Høgskolen
i Innlandet

Game Design Document

Khepris' Scarab

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1.0. Project Description

This game design document describes the details for a 3D survival, adventure, racing game. It is a single player racing game. The game has two modes: an *Adventure* mode where you shoot targets and try to stay alive, and a *Time Attack* mode where you race to beat your own record-time or against already recorded AI. The hovercraft will have a "jump" and "duck" ability to navigate through the ancient Egyptian-themed map. The map is divided into five different zones which all have different sceneries and experiences to offer to the player.

The name of the racing game is *Khepris' Scarab.* The meaning behind the name comes from the ancient Egyptian sun creation God Khepris and their holy animal: the scarab.

1.1. Game overview

The name of the game:

- Khepris' Scarab

What the game is about:

- Race for the best possible time in the *Time Attack* mode or have fun and shoot/evade targets in the *Adventure* mode.

1.2. Game genre

( ) Platformer	(**X**) Racing	( ) Strategy
( ) Endless Runner	( ) Tower Defense	(**X**) Survival
( ) Board Game	( ) Fighting	( ) Educational
(**X**) Shooter	( ) Puzzle	(**X**) Adventure

1.3. Game Perspective

(**X**) 3D Third Person	( ) 2D Visual Novels	(**X**) Back camera
(**X**) 3D First Person	( ) 2D Side-scroller	(**X**) Front Camera
( ) 3D Open-world	( ) 2D Top-Down	

1.4. Game Mode

(**X**) Single-player

( ) Online Multiplayer: Co-op (Max Limit Of 2 Players)

( ) Online Multiplayer: Party Game (Max Limit Of 4 Players)

2.0. Gameplay

In time attack the player will race with a timer counting down, where they will gain more time when reaching the next checkpoint. Their overall time will also be recorded at the end of the race. In time attack mode, pickups are disabled, as the focus will be to get through the race as quickly as possible.

Similarly, to the time attack mode, the adventure mode also records the overall time, however here you are not pushed by the countdown timer, providing a more relaxed atmosphere. Here you can collect different pick-up items from around the map to get advantages that will help you reach the goal. In addition, the adventure mode will create obstacles across the map that the player must destroy using the ship's weaponry. The map updates dynamically depending on which lap the player is currently on.

2.1. Goal

The primary goal of the game is to finish three laps without getting a game over. You also can upgrade your vehicle, to strengthen it for further races.

Each mode has its own secondary goal. In the *Adventure* mode, the secondary goal is about collecting coins and avoiding or shooting obstacles. In the *Time Attack* mode, the secondary goal is keeping up with or beating a pre-recorded ghost projection of varying difficulty, or alternatively your own recorded ghost.

2.2. User Skills

As in all racing games, the player needs skill to navigate the terrain and use their eye-hand coordination to plan the steering ahead.

What the player will learn by spending time in the game:

- Adaptability in an environment that changes for each round
- Sense how to optimize one's time and drive more efficiently
- Learn to handle the vehicle

2.3. Progression and Challenge

Progression works by collecting currency and using it in the shop to unlock upgrades. The price of the upgrades gets higher for each purchase, so some grinding is required. The local progression per map in the game is marked by different changes in the environment in the adventure mode. Each lap contains one part of the story.

Challenges in the game are to get a better time than the previous race, or to reach the checkpoints in time.

2.4. Losing

In the *Adventure* mode you lose when you run out of health, and in the *Time Attack* mode you lose once you run out of time.

