Dino Drive - VR Project Report

Matias Liu Schmid

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Dr. Hurriyet OK

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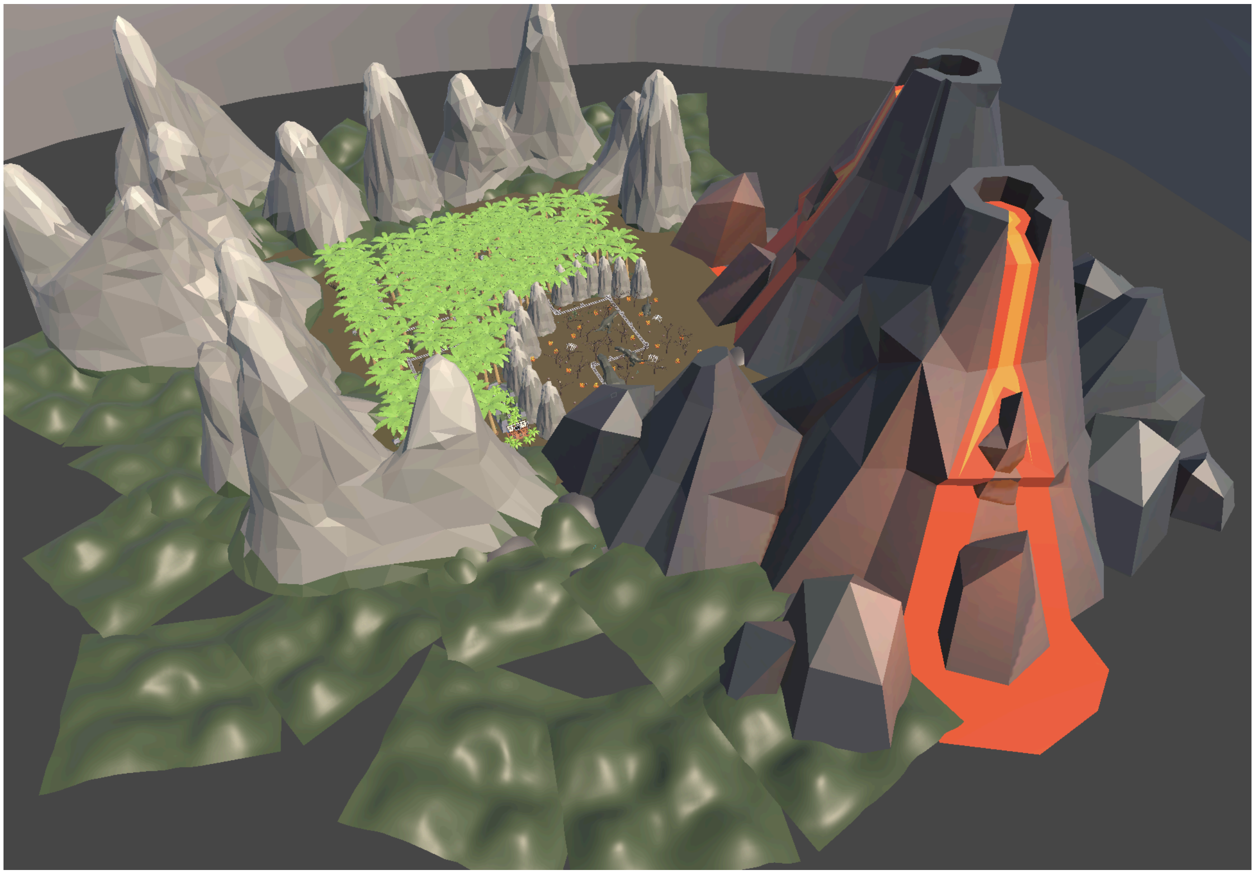
INTRODUCTION

Dino Drive presents an enthralling virtual reality experience, inviting users to embark on an unforgettable adventure through the ancient world of dinosaurs. Developed using Unity 2021.3.9f, Dino Drive is meticulously crafted to deliver an immersive journey tailored for the Meta Quest 2 device.

In Dino Drive, users find themselves transported to diverse prehistoric landscapes, from verdant jungles teeming with life to desolate volcanic terrains marked by ancient upheavals. With its cutting-edge graphics and intuitive controls, the application offers a seamless and captivating exploration of the Jurassic era.

