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CS175 Final Project Write-Up

Introduction & Learning Unity

I began my exploration of Unity by immersing myself in 2D Unity tutorials. These tutorials served as my initial guide, providing me with a foundational understanding of the Unity game engine and its many functionalities.

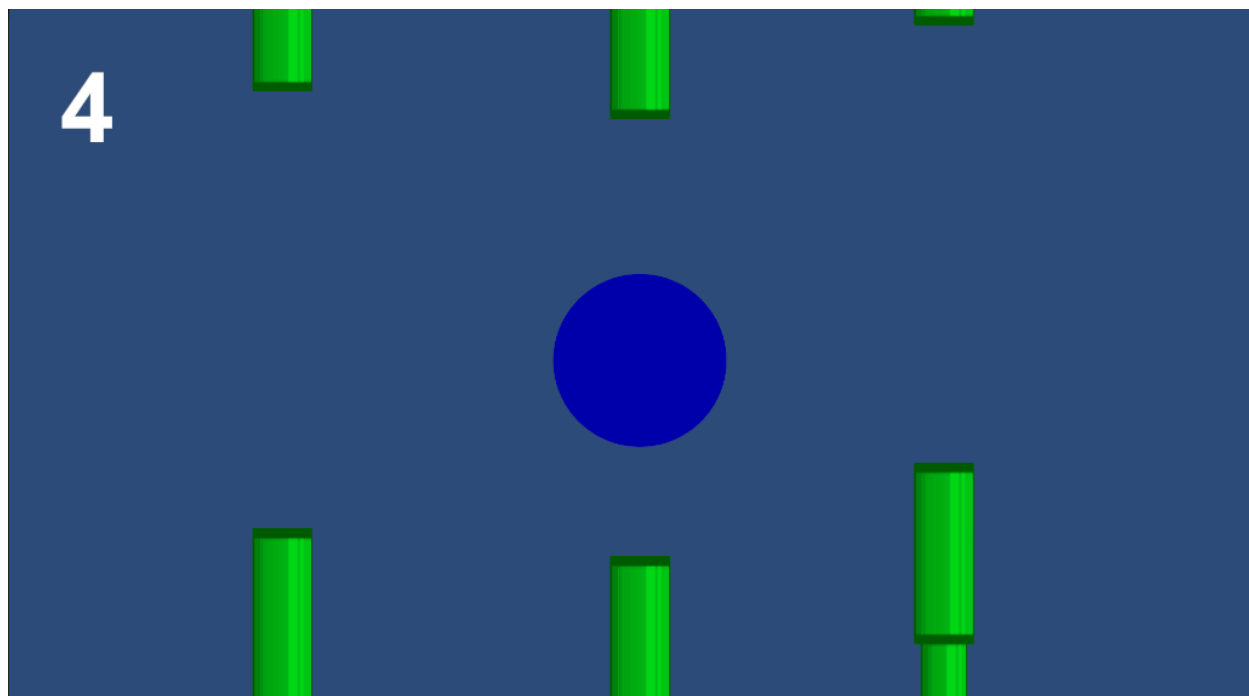


Figure 1: Tutorial creation of 2D Flappy Bird in Unity. Featured scoring and spawning of pipes

My first task Flappy Bird game in a 2D environment. This project acted as my training ground, allowing me to familiarize myself with Unity's interface, scripting capabilities, and game development principles. I followed along with tutorials, learning how to create temporary game objects, implement basic physics for gravity and player movement, and design simple user interfaces. I also learned how to dynamically generate pipes, animate their movement across the screen, and efficiently manage their instantiation and deletion to ensure a seamless gameplay

experience while correctly managing memory. Additionally, I incorporated a scoring system that incremented with each successful navigation through the pipes, further enhancing the game's interactivity and replay value.

While learning about the mechanics of Flappy Bird, I decided to push forward into the world of 3D design with the same concept. I decided to focus on the key feature of Flappy Bird: a flapping bird. I embarked on the journey of creating a flapping bird in a fully immersive 3D environment.

Modelling, Rigging, and Animation

In pursuit of creating a 3D flapping bird for my Unity game, I encountered a series of challenges and learning opportunities in the realm of 3D modeling, rigging, and animation. I began with the acquisition of fundamental skills in Blender, namely modelling, rigging, and animation.