3.0. Assets

3.1. Audio

Ship sound
- Engine
- Boost
- Shooting
- Collision
- Jump sound

Environment sound
- Wind
- Sand blowing (Niagara)

Music
- Menu
- In-game
- Shop
- Settings
- Mode Select

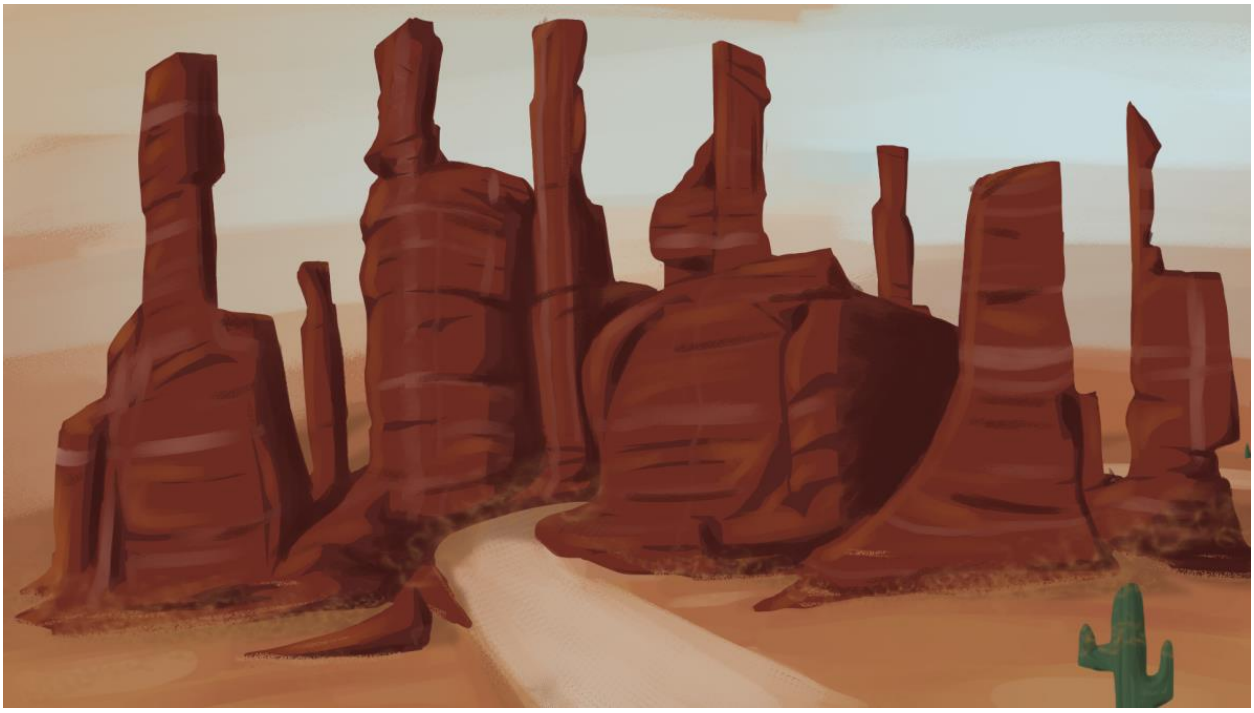
Pickup sound
- Coin
- Boost
- Ammo Refill
- Health

