

3d Space-Themed Pinball Game

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Elevator Pitch

This is a 3d pinball game in the style of an old arcade game. The game has all the classic elements of pinball, but also adds a unique twist of balls that have different behaviours, and various themes. Can you get a high score?

Summary

Pinball games used to be arcade games where players used flippers to shoot a metal ball around a table, aiming to score points by hitting targets and obstacles. They have evolved from mechanical to electronic and now to digital versions. We have decided to relive the nostalgia and pay tribute to the 70s by creating a game we all love and enjoy. This game will test your skill, quick reflexes, and strategic thinking.

USP

Our pinball game combines the nostalgia of traditional pinball machines with the features offered by a modern physics simulator. Here are some key USPs of digital pinball games:

- Experience a classic of a bygone era in a new exciting way
- A unique blend of nostalgia, excitement, and skill-based gameplay.
- Accessible Anytime, Anywhere. This allows players to enjoy the pinball experience whenever they choose, without a physical machine.
- Diverse and Immersive Gameplay. Our game offers a wide variety of designs, challenges, and interactive elements.

The Team

Meet the exceptional four-member team, each bringing their unique skills and expertise. Together, we form a bond, driven by our shared passion for creating unforgettable gaming experiences.

First up is Adam, the visionary Game designer and Project manager. With a mind teeming with creative ideas, Adam sets the foundation for the game's concept and creates a timeline that is easy to follow.

Next up is Daigoro. He is a versatile Programmer. His game mechanics turn the idea into an experience.

Meet Artist and Writer Shuvo. He writes mouth-watering marketing material to market the game to stakeholders and creates art in his downtime.

Finally, we have Steven, the brilliant Level designer. Armed with C# and Unity, Steven turns Adam's idea into reality and creates the prototype.

Each team member's role is vital to the game's success, but it is our collaboration that truly sets us apart. Our regular brainstorming sessions, constructive feedback, and open communication foster an environment where ideas flourish. Together, we overcome challenges and ensure the game meets the highest standards of quality.

Key Mechanics

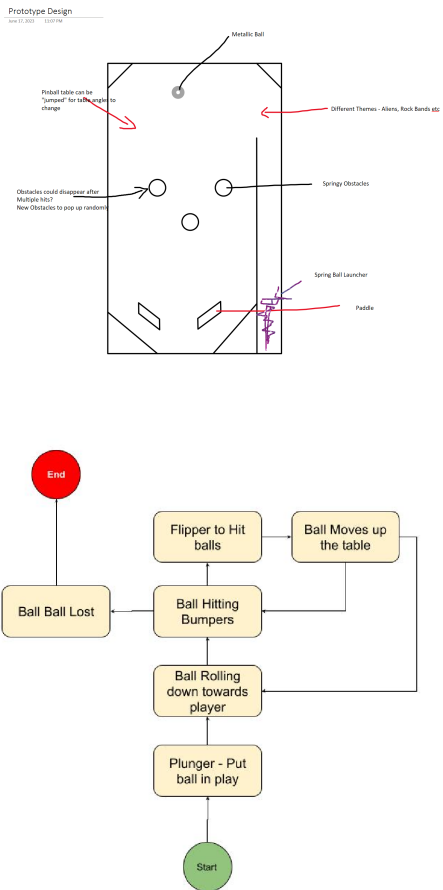
The player will interact with the pinball in different ways:

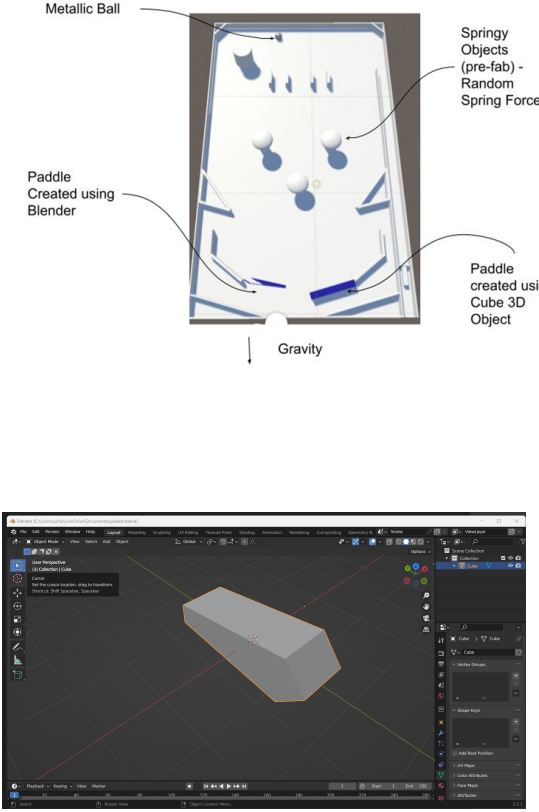
1. Press the spacebar and keep it pressed to charge the spring ball launcher. Then release the space bar to launch the ball with a given force.
2. Press the left and right buttons to activate the paddles. These will be used to prevent the ball from reaching the death area/
3. Press the arrows (or some special keys) to "tilt" the pinball machine. This might trigger a fault in the system which would temporarily deactivate the paddles if used too much.
4. Interact with the menu to change the ball's physical features - to change the ball materials and behaviour (the specifics have not been fully decided yet, but this is likely going to be a menu interaction, to be further defined after some play testing).

The key mechanics are the effect of gravity and other forces on the ball, and the player needs to use these forces to their advantage to make the ball stay in the game as much as possible while clearing some goals.

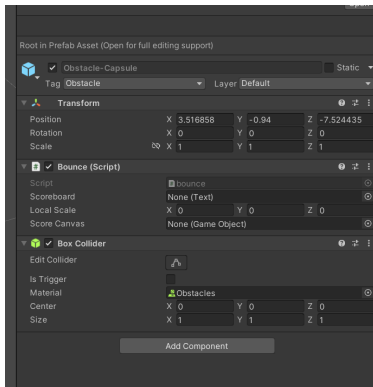
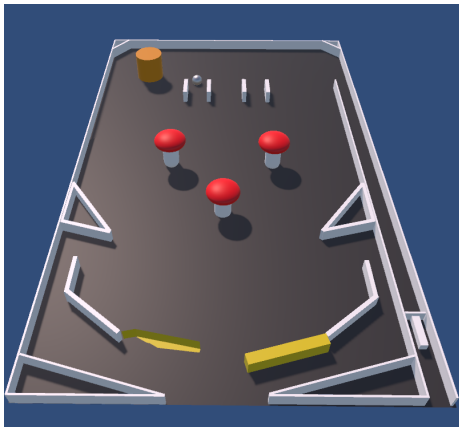
Since the ball material and behaviour can be changed throughout the game, the player will need to understand how these mechanisms affect different balls in order to use the best option for specific goals.

Evidence of Prototyping

Prototype Screenshots	Notes / Features
	Version: Initial Wireframe (Wireframe Scribble and thought process design) • Simple wireframe design Initial wireframe design of pinball 3D game, with generic obstacles, spring launcher and flippers.. • Outline of pinball table Generic outline design of the pinball table, similar to any retro pinball game • Workflow of Pinball Game Observation - simple wireframe does not provide a 3D perspective; similar to a player standing at an arcade playing the game. Physics and mechanics would need to be applied in subsequent versions of prototypes.

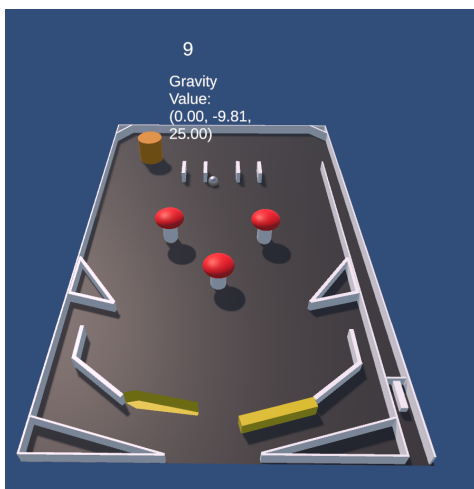
 Screenshot of Paddle created using Blender	Version 0.1 alpha • Our prototype was created in Unity. • Each asset was created using Unity's primitive objects such as cubes, spheres and cylinders • Basic materials were tested. • Gravity was changed to lean towards Z-axis so the ball moves downward towards the player • Testing of physic materials for the bounciness, colliders. • Primitive types were not enough; we started to use Blender to create assets such as the paddle (renamed as Flipper¹). • Using Blender is a challenge in itself, a lot of hours was spent on learning from youtube on how to create assets using Blender. • Issues: • Ball was going off the table - resolved by fixing y-axis position
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¹ Renamed from Paddle to Flipper as part of Naming standardisation.



