Khepri’s Scarab

Group Report

Role distribution

We all wanted to work on different aspects of the game, so deciding the different roles was an easy task. There was a good split with two programmers, one modeler, one team member interested in unreal development and two artists. The role of project lead was given to one of the programmers who professed a profound desire to gain experience in this area - while everyone else displayed a profound desire to avoid this responsibility.

Idea generation and thought process

Our game's main ideas and thoughts for the game were done in a brainstorming session soon after our groups were decided. As it was clear that it had to be a racing game, the challenge became locating possible mechanics and ideas that would make it more unique. A number of inspiration images were pulled together and combined to arrive at the visual concept. We went for an Ancient Egyptian theme to our game.

For gameplay, the group drew inspiration from both *Mario Kart* as well as other rapid-pace racing games like *Temple Run*. With the idea of a modern ship traveling through ancient

locations, pickups in the form of currency both new and old came naturally, swiftly followed by various obstacles that needed to be dodged or destroyed. Destroying obstacles introduced the concept of health and shooting, adding new pickups. We considered for a time having traps on the track that could be deactivated by shooting a target, but eventually dropped this idea as the targeting for the shooting mechanic and the mechanical aspect of the traps would have been beyond an achievable scope. For the time attack mode, pickups of speed boosts and time were suggested.

In terms of setting and space, two important factors were considered. The first was the concept of *scale*. To achieve a sense of speed, the team maintained they wanted to send the player through a variety of different environments- thus giving opportunity for new experiences along the way as well as the idea of barreling through large areas at breakneck speeds. The setting had been already decided as a sandstone-filled desert with pyramids. This suggested ancient Egyptian, which became a major point in the design of the menu- mixed with a hint of futuristic for the obvious magical nature of the floating vehicle.

The environments chosen for the player to drive through were easy choices based on the natural - or frequently occurring - geography of our chosen location. There would be a desert covering most of the terrain, a plateau of sandstone, a pyramid to drive through with ancient mysteries, and an oasis with a bright, lush feel.

Implementation and process

Project manager

Was in charge of managing the group. Arranging meetings and orchestrating the other group members.

- Setting deadlines
- Implemented the menus with animations
- Skill tree
- Checkpoints
- Pickups
- Lap counter

- Checkpoint pop-ups indicating time

Movement system programmer

Mainy in charge of creating the movement systems.

- Made the movement system using complex math
- Supporting systems to better control the ship
- Built the shooting system
- Implemented the start/loading screen
- Added destructible meshes
- Ships color-changing
- Save and load, automatically

Lead artist

I have been mainly responsible for the **concept art** and **idea development** surrounding the racing game. The things I have created concept art for are:

- Concepts of the 5 landmarks
- Concepts for all the different pickups
- Start-screen
- First sketch of the map and the finished map
- Gate and checkpoints
- The ship

I also did some **texturing** for the following assets:

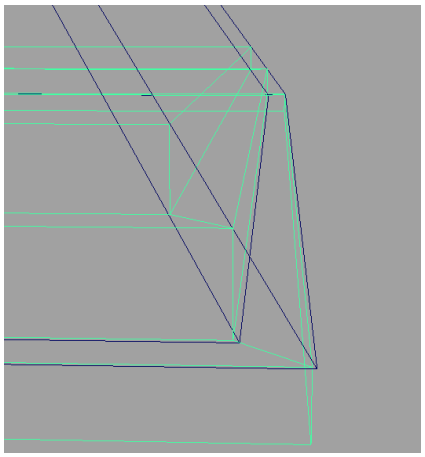
Ship, checkpoints, gate, pyramid + walls and floor, anubis statue and the pillars.

I have also been **writing on the documents needed** (while I also worked on the board games concept art and cards).

3D modeler

For the racing game I created almost all of the assets. For the most crucial and major assets, like the pyramid and its inside, and the ship, I was in close conversation with the concept artists to get assets to become the greatest they could be. I also worked closely with them on the pickups; Speed Boost, Health fill, Ammo Refill, Coins, Artifact. Most of these ended up taking a different artistic route than originally planned, but fit the theme for the game in a better way.

