

Karman Cruisers Design Document

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Overview:

A 3D Multiplayer game based on the core concepts of golf merging with a unique theme where players play as spaceship pilots commandeering unique ships traveling through courses floating in the sky. Players will be able to choose different characters and select from a range of different types of shots all while trying to race their opponents to the wormhole. Each of the characters will have different abilities and play styles. The game will feature both a 9 hole and 18 hole game mode. At the end of the game players will be ranked according to how they scored on each hole, the player with the best score wins. Players will be able to choose between using a mouse and keyboard or controller.

Gameplay:

In the title menu, the player will be able to choose from a couple of characters (each character having different abilities). The player will then move on to choose the course and begin the game. The game starts with the player aiming left or right trying to aim his ship as close as possible to **the wormhole (Goal)**. After setting the player's aiming direction, the player will start the power meter by hitting **space bar**, the power meter will start to move and the player will have to hit how much power he will add to the shot by hitting **space bar again**. As the player sets how much power they want, the **power meter** will change into an **aiming meter** in which the player will have to hit the **spacebar** for the third time to set his accuracy. When the aim is set up the ship will be launched, and the player (with some characters) will have **the ability to slightly deviate his own course** setting him up for better shots. At the start of their shot, players will have the option to choose between different **thruster levels** that allow them to launch at

different angles and go different distances. Courses will have different terrain that affect the way a player's ship launches and lands, for example if a ship is launching out of **rough terrain** they will not go as far as they would if launching off **smooth terrain**. If a player fails to land on terrain, they will be forced to retake their shot and have **additional strokes** added onto their score. The game is played with the players alternating turns throughout the holes, starting with the player who is **furthest from the hole**. The player that wins the hole starts the next hole.

Game Elements:

Terrain

Rough: Causes the Ship to not bounce or travel far if it lands on it. Also lowers the power of the next jump.

Smooth: Normal terrain, will allow the ships to bounce and get some extra distance after they have landed. There is no penalty when the ship takes its next jump.

Green: Ships landing in their area will have a small bounce, but this area of the ground is very smooth to hover over (putting).

Sand: Difficult terrain that will cause the ship to get caught if it lands in it. Requires a jump at a sharp angle to make it out successfully.

Water: A hazard that will appear on some holes, falling into this hazard will cost the player a stroke and drop them at a marked position.

No Land: If the ship misses the islands entirely, they will be penalized a stroke and have to retake their shot.

Trees: Trees will act as a border wall to either help keep the ship on an island or to create a wall that the ship will not be able to go over in a hole.

The Wormhole: Ships will be racing to get to this wormhole in as few hits as possible. Once inside the wormhole the level ends for them.

Ships

Rocket: A ship with extremely powerful engines, able to go far distances but lacks any control in the air. It does come with the ability to drastically reduce its speed, allowing it have some control over when it lands.

UFO: A slow moving ship that has a lot of control midair, while it has a lot of control its smaller engines restrict how far it can jump.

Freighter: A relatively normal ship, allowing it to jumps that are decently far with the ability to slightly change its course midair.

Escape Pod: Has thrusters on the side of the ship allowing it to add spin to its landing which will give it better control over its positioning.

Clubs

Driver: 10.5* angle for the jump, good for long distances and for starting a level.

3 Wood: 13* long distance, low and powerful shots

4 Iron: 26* \

5 Iron: 30* |

6 Iron: 34* | Irons are situational and used for different distances. Are good to get out of the

7 Iron: 40* | rough.

8 Iron: 44* |

9 iron: 48* /

Pitching Wedge: 50* \ Used for high angle, short distances. Keeps the ship from

Sand Wedge: 56* | bouncing after the hit.

Lob Wedge: 58* /

Putter: 0* used to move the ship across flat ground and get into the wormhole easily.