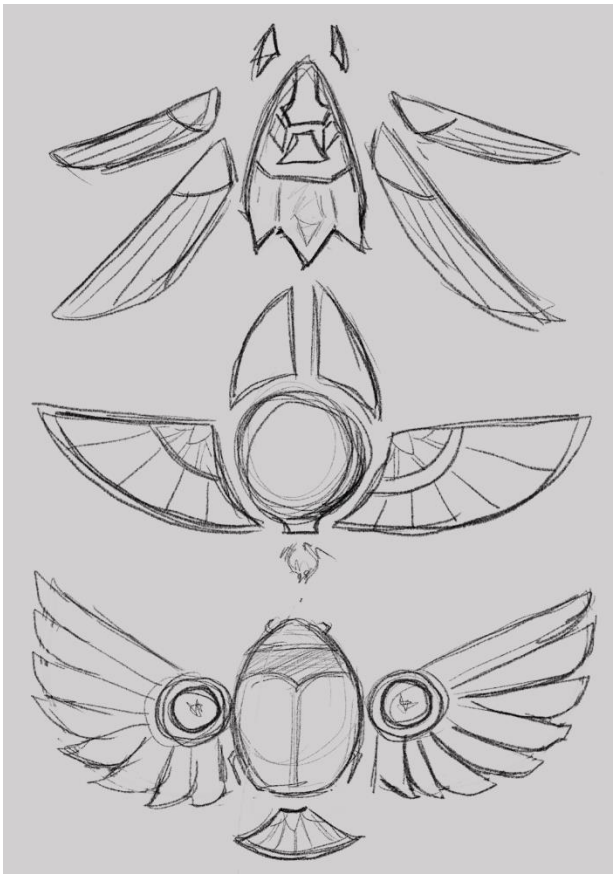
Countdown sound

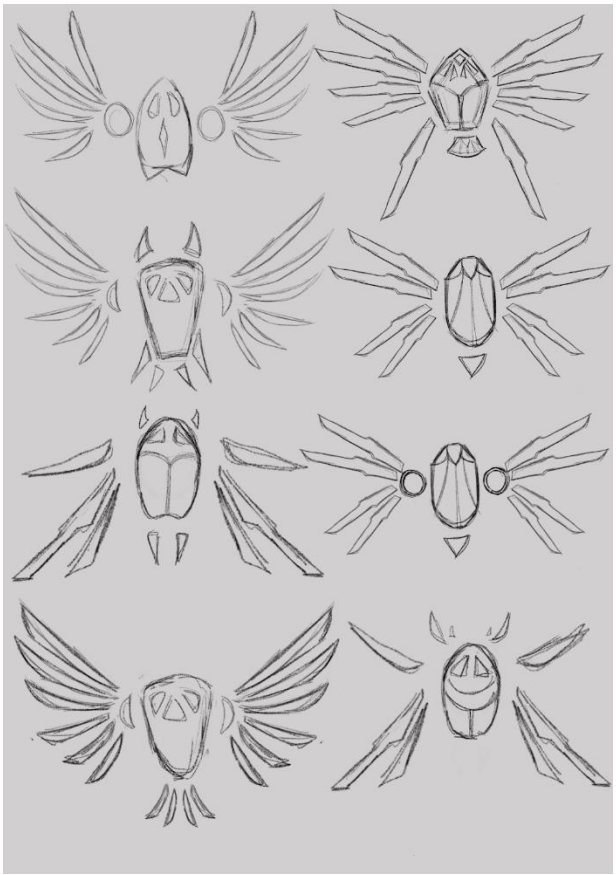
Shop button sound
- Unlock
- Buy
- Perk completion

3.2. Art style

The art style is a mix of fantasy and ancient Egyptian. We want a sprinkle of futuristic impressions on the concept of ancient Egypt. This will be visible through different assets such as checkpoints, starting gate and vehicle. Gold and warm sand-colors will be used to further enhance the expression. Semi-realistic with some stylized pieces, while also playing with a pop of color. The vehicle was designed with the idea of creating something slick and mythological with a hint of modern. The use of negative space was also a fun play throughout the game, and it was important to the vehicle's design and impression as well as the tunnel and canyon area.







3.2.1. 3D models

Assets:

- SM_GrassClumps
- SM_Pyramid
- SM_Cactus
- SM_Plants
- SM_TunnelPillars
- SM_Statues
- SM_Torch
- SM_Stones
- SM_Ship
- SM_Gate
- SM_Checkpoint
- SM_AmmoRefill
- SM_Coin
- SM_HealthPack
- SM_SpeedBoost
- SM_Artifact
- SM_CanyonSandstoneBoulder
- SM_GiganticCanyonSandStone
- SM_MassiveCanyonStandstoneCliff1
- SM_MassiveCanyonStandstoneCliff2
- SM_MassiveCanyonStandstoneCliff3
- SM_MassiveCanyonSandstoneHoodoo1
- SM_MassiveCanyonSandstoneHoodoo2
- SM_MassiveCanyonSandstoneHoodoo3
- SM_PalmTreeTrunk
- SM_TropicalPalm

Track pieces

- SM_TunnelTrack
- SM_TunnelTrackOpen
- SM_RoadTrack
- SM_SandTrack

3.2.2. 2D art

Elements of 2D art are included in the game to support the menu systems and UI elements.
2D art has also played a big part in the development process of concept art.