Prototype Version 0.11 alpha:

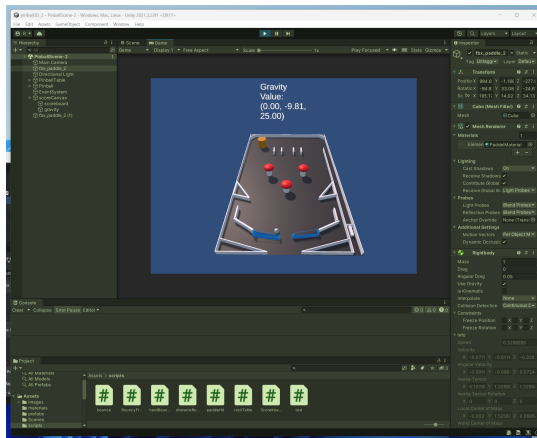
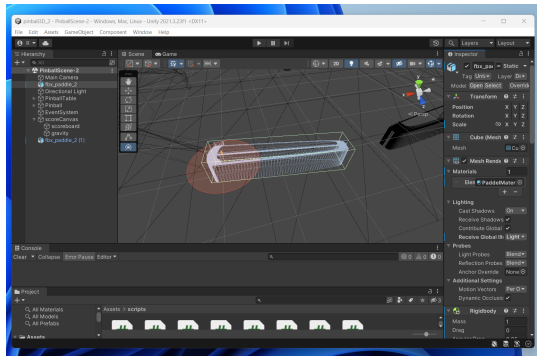
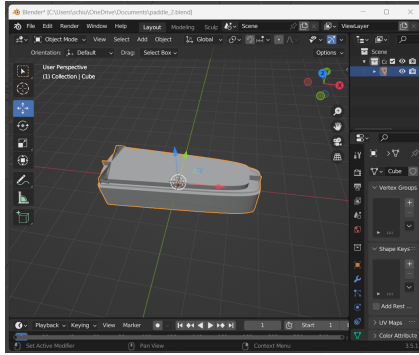
- In this version we added some colour to the obstacles and the table, in order to test basic materials
- Obstacles² now have scripts for bounciness attached to them
- Scripts are now attached to the paddles, obstacles,
- **Issues:**
- ball was moving very slow, which was fixed by increasing gravity
- Hinge Joints was to be created for paddles (flipper) so the movement pivots at the end of the paddle
- Sometimes paddles wouldn't hit the ball, which was resolved by setting rigid body collision to continuous



Prototype Version 0.2 alpha:

- This version introduced basic scoreboarding to track number of hits
- Additional Text to show gravity values as a debugging display
- Text was created using Text Mesh Pro UGUI
- The obstacles are animated to shrink and expand when hit.

² Obstacles are renamed as Bumpers in later design.



Updated Paddle Creation using Blender Prototype Version 0.3 alpha

- Featuring an updated paddle created using Blender with more complex features such as rounded corners, bevelled surface
- 2nd screenshot showing imported paddle to our game with additional component of hinge joint added to the gameobject.
- 3d Screenshot is our game-play in action

Issues during this prototyping:

- The color of the paddle seems to fade at the top.

No Screenshots - This design stage is for the team to agree on terms that will be used going forward for pinball table parts.