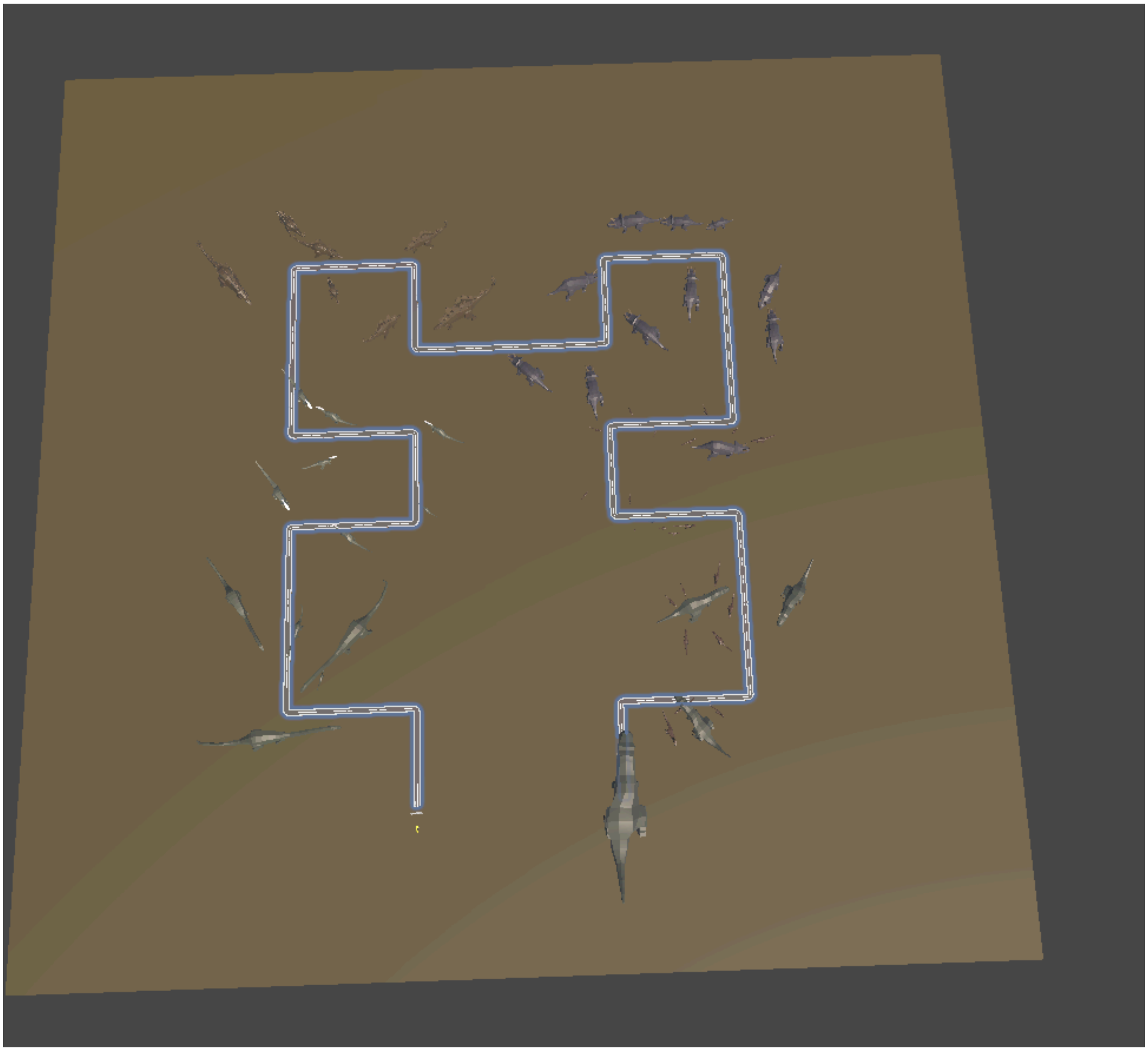


Driven by a passion for both education and entertainment, Dino Drive aims to provide users with a unique opportunity to witness the majesty and wonder of dinosaurs up close. Whether observing the graceful movements of a towering Brachiosaurus or witnessing the ferocious clashes between rival Tyrannosaurs, users are immersed in an interactive experience that blends adventure, learning, and awe-inspiring discovery.

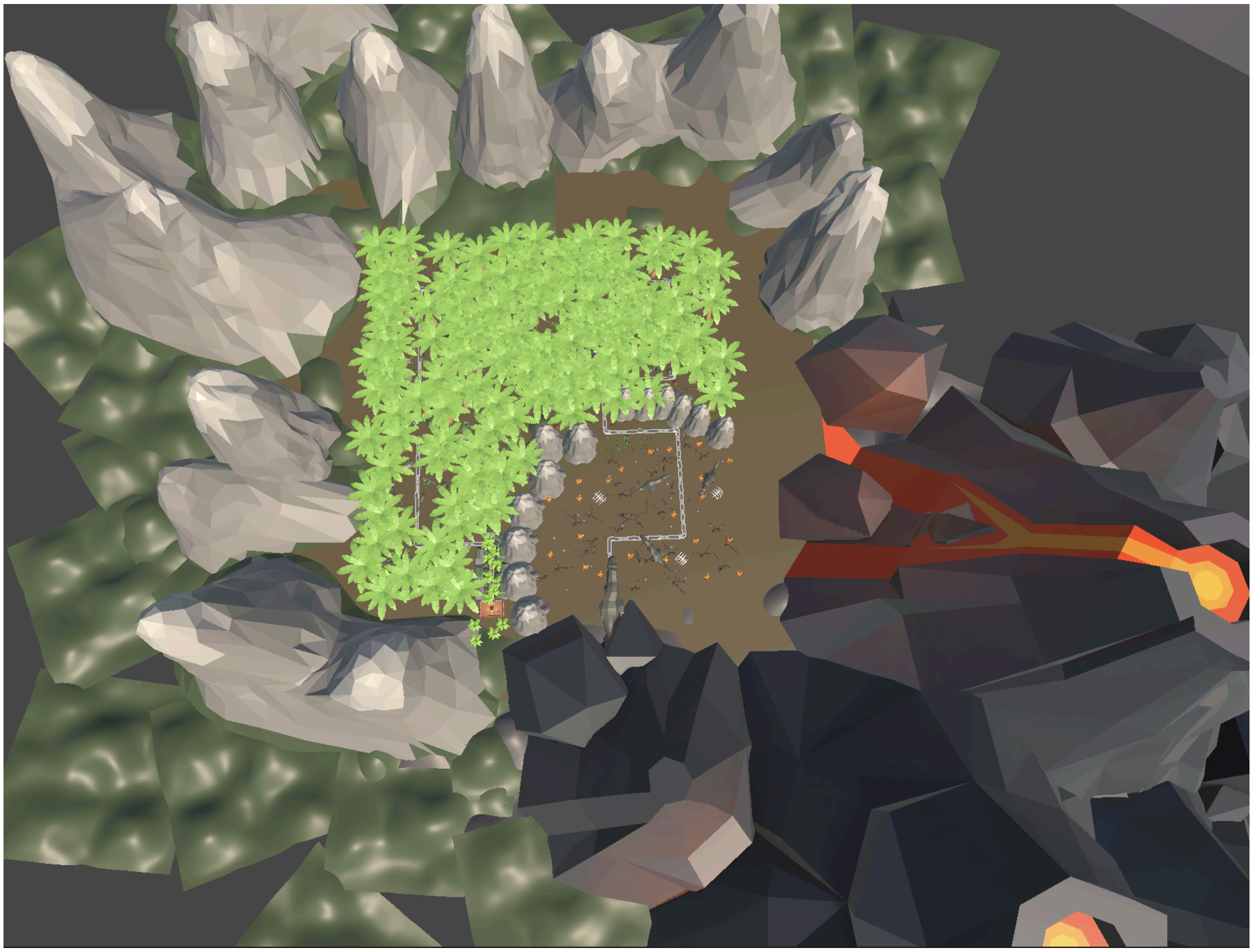
Through its innovative design and meticulous attention to detail, Dino Drive sets a new standard for immersive VR experiences, captivating audiences of all ages with its blend of excitement, education, and wonder.