Concept art:

- Vehicle:
    - Modern and slick, with a hint of mythology/scarab.
- Map:
    - Easy to read and understand.
- Landmarks/locations:
    - Different from one another, each giving different impressions.

        - Canyon
        - Oasis
        - Pyramid
        - Desert
        - Tunnel
- Items/Pickups:
    - Stylized and interesting.

3.2.3. List of UI (2D)

Player

- Health bar
- Stamina/time
- Inventory box for boost
- Ammunition bar
- Time bar
- Background image

Main menu

- Logo/Game Title
- Start button
- Exit button
- Settings button
- Shop button
- Background image

Shop menu/skill tree

- Currency display
- Upgrade ladder
- Upgrade explanation
- Background image

Settings menu

- Display settings
- Difficulty settings
- Sound settings
- Vehicle skins customization
- Background image

Pause menu:

- Buttons
- Background image

4.0. Technical Description

4.1. Game Mechanics/Ship

The vehicle that the player is controlling is a hovering ship with an animated mesh resembling an Egyptian scarab. The ship has a target height above the ground which it will try to maintain, as well as mimic the rotation of the underlying surface, allowing it to travel on uneven surfaces and up hills. Additionally, the ship can travel on vertical walls and even upside down on ceilings.

4.1.1. Physics

The ship is simulating physics using unreal engine 4's internal physics simulation engine, and code has been written in C++ to determine how the ship should hold itself above the ground. The ship uses complex math to make the movement and hovering smooth, as well as keep the ship upright and rotate along with the underlying surface.

4.1.2. Camera

The implemented camera system will be familiar with people who have played racing games before. It involves a cycle system where the player can switch between different camera angles: classic angles like 3rd person and first person in front of the ship.

4.1.3. Movement abilities

In addition to accelerating forward and turning, the ship can perform a jump action as well as "duck" where the ship will lower its hovering distance while the assigned key is being held.

4.2. Items and Power-ups

We have concluded that even if pick-ups are fun to play along with, we had to moderate. This results in 6 different pick-ups that the player can interact with during its gameplay. Pick-ups will only be available in *Adventure Mode*. *Time Attack* is for racing only.

4.2.1 Coin

The currency is a collectible (coin icon), which can be used to upgrade variables in the perk tree in the shop.

4.2.2. Artifact

A pick-up which is used to unlock new perks from the shop.

4.2.3. Boost

The boost is a pick-up that gets stored, for the player to use at any time. Once acquired, the player can use it to gain a speed boost for a limited time.

The Boost pick-up will have its own parameter in the perk-tree in the shop, where the player can upgrade the time for which the boost is active when used during play.

4.2.4. Ammo Refill

The Ammo Refill is a pick-up that automatically refills the players' ammo meter. In adventure mode, different objects can be shot to destroy obstacles or reveal hidden paths. When the player runs out of Ammo, only this pick-up can refill it, which refills the meter to max.

The Ammo pick-up will have its own parameter in the perk-tree in the shop, where the player can upgrade the maximum ammo to hold. The pick-up will always refill to max, no matter how high the max is.

4.2.5. Health

The Health is a pick-up that restores the players' health. If the player reaches 0 Health, it's game over, so it's important to stay healthy. In adventure mode different aspects may damage the vehicle (objects and crashing).

The Health pick-up will have its own parameter in the perk-tree in the shop, where the player can upgrade the amount of maximum health they have.