Prototype 0.4 (Naming Standardization)

- Standardizing part names (for example Flipper was called Paddle.. etc)

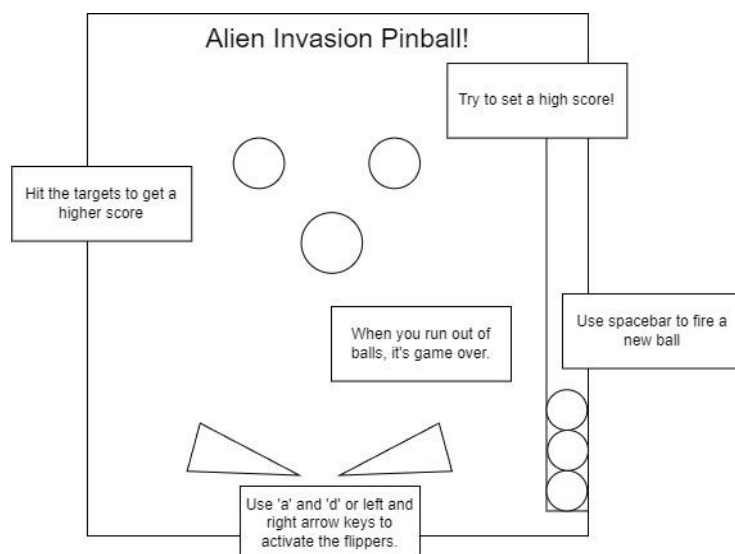
Character and settings

This is a pinball game, so the player is like a person playing a pinball game at an arcade. However, the pinball game itself also has its own theme and setting. The pinball game is set during an alien invasion. Aliens have invaded Earth, and it's up to the player to defend the Earth. The player will receive prompts to give them objectives in order to score more points or earn other rewards. For instance, the player might be given the objective to fight off the incoming UFOs. This is accomplished by hitting certain bumpers in a specific order. When the player completes this task, they have “defended” against the incoming invasion temporarily.

In a broader sense, the player is trying to get the highest score possible. This can be achieved by completing tasks, getting long streaks without dying, and activating power-ups and multipliers.

Beginning the game

The player will be greeted with a static screen explaining the basics of pinball. It will consist of a screenshot of the game with arrows giving basic directions (i.e. Use the ‘a’ and ‘d’ keys to activate the flippers). This should be enough to get the player started. The first time a new power-up or ball is unlocked, the game will pause briefly and show another static screen with the new information.



First 2-5 minutes

After reading the tutorial page, the player will hold the spacebar to pull the plunger back and launch their first ball. While this can be a skill shot, initially the ball will bounce somewhat erratically. The player should have a few chances to hit the ball with the flippers a few times before the first objective is triggered.

Objectives are communicated via direct communication on the scoreboard, as well as by nudges including lighting and sounds. The first objective will be something simple like hitting the three middle bumpers once each. If the player completes an objective, they will get a bonus to their score, as well as some reward cues from sound and lighting. After a small amount of time (initially, we're trying 20 seconds and adjusting that after feedback) another objective will be given to the player.

At some point, the player will die by missing the ball and having it fall between the flippers. Each player starts with three lives, so on the first death, a new ball will be loaded and the player will be able to launch the ball into the play area to continue play.

When the player has used all three of their lives, the scoreboard will give them a summary of their game, including their final score, number of objectives completed, and active playtime. They will be prompted to play again by hitting the spacebar.

Art Style

The style of the game is that of a retro pinball with an alien / spaceship theme.

The general art style is with chromatic / neon colours, with two main themes: the enemy side follows a general red / purple colour scheme (i.e. the components of the pinball that the player needs to hit, or those working against the player), whereas the friendly side (the components helping the player, e.g. the gravity inverter) will follow a blue colour scheme.

Some inspirational art styles (both physical and digital) are provided in the appendix. These will be used in a later phase when creating all the assets to help with inspiration and adding details.

A colour palette has also been created as a guideline when creating assets so that they will blend together.

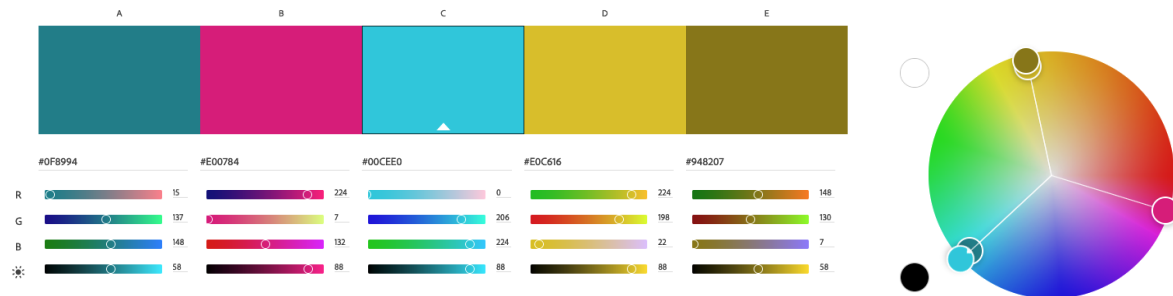
Primary colour palette

A - Supporting colour for friendly assets (#0F8994)

