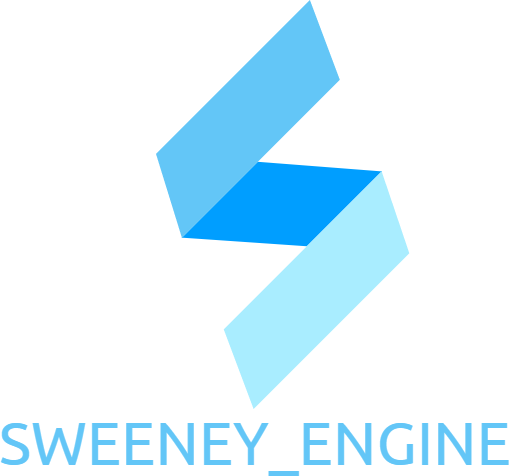
Fusion Rush Design Document

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Game Overview

## My Design Goals

#### Design goal #1

The goal i set out in making this was to push my programming ability further. I didn't want to use an an existing engine like unreal or unity. Instead i wanted to create my own engine in C++. I would have to build major parts from scratch, from the 3D rendering pipeline to resource management to the custom math library.

#### Design goal #2

I wanted to build a game with some online aspects and player network. The ability for player to compete on online race time leaderboards interested me.

#### Design goal #3

For the look and feel of the game i wanted a throwback to 80’s old arcade classics. Where the screens that the player played on where old CRT displays. The game would be short is duration but would be replayed multiple times over a long period like classic arcade games.

## Common Questions

#### What is the game?

The game is called *Fusion Rush*. Fusion Rush is a fast paced 3D racing game where the player must smoothly maneuver themselves around a series of procedural generated obstacles on a straight track. The race track is generated daily online and players can download the newest track if they are connected to the internet. The best 10 players in the world are displayed on a leaderboard.

#### Why create this game?

I wanted to challenged myself as a programming, building games is hard. But also building your own game engine is hard which serves the basis for making a game. I wanted to take on both challenges of making an engine and then making a game.

#### Where does the game take place?

Fusion Rush takes place in an abstract 80’s science fiction world where racers come together to battle for top positions on the leaderboard. The aesthetic of the world is a throwback to old arcades games.

#### What do i control?

The players controls a space racing pod. The racing pod can be controlled with either the keyboard or an Xbox 360 steering wheel.

#### What is the main focus?

The objective of the player is to get themselves ranked on the top 10 world leaderboards.

#### What’s different?

The game is build outside of a proprietary engine.

Game Overview

## General Features

Online network features

3D graphics

CRT screen effect

## Multiplayer Features

Create an account and sign in

A leaderboard displaying the best in the world.

Daily procedural race track.

## Gameplay

Race your best time by competing with a ghost racer on track.

The Game World

## Overview

The game is set in a futuristic science fiction world with an 80’s style to it. The world is very abstract with no detail on what purpose game entities have here.

## Rendering System

#### Overview

Fusion Rush uses OpenGL API for it’s 3D rendering.

#### 3D Rendering

In Fusion Rush i used GLSL for rendering 3D objects on screen. I also use post processing effects such as the CRT effect.

## Camera

#### Overview

For camera movement in the game i wanted smooth movement. When the player pressed play in the menu to game camera moves into the camera position for the player. This also happens when the player finishes the game. I use LERP to achieve this look. When i take the start position, the final position and interpolate between them each frame.

## Game Engine

#### Overview

I build my own engine instead of using a proprietary engine like unreal or unity. This allowed me to have much more control over everything along with the content pipeline.

#### Resource Management

I built my own custom hash table along with a string hash to retrieve game assets when needed.

#### Debug Draw Manager

I built a custom draw manager for debug proposes. This allows me to debug render normals, velocity direction, collision normals, AI racer nodes etc. Anything that has a geometric property i could visual debug on screen as a tool instead of printing to console.

#### Collision Detection

The player can collide with the obstacles on the track and the barriers. Some obstacles on the track are rotating so to check if the player is colliding i implemented a system to check if oriented bounding boxes are colliding with another oriented bounding box so that the collision system is fair to the player.

## Lighting Models

#### Overview

For most of the rendering in Fusion Rush it is just diffused map lighting. There are no shadows instead, i used a very polish reflection of the world. Along with this i used

## The World layout

#### Overview

In Fusion Rush the Race Track is a single stretch of road similar to drag racing. There are obstacles procedurally generated along the track and building along the side.

## The User Interface

#### Overview

The user interface allows the player to navigate from the menu to playing and also back to the menu when finished. It shows the online Leaderboard and lets the player sign in and create an account through the user interface.

Musical Scores & Sound Effects

## Overview

For music production i used a mixture of LMMS and fruity loops software packages to make sound effects and looped soundtracks. I used audacity for editing the music and sound effect while also apply filters.

## Sound Design

The sound design is based on old wipeout games that came out for the PlayStation One, simple beats looped over the course of 3 minutes.

Single Player Game

## Single Player Game

The player races a ghost AI racer on the track while avoiding obstacles on the track that are procedurally generated.

## Hours of Gameplay

Fusion Rush is designed to be played in a short duration over long periods, usually 20-40 seconds depending on the race seed but replayed many times. A throwback to old arcade classic where the rules were learned in the first minutes and the gameplay would go on for hours.

## Victory of Conditions

The player beats their previous score, they get a new ghost racer on the track representing their

Multiplayer Player Game

## Overview

In Fusion Rush the player can compete with other players around the world by creating an account, signing in and racing for a lap time. If there in the top 10, they will be shown on the leaderboard. There rank will be displayed in the menu when they sign in.

## Internet

Fusion Rush requires an internet connection with download and uploads speeds of 2mb/s for a quick accesses to leaderboards and signing in.

## Victory of Conditions

The player gets a good enough race time that they are displayed in the top 10 in the world for that day.

## Persistence

Every day a new race seed is available for the player to download. Every player will use the same race seed, allowing each other to compete on the same track each day but have a different track to play the next day.

## Saving and Loading

If the player is offline, they user the previous track seed and their ghost racer and time is loaded.