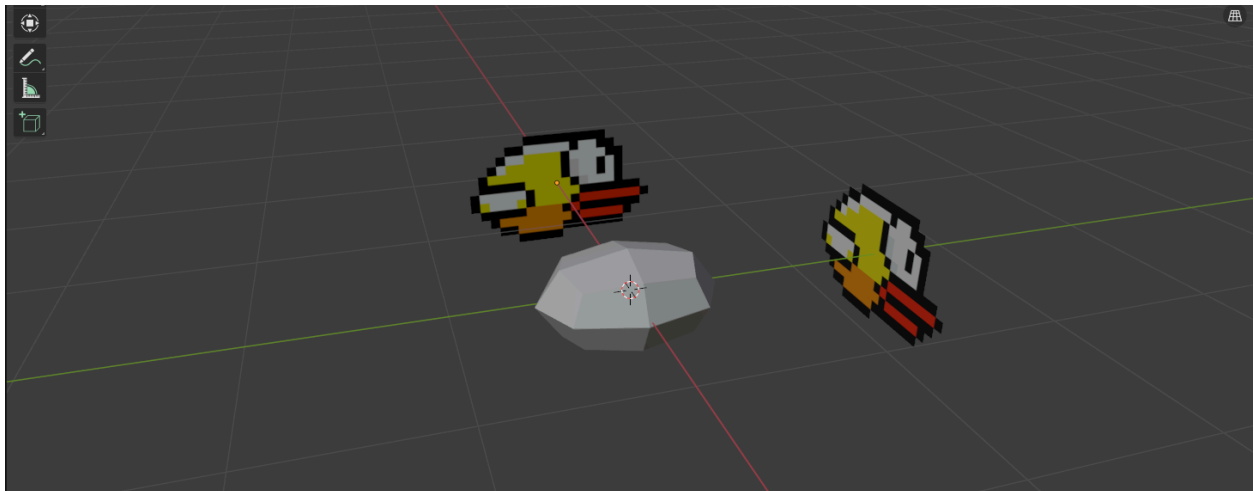


Figure 2: Initial modeling of personal flapping bird. Using the original as a reference

I initially familiarized myself with basic modeling techniques such as extrusion and subdivision. Extrusion allowed me to create intricate shapes and contours for the bird model, while subdivision enabled me to refine its geometry and achieve smoother surfaces, similar to

what we learned in class. I gradually gained confidence in manipulating vertices, edges, and faces to sculpt the desired form of the bird.