PAR 3



PAR 4



- PLAYER
- WORMHOLE
- THE GREEN
- FAIRWAY
- ROUGH
- TREES
- SAND

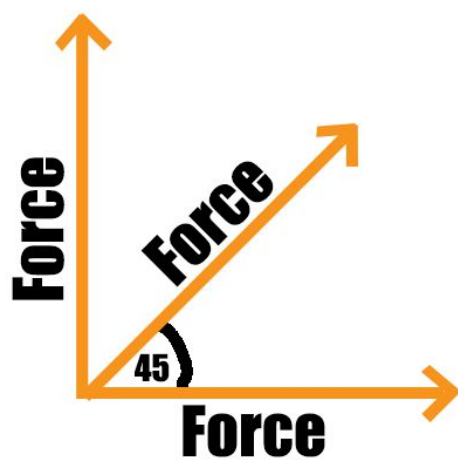
Artistic Style:

Karman Cruisers will be a 3D low poly stylized atmospheric golf game. The game will follow the players who will be playing as a variety of different looking ships. The game also wants to feature a unique cartoonish style that really separates it from the other golf games out there. It draws inspiration from other iconic games like The Legend of Zelda: Wind Waker, Overwatch, and the Borderlands series. We really want to create a unique setting for players where the environment really feels out of our ordinary world. We plan to accomplish that by having our setting exist between earth and space. By this we mean the courses that the player's ships will be traveling through will be floating in the sky and broken apart (unlike your average golf course). The holes will also be massive in scale since a spacecraft is quite larger than a golf ball. This will help to create the feeling the each time your ship takes off to clear some distance you truly feel like you are traveling very far to reach the next destination. Also having the courses in the sky will doubles the hazards of your average golf game by punishing players for missing land along with your standard hazards like rough terrain, sand, water, etc. Lastly we wanted our mechanic of golf to be unique. Instead of clubs, each ship will be equipped with different "Thrusters" with unique stylized particle effects which will simulate a shot in golf (but for spaceships). The hole in which one must get their ship inside of in a certain amount of shots is also a wormhole which teleports your spacecraft to the next hole.

Process:

Our game's core mechanic is mostly the physics of the game, since it's based on the concept of golf, physics and trajectory tracking is really important for the game to feel realistic,

and fun at the same time. To make this game the code will have to find out 3 main things: The y position of the ball before the ball is launched, the angle in which the ball will be launched at, the resultant velocity it starts with. (Resultant velocity is shown on the image below, both resultant force and resultant velocity can be figured out with the pythagorean theorem.)



v = Velocity
g = Gravity
d = Distance
 θ = Theta
y0 = Object Y-Position

$$\text{Angle} = \theta = \tan^{-1}(\text{Force}/\text{Force})$$

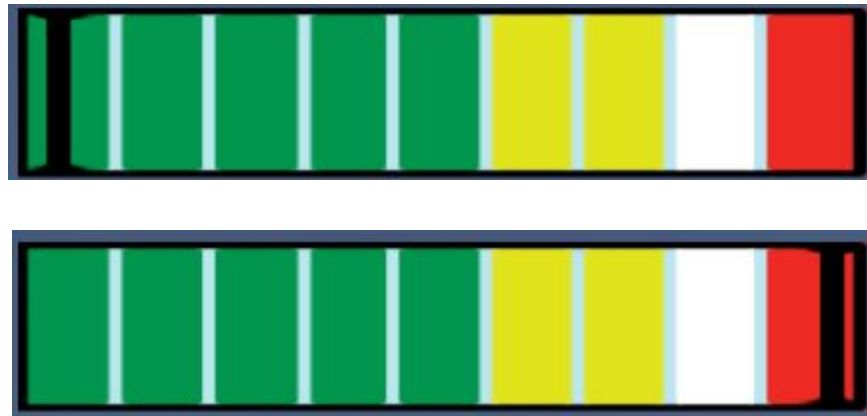
$$\text{Velocity} = \text{Force}/\text{Mass} * \text{Time}$$

$$d = (v * \cos\theta) / g * (v * \sin\theta + \sqrt{(v * \sin\theta)^2 + 2 * g * y0})$$

When we get the force that is being applied on the Y-axis and Z-axis of the object we can figure out the angle it will be launched at. As you can see in the figure above, the angle equation is how we figure out the angle it will be launched at. By knowing the angle it is launched at, the velocity of the object, and its y position we can plug it all into the distance equation, and be able

to track where the game object will land. I was thinking on making a line renderer for the arc the ball would take, but for now I am just gonna show the player where he will land.