APPLICATION DESIGN

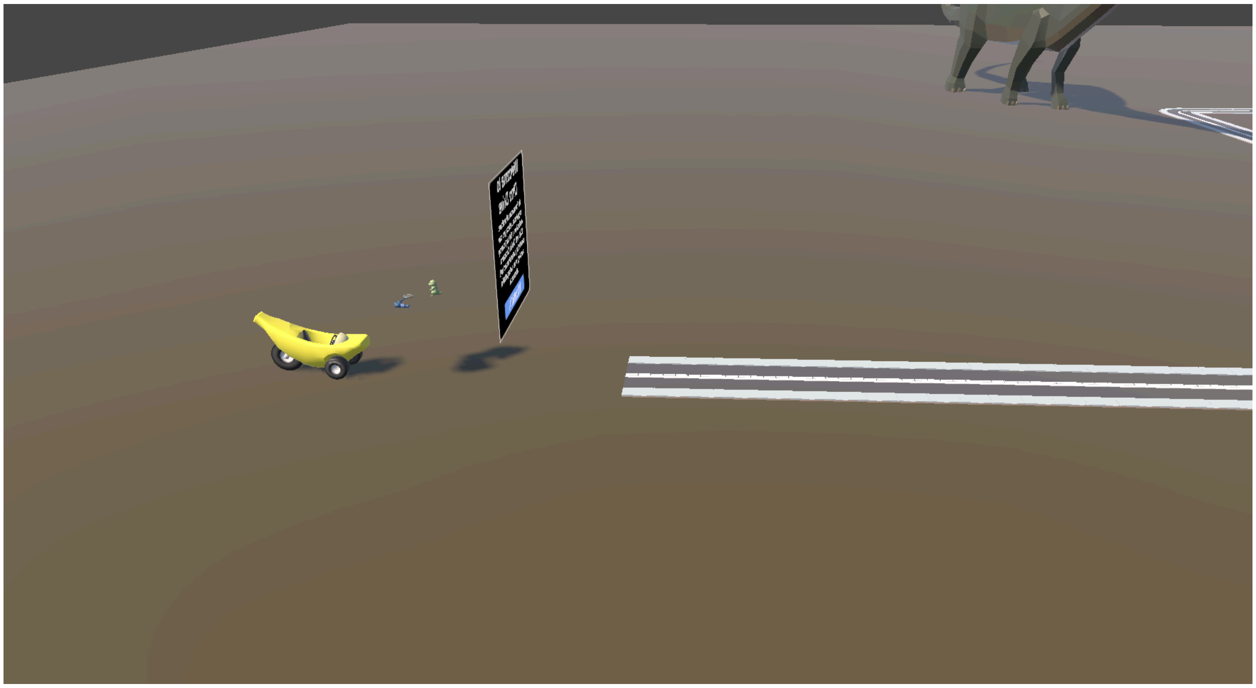
The design of the DinoDrive VR application is centered around creating an immersive and comfortable experience for users while exploring the prehistoric world of dinosaurs. Several key design considerations have been carefully implemented to enhance user engagement, minimize motion sickness, optimize performance, and streamline development processes. One of the primary design considerations in Dino Drive is the layout of the virtual environment's roads. To mitigate motion sickness commonly experienced in VR, the roads are designed to be symmetrical with minimal turns. This design choice provides users with a smooth and predictable journey through the dinosaur habitats, reducing the likelihood of discomfort during the experience.



To create distinct environments and delineate dinosaur territories, various environmental objects such as rocks, bushes, and palm trees have been strategically placed throughout the virtual world. These natural objects not only add visual richness to the environment but also serve to divide different sections of the landscape, enhancing the sense of immersion and exploration for users.