4.3. Checkpoints

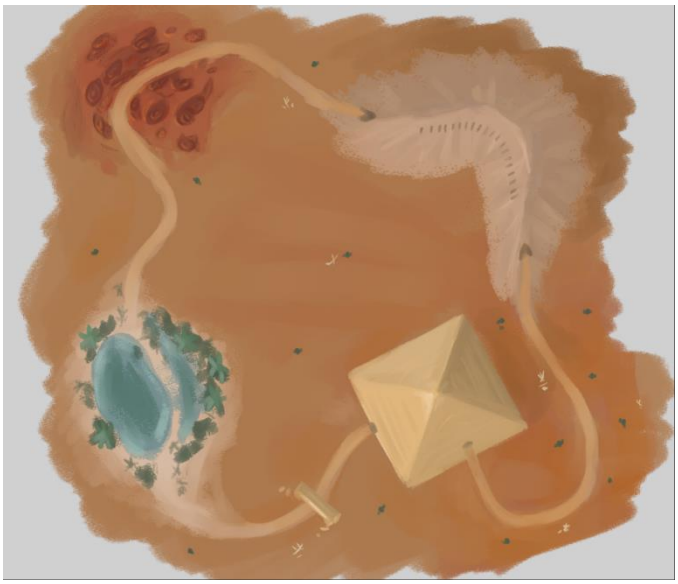
The track includes several checkpoints. On each checkpoint the player will be informed about its racing time, but in *Time Attack* the player also gets more time equal to what's been upgraded in the shop.

The checkpoints are linked so that the player cannot skip one of them. In that case, the checkpoint will not register the player, so it will be harder for the player to find shortcuts not intended by the track.

When the player reaches the track's first checkpoint after being through all the others, the lap counter changes to display a new round. When this counter reaches 3, the race is over, and the player's time will be saved.

4.4. Map

The core concept of the map delineated that it should have five different environments for the player to drive through, each with its own unique feel. These five areas were a pyramid with narrow corridors and statues along the walls, an oasis with lush greenery and sparkling water, the wide-open desert with tall sand dunes to drive over, a canyon landscape leading up to the mountaintop and a tunnel with large windows that overlooked the rest of the area.



In development, there were some additions implemented specifically around the mountainous area. To provide additional variety, the two slopes leading up to the tunnel section were made more uniquely varied with one section as a rockier, canyon-like area and the other as a more gentle, gradual slope down to the desert level.

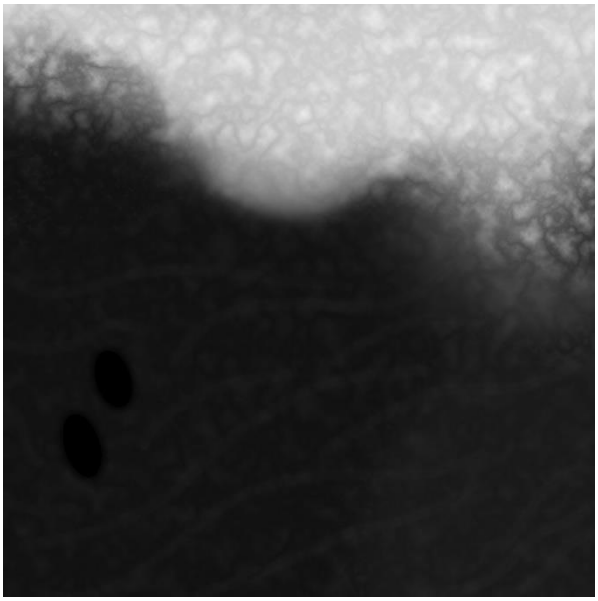
The map's basic shape was created in Photoshop using a combination of techniques. It is a 16-bit grayscale height map created using the clouds and difference clouds filters, amended with color masks of nearly black and white to delineate key height differences. The color choices were important in the creation here to facilitate a significant amount of height difference between the

main desert area and the high plateau of the mountain, while also maintaining a gentle variation within the sections themselves. Rocky sections were painted using an artistic brush and sand dunes added using the outer glow blending option.