B - Mainly used for enemies assets (#E00784)

C - Mainly used for friendly assets (#00CEE0)

D&E - Neutral colour, used for the machine and any extra details (#E0C616 and #948207)



Primary color palette³

Audio

There will be 3 main types of audio effects:

1. Drama effect - These will be used when something on the pinball changes (i.e. a component being upgraded, a mission being completed, a new challenge etc.)
2. Components sound - these are sounds that each component might make when either idle or moving (e.g. spinning parts, ball sliding on the pinball floor) or interacted with (e.g. the flippers sound when moved by the player)
3. Interaction with the ball - each component will make a sound when colliding with the ball

For the audio resources, the team will most likely use sound effects from Pixabay,⁴ a website that provides royalty-free sound effects.

The current idea is for the general theme to follow space sound effects, where drama effects and component sounds will be mainly using lasers / space effects, and the ball interactions will be using metallic sounds.

For a list of all audio files required, see the assets section.

³ Created using Adobe Color - <https://color.adobe.com/create/color-wheel>

⁴ Pixabay sound effects - <https://pixabay.com/sound-effects/>

SWOT Analysis

Strengths:

1. **Realistic Simulation:** Our game can provide a highly accurate simulation of traditional pinball machines, offering players an immersive and authentic experience.
2. **Portability and Accessibility:** Unlike physical pinball machines, Our game can be played on various devices such as computers, smartphones, and gaming consoles, allowing for easy accessibility and portability.
3. **Diverse Themes and Customization:** We can offer a wide range of themes and customizable options, allowing players to choose from different pinball tables, layouts, and graphics, enhancing the overall gaming experience.
4. **Multiplayer and Online Features:** offering multiplayer modes and online features, enabling players to compete with friends or other players worldwide, fostering a sense of community and competition.

Weaknesses:

1. **Lack of Physical Sensations:** Unlike traditional pinball machines, the game lacks physical sensations of manipulating the machine's flippers, which may reduce the overall sense of realism and enjoyment for players.
2. **Limited Screen Space:** Digital pinball games are often constrained by the screen size of the device, limiting the available space compared to physical machines, which can impact the gameplay and may make certain shots more challenging or less satisfying.
3. **Adaptation:** Some players may be sceptical of digital arcade games, as they prefer the traditional machines and find it difficult to replicate the same level of engagement and nostalgia in a digital format.

Opportunities:

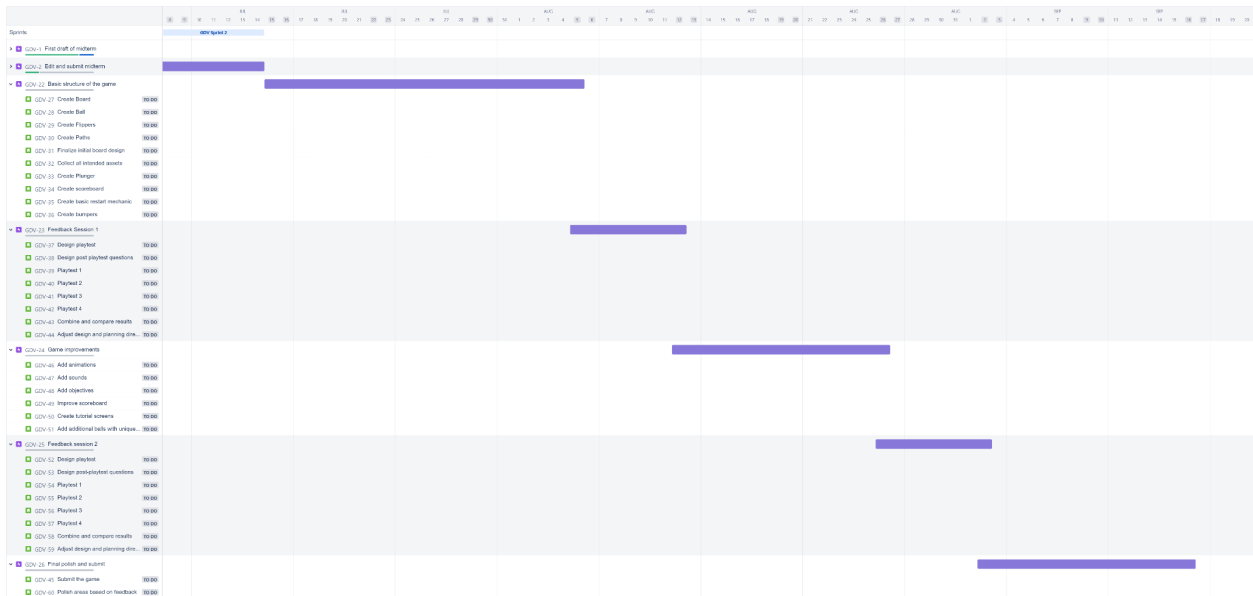
1. **Technological Advancements:** With advancements in technology, digital pinball games can incorporate new features such as improved graphics, physics engines, and haptic feedback, enhancing immersion.
2. **Expanding Platforms:** The increasing popularity of mobile gaming and the availability of apps offer opportunities for us to reach a wider audience and attract new players who may not have access to physical pinball machines.
3. **Cross-platform Integration:** Integrating games with other platforms or technologies, such as virtual reality (VR) or augmented reality (AR), can create unique and innovative gaming experiences, further enhancing the appeal of digital pinball games..

Threats:

1. **Competition:** The availability of such games in the market and over-saturation of the market poses a threat.
2. **Licensing and Intellectual Property:** Digital pinball games often incorporate licensed themes and any limitations associated with securing licences for popular brands or franchises can impact the variety of available pinball tables.
3. **Imitation and Piracy:** The digital nature of pinball games makes them vulnerable to piracy and unauthorised reproduction, potentially leading to lost revenue.

Production Schedule

For our project, we are using Jira as a management tool. Rather than assign many individual tasks at this point in development, we have chosen to map out the sprints and the tasks to be done, while allowing each member of the group the flexibility to choose the tasks that they have both time and interest in doing. We've also created a vacation schedule for the group so that we know who will be absent and when. Here is the current schedule for the group:



Asset list

Audio

Bumper	To be determined
Flipper Moved	To be determined
Flipper Hits Ball	To be determined
Ball Launcher	To be determined
Ball Movement	To be determined
Ball hits wall	To be determined
Background	To be determined
Goal completion	To be determined
Ball falls to bottom (lose life)	To be determined

Scripts

bumperPhysics.cs	- interaction between ball and bumper (bounces) - includes increasing or decreasing scores - Exploits physics engine and applies to the objects (i.e AddExplosionForce)
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flipperControl.cs	Controls left or right flippers to hit the ball
goalManager.cs	Controls the goals location
ScoreKeeper.cs	Tracks scores and prints to Text Gui
Plunger.cs	Puts the ball into play

Prefabs

Ball	Pinball in play will be instantiated
Pinball Table	The entire pinball table: - Table Frames - Plunger - Bumpers - Paths This will be a prefab. Skins can be dynamically added to the pinball table.
Ramps	Ramps can be added dynamically to the game to enhance interactivity
Bumpers	Bumpers are prefab to be created on pinball table at various locations These will have various animation to change their appearance and their physical properties (e.g. different forces and lights)
Slingshots	These are triangle shaped module located near the bottom of the pinball that throw the ball upwards upon impact
Flippers	2 or more flippers are used in the table
Doors	Doors will be put in different location on the pinball and will give extra points or special features to the player. For example: - Gravity inverter door - 3X door (gives back 3 balls)
Goals	These are special locations that are activated upon impact and give points to the player. These can be other assets or specific locations on the pinball floor.

Several of the prefabs will have different levels depending on how many times they were hit. As the level of the asset increases, so does the number of points that are gained by re-hitting it, as well as some physical properties like force.