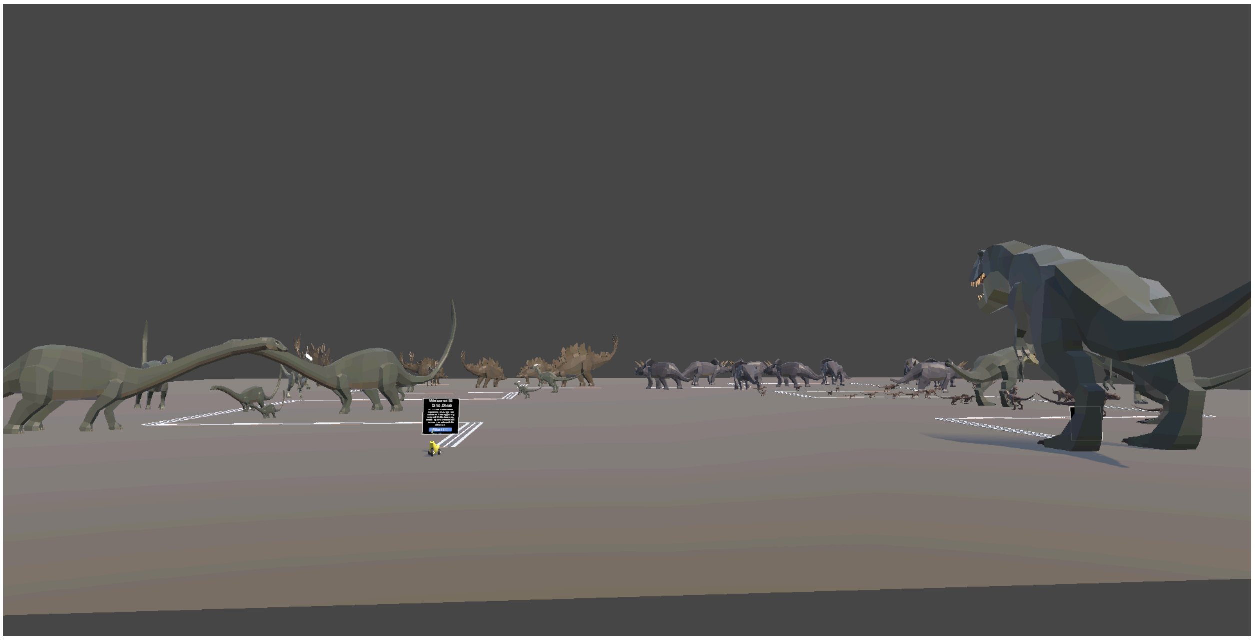


In Dino Drive, user movement is facilitated through a self-moving cart rather than allowing free-roaming exploration. This design decision allows for greater control over the user's viewpoint and trajectory, enabling the developer to guide users through specific points of interest and dynamically showcase various features of the virtual environment. By implementing a self-moving cart, the developer can create a more curated and engaging experience for users, ensuring they do not miss out on important elements of the VR journey.



The choice of a low-poly art style for Dino Drive serves multiple purposes. Firstly, it allows for efficient rendering and optimization of performance, ensuring smooth gameplay on VR devices. Secondly, low-poly assets are widely available for free, reducing development costs and accelerating the production process. Despite their simplicity, low-poly assets can still effectively convey the prehistoric landscapes and inhabitants of Dino Drive, contributing to the overall immersive experience for users.

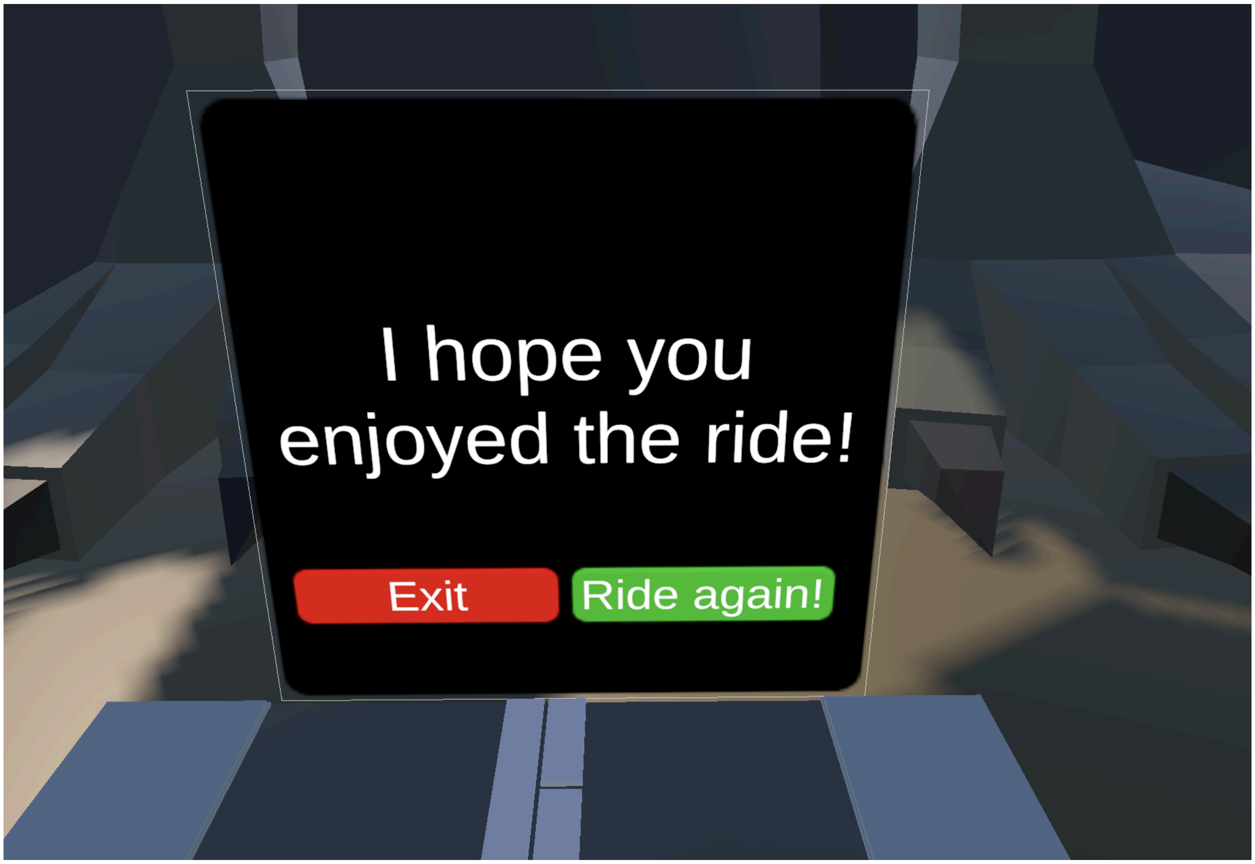
To streamline development and optimize performance, a deliberate decision was made to include a total of six dinosaur species in Dino Drive. By minimizing the number of unique dinosaur models and animations, the developer can focus resources on enhancing the quality and realism of the selected species, ensuring they are accurately represented within the virtual environment. This approach also reduces the complexity of managing multiple assets and animations, making it easier to maintain and update the VR application over time.