Over this height map, the track was laid using the landscape spline. It was adjusted to flow logically along and across the landscape, and the landscape modified by aligning most of it to the track spline, minus the parts of the track going through a tunnel. Instead, to accommodate for tunnel entrances and the tunnel vista, pieces of the landscape were erased using the visibility tool, the gaps filled in with static meshes of sandstone rocks.

4.5. Track

The track is made using Unreal Engine's Landscape Spline tool. It is intentionally extra wide (45m, 21 times the player vehicle width) to allow players to choose optimal racing lines or look for placed pickups, or to challenge themselves by sticking to either side of the track. Meshes were added to all sections of the track to solidify the visual indication of where the player is meant to go.



The track pieces are static meshes created to be as simple as possible. This was done to minimize rendering problems possibly resulting from the large number of meshes being placed through this method. A similar method could not be applied to the tunnel, as it needed enough vertices to allow for smooth driving up and down as well as around corners. Similarly, the tunnel needed to always use complex collisions to make it possible to drive on the inside of a hollow tube.

5.0. Marketing and Funding

To receive audience interest early in development, focus lies on creating the base model of the player's ship and getting a base track with some good visuals up and running. Even though development is at an early stage, it is important to display a concept to potential audiences and give confidence that this is something they can expect and look forward to.

For the project to gain any traction, the plan is to make something partly original, that doesn't fall into the blender of stereotypical modern racing games. Using the core game mechanics as an example, the player should be "freer" than in a traditional racing game while we are also straying away from modern realism.

A popular tactic for earning more players and gaining more revenue from games right now is having the game be free, while giving players the option to spend money in-game. While downloading a free game might not feel as valuable as paying for it, it might be the best choice to gain traction and a player base in our first published game.

It's become quite popular to host indie-game dev channels. Starting a YouTube channel might be a great idea, not only to get attention but to connect with our audience and show face. Building trust and starting an aspiring community looks good to newcomers.

6.0. Demographics

The game would be best fit among the ages 12 - 26, as it is not quite as easy and basic as Mario kart, but still not as realistic and complex as a game like Forza. As a continuation to the marketing section, due to the game being released to a younger audience, having the game be free is a big part of that. Kids under the age of 18 often don't buy or have access to paid games, which is why for example Fortnite is so popular. The game will fit a more casual audience of both genders, as it is not a multiplayer-competitive game, rather an adventure racing game.

7.0. Platforms and Monetization

This section has been mostly explained in the "Marketing and Funding"-section. Initially the game will be played on Windows-PC only and be powered by Unreal Engine 4. Judging by our experience in game development and publishing this will be the safest move for now. Further porting to Unreal Engine 5 might occur depending on the continued development of the game.

However, joystick/controller compatibility will be present to preserve the comfort zone of those who like this kind of input (e.g., console players).

We are using Github for storing and updating code/assets and *Clickup* for project management.

7.1. Localization

Initially the game will only support the English language, due to the small development team. After beta testing and getting some statistics of the audience prior to release, we might investigate getting translators for additional language support.

8.0. Other ideas

This is a collection of possible expansion opportunities for the game, should additional time be invested after the initial development, or if the team has excess capacity during this time.

- Second level with a different track
- More animated story elements including day and night cycles
- A varied skill tree with more possibilities
- Caravan that tells a story throughout the different rounds
- A rising Pharaoh in the pyramid
- Vultures in the distance
- A more advanced maze in the pyramid
- Integrated AI, supported up to 6 opponents

- Hidden areas that can only be accessed through the usage of the boost ability on jumps
- A chicken that moves around, until it's getting cooked at the last round
- Homing obstacles that shoot bullets, targeting you
- Fata morgana in the middle of the desert

9.0. Production timeline