Talking more about the MVP, the game will have a built Par 3 Hole (One level built). Where the player will be able to aim his shot on the X-axis, and then be able to shoot. The shooting phase as you can see below, consists of a power meter.



When the player hits the spacebar for the first time, the power indicator will start moving forward. After pressing the spacebar for the second time the power meter will record the power the player has landed on, and switch the power meter into an aiming meter. The aiming meter as you can see below, works similarly to the power meter. But now if you land in the white your ball will go straight, if you land to the extreme left on the green, your ball will land farther to the left, and the same thing will happen if you slice it to the right.



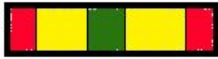
To end up the process discussion, I will list down the things we will have for our MVP, and explain a little of what each one is, and how it will be implemented.

- **1 Par 3 Hole:** The full level built with a goal (being the hole/wormhole).
- **Projectile Trajectory:** The algorithm or formula that will figure out the distance of the player, or where the player will land, if a perfect shot is hit.
- **Clubs:** In the game we will have 12 clubs, but most likely for the MVP we will have 2-4 clubs out of the 12.
- **3 Cameras:** The player will have a launching camera, where he can aim his shot on the X-Axis. And there will be a top-down camera that will show the player where he will land after a perfect shot. The last camera will be an after shot camera, basically a camera with a better angle showing the trajectory of the ball after the player has shot.
- **Physics:** The equations will be working correctly, collecting the velocity of the object, and the angle it is launched at. Also the forces will all be tweaked to feel more realistic, and have a smoother feel to shooting the ball.
- **Player Aiming:** The player is already able to aim where he wants his ship to land based on its X-Axis.

Appendix (Visual Docs):

Basic Gameplay

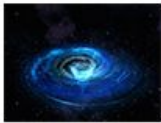
Example shown might differ from the final product.



Power level to determine how far the ship will go.

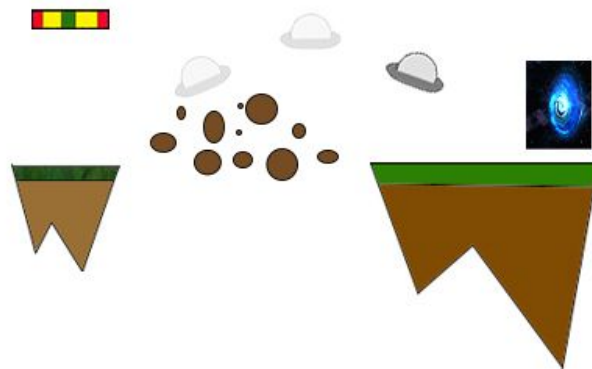


Player can chooses from different ships.

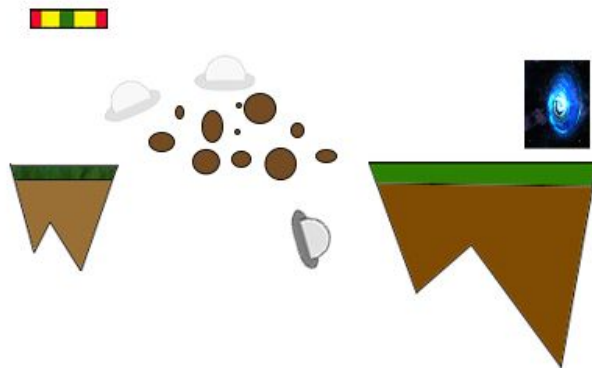


Wormhole is where th player wants to get to.

Good Gameplay



Bad Gameplay



Depending on the hazard you fail to surpass, you as the player will be placed around the hazard in 'drop zones' or you will have to try again with an added stroke.