In Dino Drive, user interaction with dinosaurs and other elements of the environment is facilitated through the use of ray casts. By casting invisible rays from the user's viewpoint and detecting collisions with game objects, ray casts enable intuitive interaction without the need for complex control schemes or button inputs. This design choice enhances the accessibility and immersion of the VR experience, allowing users to explore and engage with the virtual world effortlessly.

The development of Dino Drive follows a segmented design approach, dividing various components of the application into distinct categories for easier management and editing. This segmentation includes separate segments for dinosaurs, environment assets, and player movement mechanics, each with its own set of properties and behaviors. By organizing the VR application in this manner, the developer can efficiently iterate on individual elements and make targeted adjustments without impacting the overall functionality of the application.

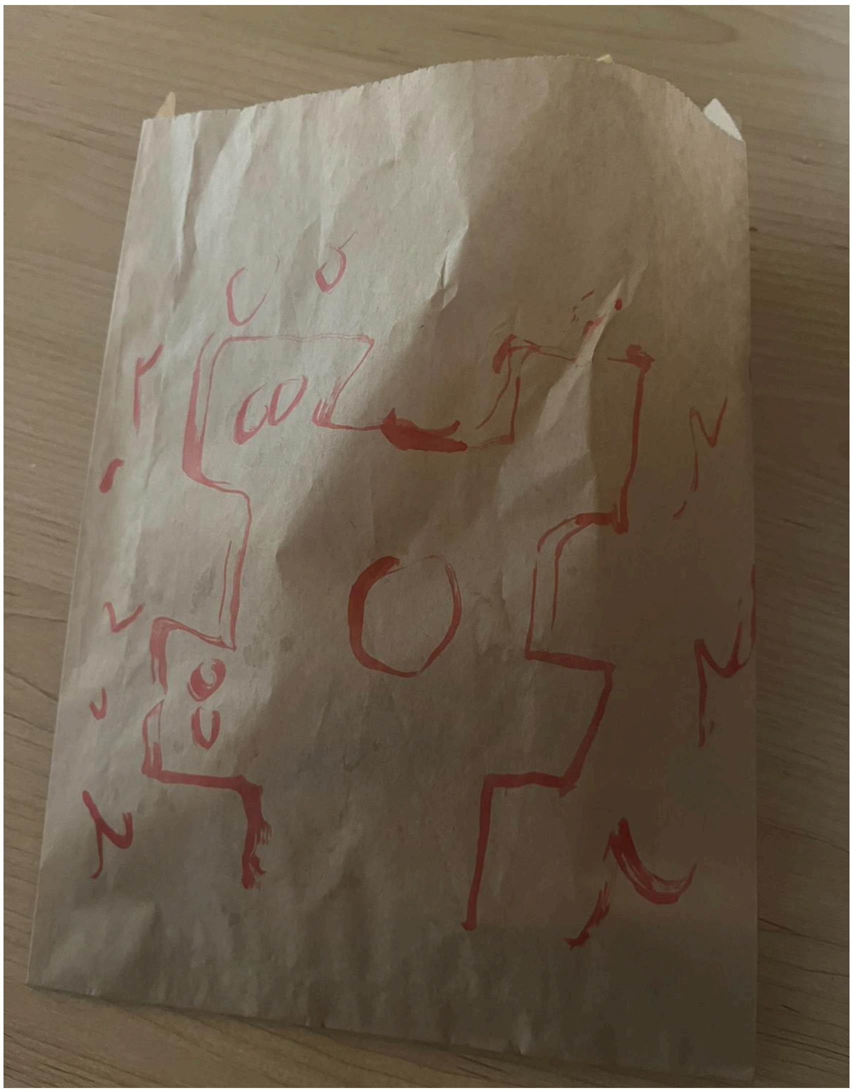
A key design consideration in Dino Drive is to incentivize users to complete the VR experience by making the application exitable/resetable only at the end of the ride. By delaying the option to exit or reset the application until after the user has completed the entire journey, the developer encourages users to fully engage with the content and explore all the features and attractions of the virtual environment. This design choice promotes user retention and satisfaction, ensuring that users derive maximum enjoyment and value from their VR experience.