The ship was made out of a cube in Maya. For most of the creation process I used *extrude* and *edge-loop*. The wings were also made out of a cube, then shaped with the help of *multi-cut tool*. When both the body and all the wings were done, they were *combined* to a single mesh. After all the meshes were combined into one, I started to UV map it. For most of the time the ship was just mesh without any movement. Nearing the end of the game production, the ship was rigged with bones. We now had the possibility to add life and movement to the ship, I created 2 of 3 animations for the ship; Break and boost.



The pyramid was also made out of a cube. For this asset I started with *extruding* the face of the cube in a staircase manner upwards. I had created two default pyramids from *Polygon Primitives* in Maya. These were used to help as guidelines for the extrusion part of the process. I put the viewport in *wireframe*-mode and used their edges to signal how far in I could extrude and how far up I could extrude. After the mesh was done, I had to create the “doors”. This was done by *Inserting edge-loops* with *Equal Multiplier* to get it symmetrical. It also involved a lot of bridging between faces and *Multi Cut*. The pyramid also involves floors and roof, and a lot of walls. A. LOT. All made by me.

For some of the other assets that I didn't need to get the artist's pointer on everything, I just took some inspiration from their concept art.

Take the anubis statue for instance. I didn't have more to go on than a side profile, but in reality that was all I needed. These kinds of statues are very symmetrical, so if they look like this on one side, they will look like this on the other.

Some other assets in the game are borrowed from **Quixel Bridge**, which is a Megascan library with photo realistic assets. I also borrowed the torch used in the pyramid from sketchfab (link: https://skfb.ly/6SZXN)

2D Artist/modeler

I have created some different designs, and 2D art for the game. I collabed with the *Project manager* to make the different menu setups. I did the design for the different menus: the Main menu, Mode selection menu, Settings, Shop and Pause menu.

I used the sketches from the *Lead artist* to make the finish design for the pick-up items, which I then passed on to the *3D artist* to make. I made three different designs for the artifact currency.

I also did some sketches of the set up, and the design for the UIs.

All artwork and designs were made in Sketchbook Pro.

Unreal developer

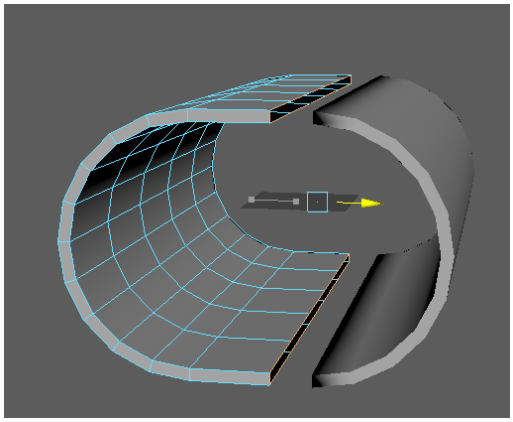
My primary work on this project has been on map implementation, design suggestions and peripherals relating to the track. I have created a series of versions of the map ranging from a simple placeholder to the full-fledged custom heightmap based variant that is included in the final version. I worked extensively on the spline-based track variants, implementing a total of three different versions for testing and usability purposes. With primary responsibility for the

map, I was in charge of deciding the track's path and the placement of various checkpoints, pickups and obstacles. As a secondary, I also modeled, partially UV-unwrapped and textured a wide variety of different track pieces designed for modularity. Special care was given to the tunnel segments, and I corresponded back and forth with the movement system programmer for difficulties encountered due to the track segmentation.

Throughout the project, I have worked primarily in Unreal Engine, with a significant chunk of time also spent working in Maya and a lesser but not insignificant amount of time devoted to creating the height map in Adobe Photoshop. In the early stages of the project, I also wrote the overarching story idea - which unfortunately was later scrapped.

