overview of the painstakingly created historical artifacts, landscapes, and interactive elements available in the VR platform can be found in the 3D Models Catalog. A brief description of each model is included, emphasizing its historical accuracy and intended educational use.

Collaborative Partnerships: The cooperative relationships formed throughout the project are described in this section, including those with KP Tourism, historical specialists, artists, and developers. The ways in which these collaborations aided in the collection of data, the development of assets, and the prototyping of environments are described.

User Feedback Analysis:An examination of user comments is offered, offering perceptions into how the VR historical education platform affects user satisfaction in general, engagement, and retention. To support the favorable response and identify opportunities for development, quotes, surveys, and analytics are provided.

Technical Specifications: The technical details An extensive summary of the hardware and software needed for the best possible use of the VR historical education platform can be found in the appendix. This covers system setups, VR device compatibility, and any

dependencies needed for smooth operation.

Educational Module Descriptions: This section explores the educational modules that are part of the virtual reality platform. Detailed explanations of every module, incorporating interactive simulations, historical timelines, and learning objectives, provide a thorough grasp of the instructional material offered.

Future Development Roadmap:The VR historical education platform's planned expansions and enhancements are outlined in the Future Development Roadmap. This covers suggested features, extra historical locations, and possible tech developments to improve the user experience.

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