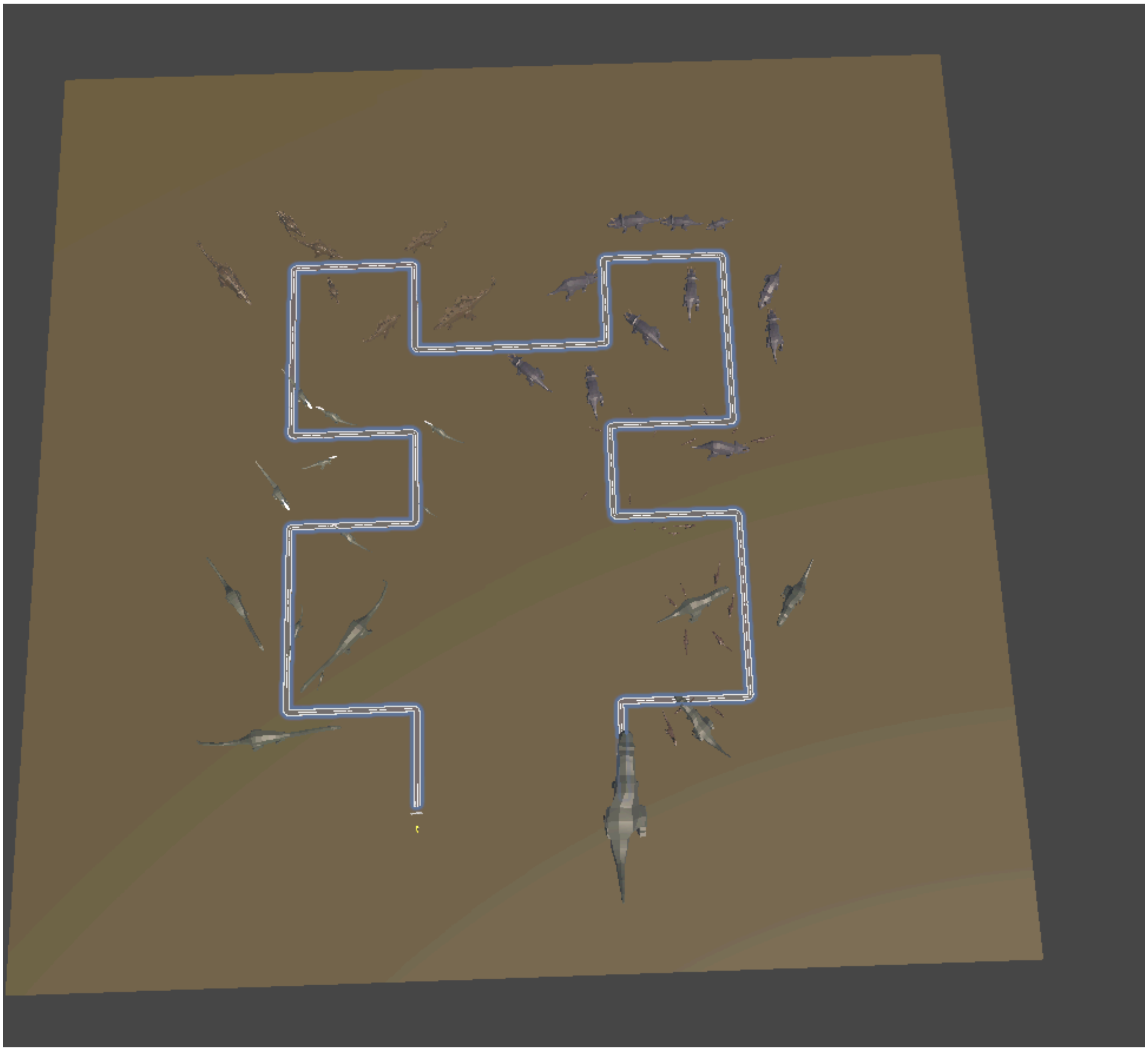
The design of Dino Drive VR application incorporates several key considerations aimed at optimizing user comfort, engagement, and overall experience. From the symmetrical road layout to the use of ray casts for interaction, each design element has been carefully chosen to enhance immersion, minimize motion sickness, and streamline development processes. By prioritizing user experience and performance optimization, Dino Drive delivers a compelling and enjoyable journey through the prehistoric world of dinosaurs in virtual reality.

INTEGRATION

The development process of Dino Drive involved a meticulous integration of various assets, tools, and scripts within the Unity environment. The following paragraphs provide a detailed overview of the build process, accompanied by screenshots from Unity, and explanations of the third-party software tools and assets utilized. Initially, the development journey commenced with a rough sketch outlining the layout and features of the virtual environment and the ride experience. This served as a foundational blueprint for the subsequent stages of development.



Following the conceptualization phase, available assets were sourced and utilized to sectionize the dinosaurs, adopting a safari/zoo-like approach wherein each species of dinosaurs had its designated environment. This process involved careful consideration of asset compatibility and thematic cohesion to ensure a cohesive and immersive experience for users.



Once the conceptual groundwork was laid, the development transitioned into the implementation phase within the Unity environment. The track and an empty plane were set up as the foundational elements for the virtual environment, providing a canvas upon which to construct the immersive world of Dino Drive.

Dinosaurs were strategically placed around the track, accompanied by the construction of the surrounding environments, including lush tropical jungles and barren volcanic landscapes. This meticulous environment-building process aimed to immerse users in diverse and visually captivating settings, enhancing the overall experience.

Additionally, outer environmental elements such as mountains, volcanoes, and hills were integrated to reinforce the illusion of an enclosed Jurassic island, further enriching the immersive atmosphere of the virtual world.

The next phase of development involved adding animations to the dinosaurs to enhance realism and create dynamic scenes. Specific scenarios, such as dinosaur fights and pack behavior, were meticulously crafted to add excitement and authenticity to the user experience.

Furthermore, the development process encompassed the creation of a starter room for users, providing a simple tutorial and initiation into the game. This introductory space served as a gateway to the immersive world of *Dino Drive*, guiding users seamlessly into the VR experience.

To optimize user interaction and minimize reliance on controller buttons, a raycast-based interaction system was implemented. This system allowed users to hover over dinosaurs, triggering a UI canvas displaying relevant information about each character.

Throughout the development journey, various resources were leveraged to aid in learning and troubleshooting. YouTube videos, Unity tutorials, and the Unity FAQ section provided invaluable insights and guidance, facilitating the acquisition of knowledge and skills essential for project development.

https://unityassets4free.com/low-poly-animated-dinosaurs/

https://www.youtube.com/results?search_query=Unity+VR+object+clickable https://learn.unity.com/tutorial/vr-project-setup-2?uv=2021.3&courseId=60183276edbc2a2e6c4c7dae&projectId=60183335edbc2a2e6c4c7dcb#

Additionally, third-party software tools such as Polypizza were utilized for designs and game objects, enhancing the visual aesthetics and functionality of the VR application. The C# library was also extensively utilized to develop custom scripts and functionalities, expanding the capabilities of the Unity environment and enabling the realization of project objectives.

C#: https://www.w3schools.com/cs/index.php

Poly Pizza: https://poly.pizza/search/Dinosaur

In summary, the development of Dino Drive involved a comprehensive integration of assets, tools, and scripts within the Unity environment, guided by a systematic build process and a commitment to delivering an immersive and engaging VR experience. The utilization of third-party software tools and resources played a pivotal role in enhancing the efficiency and quality of the development process, ultimately contributing to the successful realization of the project goals.