Track pieces were made using Autodesk Maya using simple techniques. The basic idea for a lot of the iterations was ensuring functionality while maintaining a low poly count. Therefore, the main track is based on a simple cube sized to fit the width of the track. There are two versions: one suited for asphalt with a safety line, and one that is meant to fully meld with the desert. Each version of these above-ground track pieces is a mere 20cm tall, though a full 45 meters wide. The width of the track was subject to significant debate, though ultimately decided like this due to the width of the player model and by keeping in mind that in theory, several of them would have to fit next to one another on the track. The desert track pieces, which do not have a safety line, were instead molded to the same width with the addition of tiny cubes at either end, beyond the line of the actual track. This ensured that the track would never morph into a different width during travel.

Tunnel pieces were created through a sequence that started with a cylinder. Here the radius was most important, though the length of the item was set to one hundred meters with five segments. This cylinder was duplicated, the original made slightly larger (20 to 50 cm). Then the two were used in a difference boolean, creating a hollow tube. The vertex ends of the hollow tube had to be merged, as the boolean operator created double vertices here. Next was to delete half of the hollow tube, then duplicate the half-tube and rotate it 180 degrees and finally extrude the edges of the now open-ended side to perfectly align with those on the other side. Those vertices were then merged, creating the final tunnel design. (image is demonstration of concept, not actual tunnel mesh)



Development inspiration

Part of the initial design for the flying vehicle was based on the *League of Legends* character *Galio*. From this we suggested strong, almost carved shapes and a color palate of stone ornamented with gold. This idea also influenced the further foray into Egyptian mythology and iconography, as the character is a large statue and Egypt is partially known for a large stone statue- the Sphinx.

Secondly, Ancient Egyptian mythology was of course our main inspiration for the development. The pyramids and the desert are a big part of the track's design. Both the name of our game, *Khepris' scarab*, and the Anubis statues are taken from ancient Egyptian gods. We also used the *Eye of Horus* as our special currency.

Other sources we got inspiration from: Mario Kart (1992) (1996) (2001) (2003) (2005) (2008) (2011) (2014) (2017) and (2020), Temple Run (2011) and Black Panther Comics (the aircraft).

Challenges and rewards

- Being split in different groups working on different Third Person Shooter games at the same time as the racer project. This made scheduling and teamwork harder for some members.
- Scaling the map and mechanics down to make our goals reachable with our skills and provided time. Having to compromise.

- Communication has been difficult at times. In part, this was due to the team's lack of experience with the project management software, resulting in sometimes unclear tasks. Moreover, there was no real incentive for each team member to continuously comment on their work which made for a very quiet group environment. Towards the later stages of the project, communication improved with the addition of a daily update channel for team members to describe their progress. This made advancements in the development very visible and provided both satisfaction and a feeling of clear, visible progress.
- Creating a finished product based of off our idea in the beginning has been rewarding even though
- The spline-based modular track design was a major challenge. Several different iterations were tested for different purposes and use cases. We had a track version that was blueprint-based and intended to be used as a bridge, which had extra features that allowed periodic pillars to be generated at the sides of the track. This variant was used in the alpha version of the game, and it was briefly tested for usability to restrain the player within the track as well. However, the segments on this iteration of the track did not seamlessly connect which made it ultimately untenable as the release version. There was a second spline-based, blueprint track made, though this was not thoroughly tested in later versions. Instead, the map was converted to using Unreal Engine's landscape spline tool as the main method of forming the track. This had the advantage of both placing the track pieces seamlessly as well as the option to deform the landscape to perfectly align with the track. The biggest problems with the landscape splines was that it created a 'wobbly' surface by way of the automatic segmentation. Essentially, since the segments of the track were tens of meters long, the track itself could not form smooth curves, instead becoming a rapid sequence of flat surfaces around sharp bends. Fortunately, this problem could be solved through a combination of using track pieces of shorter length and ensuring that the spline segments themselves were kept relatively short (~200m at most)
- Some of the 3D assets were quite a challenge to make.
- We gained a lot of experience that we can use for our next video game project. How to manage a project better and how to better communicate with your teammates.