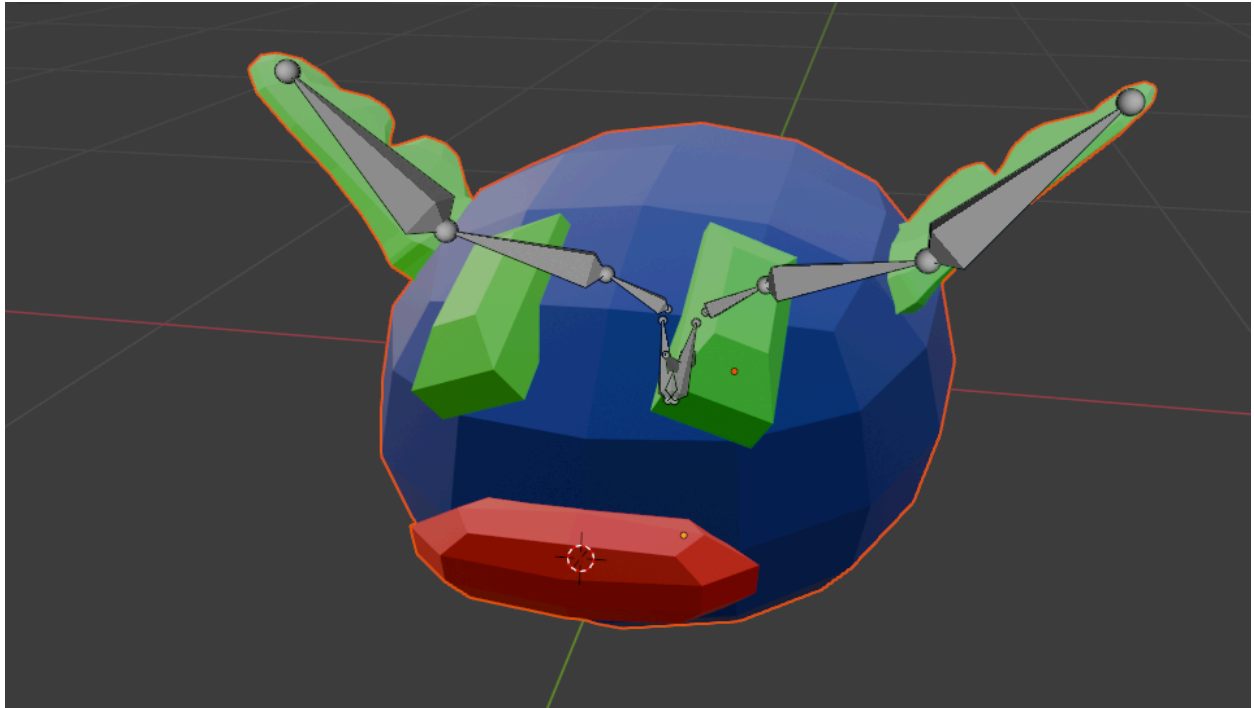


Figure 3: Rigging within customized bird model. Allowed manipulation of model and consequently animation

Upon completing the modeling phase, my attention turned to rigging – the process of creating a skeletal structure for the model to enable animation. Leveraging Blender's rigging tools, I imported a generic bird bone rigging template and adapted it to suit the proportions of my bird model. This involved positioning and orienting bones to correspond with key points of articulation, mainly the wings. Soon, I ensured that the rigging provided sufficient flexibility and control for animating the bird's movements in Unity.

With the rigging in place, I proceeded to animate the flapping of the bird's wings. Drawing upon more tutorials of keyframe animation, I employed Blender's timeline and keyframe interpolation tools to choreograph the motion of the wings. I achieved a naturalistic flapping motion by setting keyframes at key intervals and adjusting the interpolation curves.

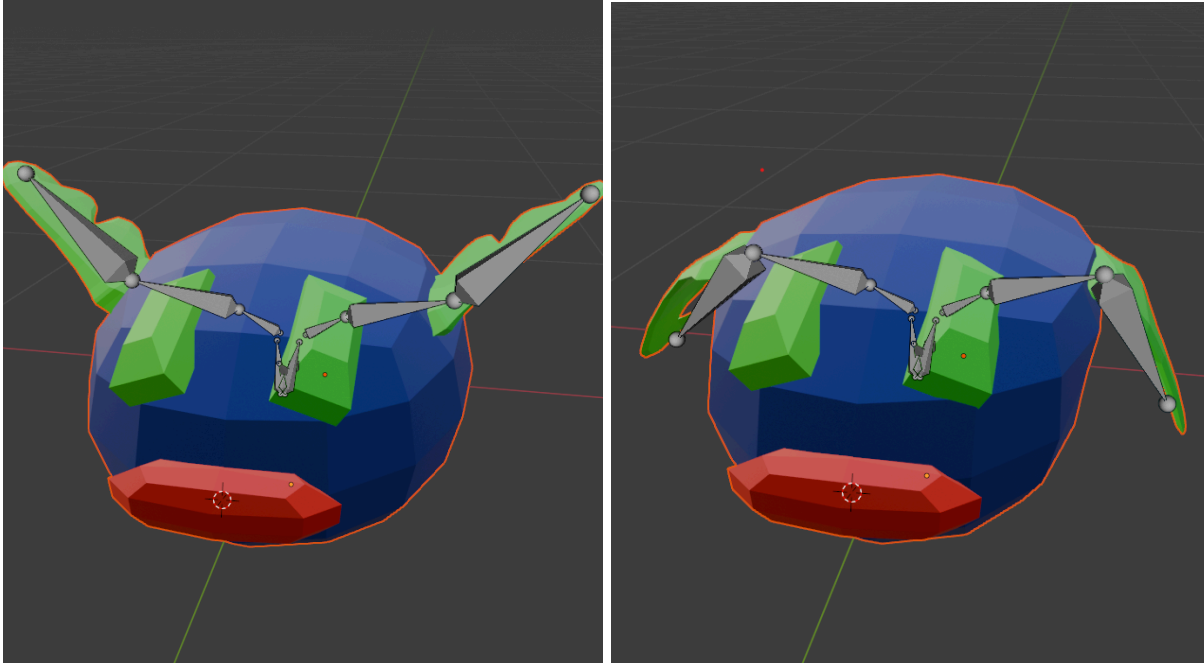


Figure 4: Flapping animation composed of three keyframes: Wings positioned up, wings position down, and return to original position

I was finally finished and able to export the model as an fbx file to utilize in Unity.