USER EXPERIENCE

In the development of Dino Drive, significant attention has been dedicated to optimizing the user experience in accordance with effective VR application design factors. The following strategies have been implemented to enhance user comfort, engagement, and immersion within the virtual environment: To streamline user interaction and minimize cognitive load, the utilization of controller buttons has been minimized. Instead, intuitive mechanisms such as raycast-based interactions have been implemented, allowing users to interact with dinosaurs and other elements in the environment simply by pointing or clicking with their VR controllers. This approach promotes ease of use and immersion, ensuring a seamless and intuitive experience for users.

[tutorial image]

Performance optimization is crucial for maintaining a smooth and immersive VR experience. To this end, game objects within Dino Drive have been carefully configured as static to optimize frame rates and polygon shapes. By minimizing unnecessary computations and reducing rendering overhead, the application achieves higher frame rates, resulting in smoother movement and enhanced visual fidelity. This optimization contributes to a more realistic and immersive VR environment, enhancing user immersion and comfort. To mitigate motion sickness and emulate the sensation of a real ride, the control and waypoint systems for the cart and camera movements have been meticulously smoothed. By implementing gradual transitions between waypoints and ensuring fluid movement trajectories, the application minimizes abrupt changes in direction and velocity, reducing the likelihood of motion-induced discomfort for users. This approach enhances user comfort and allows for a more enjoyable and immersive VR experience.

To further immerse users in the virtual environment and provide feedback on interactive elements, haptic sensors have been integrated into Dino Drive. When users interact with objects or dinosaurs within the environment, haptic feedback is triggered, providing tactile sensations that enhance the sense of presence and engagement. This tactile feedback mechanism adds an additional layer of immersion, allowing users to feel a tangible connection with the virtual world and enhancing the overall user experience. In addition to tactile feedback, auditory cues have been utilized to engage users and provide feedback on their actions. Click sounds have been implemented for controller interactions, providing audible confirmation when users interact with objects or navigate through the environment. This auditory feedback reinforces user actions, increasing engagement and immersion within the virtual environment. To further immerse users in the prehistoric world of Dino Drive, background music has been carefully curated and integrated into the application. The Jurassic-themed soundtrack enhances the atmosphere and ambiance of the virtual environment, transporting users to a bygone era filled with majestic dinosaurs and lush landscapes. This auditory stimulation complements the visual experience, enhancing immersion and providing a more engaging and memorable VR experience for users.

In summary, the optimization of user experience within Dino Drive encompasses various strategies aimed at promoting user comfort, engagement, and immersion. By minimizing reliance on controller buttons, optimizing performance, smoothing control mechanisms, integrating haptic feedback, employing audible engagement cues, and enhancing ambient audio, the application delivers a compelling and immersive VR experience that captivates users and transports them to the mesmerizing world of dinosaurs.

CONCLUSION

In reflecting on the initial design goals of Dino Drive and evaluating the outcomes of the development process, several aspects have proven successful while others have highlighted areas for improvement.

What Worked:

1. Dinosaurs: The inclusion of lifelike dinosaur models and animations succeeded in bringing the prehistoric world to life, captivating users with realistic depictions of ancient creatures.

2. Ride Experience: The implementation of a curated ride experience, guided by a self-moving cart, effectively guided users through diverse environments and dinosaur habitats, enhancing immersion and engagement.

3. Animations: Dynamic and captivating animations, including dinosaur interactions and environmental elements, enriched the user experience and contributed to the overall realism and excitement of the virtual journey.

4. Environment Design: The creation of visually stunning environments, ranging from lush jungles to barren volcanic landscapes, successfully transported users to diverse and immersive settings, enhancing the sense of exploration and discovery.

5. UI Information: The integration of UI elements to provide educational information about dinosaurs effectively augmented the user experience, enriching gameplay with informative content and enhancing immersion.

What Didn't Work:

1. Meteorite Event: Despite initial ambitions to include a climactic meteorite event as the conclusion of the VR experience, technical challenges, and time constraints resulted in its omission from the final product. The implementation proved to be too difficult within the project scope, highlighting the need for more streamlined development processes and better time management.

2. Hand Recognition Movement: The intended implementation of hand recognition movement as a control mechanism proved to be challenging and was ultimately unsuccessful. This feature did not meet expectations due to technical limitations and complexities, indicating the need for more robust solutions or alternative approaches to user interaction.

3. Non-Flickering UI: Despite efforts to create a seamless and immersive user interface, occasional UI flickering detracted from the overall user experience. This inconsistency in UI performance detracted from immersion and usability, highlighting the importance of refining UI design and optimization for future iterations.

Areas for Improvement:

1. Movement Animations for Dinosaurs:While the animations for dinosaurs were successful in creating dynamic and engaging scenes, further refinement of movement animations could enhance realism and immersion, providing more lifelike behavior and interactions for users to observe.

2. Non-Flickering UI: Addressing UI flickering issues and ensuring consistent performance of UI elements is essential for maintaining immersion and usability. Implementing optimizations and refining UI design can minimize distractions and enhance the overall user experience.

3. Better Environment Assets: Enhancing the quality and variety of environment assets can elevate the visual fidelity and realism of Dino Drive, further immersing users in the rich and diverse landscapes of the prehistoric world. Acquiring or creating higher-quality assets can contribute to a more captivating and immersive VR experience.

In conclusion, while Dino Drive has achieved success in many aspects of its design and development, there are clear opportunities for refinement and improvement. Addressing technical challenges, refining features, and enhancing visual and interactive elements will contribute to the continued evolution and success of the VR application, ensuring a compelling and immersive experience for users in future iterations.

Further Improvement

While the current scope of the class project may limit the implementation of certain features, there are several suggestions for further improvements that can enhance the overall quality and user experience of Dino Drive in future iterations:

1. Improved UI Canvas Stability: Enhance the stability and performance of the UI canvas to prevent flickering when interacting with dinosaurs or other elements in the environment. Implement optimizations and adjustments to ensure smooth and consistent UI rendering, improving usability and immersion for users.

2. Menu System for Restart/Exit Options: Introduce a menu system within the VR environment that allows users to easily restart or exit the game at any point. Providing convenient access to these options enhances user control and flexibility, improving the overall user experience and accessibility of the application.

3. Customizable Speed Settings: Implement a menu option or settings interface that enables users to adjust the speed of the cart or user movement according to their preferences. Offering customizable speed settings caters to individual user preferences and comfort levels, enhancing user satisfaction and engagement with the VR experience.

4. Camera Position Relocalization: Evaluate and adjust the camera position within the VR environment to optimize user perspective and comfort. Lowering the camera position or implementing adaptive camera adjustments can improve immersion and reduce potential discomfort for users, enhancing overall enjoyment of the experience.

5. Expansion of Dinosaur Variety and Animation Quality: Introduce additional dinosaur species with improved movement and animation quality to further enrich the diversity and

realism of the virtual environment. Investing in high-quality assets and animations enhances the authenticity and engagement of Dino Drive, providing users with a more immersive and captivating experience.

6. Enhanced Surround Sound Design: Enhance the audio experience of Dino Drive by incorporating immersive surround sound effects that complement the visual environment. Utilize spatial audio techniques to create a more dynamic and realistic auditory landscape, enriching the overall immersion and sensory experience for users.

While these suggestions may require additional resources and development efforts beyond the scope of the current class project, they represent valuable opportunities to further refine and enhance Dino Drive in future iterations. By prioritizing user feedback and focusing on continuous improvement, the VR application can evolve to deliver an even more compelling and immersive experience for users.

Appendix I: Lessons Learned

Throughout the development of Dino Drive, my journey has been marked by valuable lessons and insights that have contributed to my growth as a VR developer. Below are the key lessons learned during this project:

1. Asset Research and Application: I gained proficiency in sourcing and applying assets to the virtual environment, learning how to identify suitable resources and integrate them effectively to enhance the visual quality and realism of Dino Drive.

2. Asset Creation with Blender and Unity: I acquired skills in asset creation using both Blender and Unity, allowing me to develop custom assets tailored to the specific needs and

requirements of the project. This hands-on experience broadened my toolkit as a developer and empowered me to create unique and personalized content.

3. C# Scripting: Through the development of scripts in C#, I deepened my understanding of programming principles and their application within the Unity environment. Scripting enabled me to implement complex functionalities and interactions, adding depth and interactivity to Dino Drive.

4. Dinosaur Knowledge: Immersion in the world of dinosaurs expanded my knowledge of prehistoric creatures, their behaviors, and habitats. This newfound understanding enriched the development process, enabling me to create authentic and engaging experiences for users.

5. Utilization of Controllers and VR Devices: Working with controllers, VR headsets, and device simulators provided hands-on experience with VR hardware and peripherals. This practical knowledge deepened my understanding of VR technology and its capabilities, informing design decisions and optimizing user experiences.

6. Audio and Haptic Feedback Integration: Incorporating audio and haptic feedback into Dino Drive taught me the importance of sensory stimulation in VR experiences. By leveraging these elements, I enhanced user immersion and engagement, creating a more immersive and dynamic virtual environment.

7. Overall Understanding of VR Development: Dino Drive served as a comprehensive learning experience in VR development, encompassing various aspects such as asset creation, scripting, user interface design, and optimization. Through this project, I gained valuable insights into the iterative development process and acquired the skills necessary to create successful VR applications.

In conclusion, the development of Dino Drive has been a transformative journey, equipping me with a diverse skill set and a deeper understanding of VR development. These lessons learned will serve as valuable foundations for future projects, guiding me towards creating even more immersive and impactful experiences in the realm of virtual reality.

Appendix II: Feedback to the instructor

Throughout the duration of the course, I have encountered several challenges and observations that I believe warrant attention and consideration for future iterations of the curriculum. Below are my feedback and suggestions for improvement:

1. More Work During Class Time: Given the complexity of VR development and the time-consuming nature of problem-solving, I suggest allocating dedicated class time for hands-on work. Many students, including myself, face difficulties with accessing VR headsets and finding time to attend office hours. Utilizing class time for practical exercises and troubleshooting sessions would provide invaluable support and guidance, enhancing the learning experience for all students.

2. Designated Work Sessions: Incorporating designated work sessions during class time, preferably for an hour or so, would facilitate collaboration and productivity. These sessions could focus on tackling specific challenges, debugging issues, or implementing concepts covered in lectures. Having structured work time with the guidance of instructors would alleviate confusion and accelerate the learning process for students.

3. Group Tutorials: Some concepts in VR development can be complex and challenging to grasp independently. I recommend conducting group tutorials during class sessions, allowing students to work together on tutorials and exercises. Collaborative learning environments foster

peer-to-peer support and knowledge sharing, making it easier to navigate difficult concepts and troubleshoot issues effectively.

4. Assistance with Setup: Setting up Unity and configuring development environments can be daunting for beginners. Personally, I encountered significant difficulties with Unity setup, which delayed my progress in the project. Providing comprehensive guidance and support for setup procedures, including troubleshooting common issues, would alleviate frustration and ensure smoother onboarding for students.

5. Project Package Updates: I encountered challenges with project package updates towards the end of the project, resulting in functionality issues that required troubleshooting. It would be beneficial to provide timely guidance on handling project updates and version control, ensuring students are equipped to address potential issues without undue frustration.

In conclusion, implementing these suggestions would enhance the learning experience for students and facilitate smoother progress in VR development projects. By prioritizing practical exercises, collaborative work sessions, and comprehensive support for setup and troubleshooting, the course can empower students to overcome challenges and succeed in their VR development endeavors. Thank you for considering these feedback points for future course improvements.