Environment Creation & Movement

I began the task of constructing the environment for my 3D flapping bird game. This environment comprised not only the bird model I had meticulously crafted but also a small landscape and the iconic pipes that would serve as obstacles for the player. Initially, I designed the landscape and pipes in Blender, leveraging the software's modeling and texturing capabilities to create visually compelling assets.

The landscape consisted of simple terrain geometry, sculpted to provide hills and valleys for the bird to navigate. Similarly, the pipes were modeled. Upon completing the modeling process, I exported the landscape and pipes from Blender and imported them into Unity. In

Unity, I added appropriate colliders to each object, enabling collision detection and interaction with the player-controlled bird.

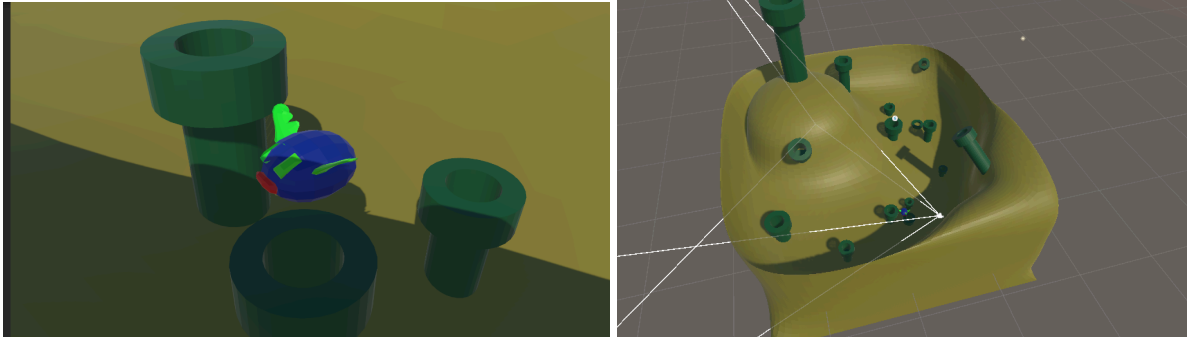


Figure 5: Shows the environment for the bird to traverse. Includes pipe and terrain modeled in blender

I turned my focus to implementing the character controller for the bird and scripting its movement within the Unity environment. Drawing upon my tutorials of C# programming and Unity's scripting API, I developed a custom character controller script that governed the bird's movement dynamics. This script allowed the bird to respond to player input, enabling it to ascend, descend, and maneuver through the landscap. Additionally, I integrated the flapping animation created in Blender into the character controller script, synchronizing it with the appropriate user inputs. By mapping player actions to specific animation triggers, I ensured that the bird's wing flapping motion was seamlessly synchronized with its movement, enhancing the overall visual appeal and immersion of the gameplay experience.



Figure 6: Fully exported In-Game shot of bird flapping through the environment

Conclusion

As I reflect on the completion of the 3D flapping bird game project, I acknowledge that there are areas for further development and refinement that I could not address due to time constraints. One of the primary features that I would have liked to implement is the scoring system and game restart mechanics, akin to those found in the original Flappy Bird game. Integrating a scoring system would add depth and replay value to the gameplay experience, motivating players to strive for higher scores and compete with friends. Additionally, implementing a seamless game restart mechanism would enhance the overall user experience by allowing players to quickly retry the game after a failed attempt, maintaining engagement and momentum. I am confident that I would be able to integrate these mechanics seamlessly into the game given that I had already modeled everything.

In conclusion, the process of creating a 3D flapping bird game in Unity has been a challenging yet immensely rewarding endeavor. Through a combination of skills acquired from Blender modeling, rigging, and animation, coupled with Unity game development and scripting, I was able to bring my idea to life. By leveraging the strengths of both software platforms and integrating them cohesively, was able to accomplish what I sought out to achieve.