Levels

Base level - In this level the pinball features the initial version of some of the assets (bumpers, slingshots, etc.), and different goals are shown to the player (e.g. hit specific areas). The goal of this level is to have the player get accustomed to the mechanics and reach a certain amount of points, at which point some more assets will be made available.

Additional levels - Gravity inverter - This can be activated at some point in the game by hitting the gravity inverter goal. This will trigger a behaviour where gravity will go upward instead, and some extra assets will be made available on the board (two flippers on top, and a “death” slingshot at the very top which throws the ball directly into the death zone when reached).

Refs

- Topic - Anatomy of a pinball machine ⁵

Appendix

Art style

Some inspirational art styles are shown below. These will help the team design different components of the game.

1. The Alien physical pinball, created by Pinball Brothers, features components from the Aliens movie (see Image 1 and 2)
2. Some AI generated images using the DeepAI website⁶

⁵ Topic - Anatomy of a Pinball Machine - <https://www.topic.com/anatomy-of-a-pinball-machine>

⁶ DeepAI website - <https://deepai.org/>

 Image 1 - Alien Pinball⁷	 Image 2 - Alien Pinball style⁸	 Image 3 - DeepAI generated art⁹
 Image 4 - DeepAI generated art¹⁰	 Image 5 - DeepAI generated art¹¹	 Image 6 - DeepAI generated art¹²

⁷ From FlipNOut Pinball website

(<https://www.flipnoutpinball.com/product-page/alien-pinball-machine-limited-version>)

⁸ From Home Leisure website

(<https://www.homeleisuredirect.com/blog/pinball/alien-pinball-ultimate-guide.html>)

⁹ Generated from <https://deepai.org/machine-learning-model/text2img> using the text “Spaceship pinball neon blue and red” and the Cyberpunk Generator

¹⁰ Generated from <https://deepai.org/machine-learning-model/text2img> using the text “Spaceship pinball neon blue and red” and the Cyberpunk Generator

¹¹ Generated from <https://deepai.org/machine-learning-model/text2img> using the text “Spaceship neon laser red” and the Cyberpunk Generator

¹² Generated from <https://deepai.org/machine-learning-model/text2img> using the text “Spaceship neon laser red” and the Cyberpunk Generator

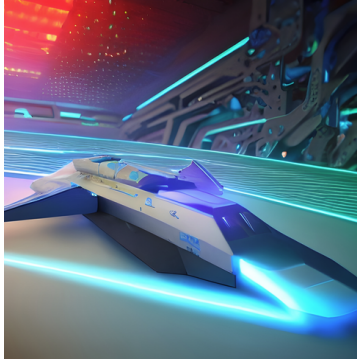
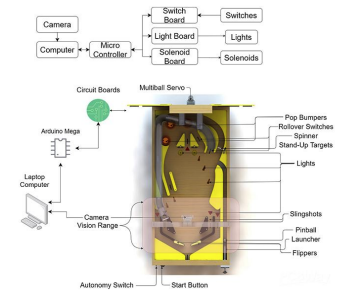


Image 7 - DeepAI generated art

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Image 8 - DeepAI generated art¹⁴



Flipper parts ¹⁵

Name Standardisation:

Plunger - This is the ball launcher on the right of the table to start the game. *When tugged all the way back and released, the plunger will send the ball flying around the playfield with careless abandon, into a potential series of landmines.*¹⁶

Ramp - *In early games, the playfields weren't designed with ramps that were directly shootable; they were more like decorative design additions meant to make the playfield more interesting*¹⁷.

Bumper - These are obstacles to which the ball hits and bounces off to another direction.

Paths - Hidden ramps in the playfield (as per real pinball arcade game)

Flippers - These are paddles at the bottom of the pinball table that are controlled by the player to hit the ball. *Flippers are the primary way to move a ball through the playfield*¹⁸

Action (July 1st, 2023) : All parts, files, and prefabs that refer to different names will now be renamed to standard naming.

¹³ Generated from <https://deepai.org/machine-learning-model/text2img> using the text "Spaceship neon laser blue" and the Cyberpunk Generator

¹⁴ Generated from <https://deepai.org/machine-learning-model/text2img> using the text "pinball from above with an alien spaceship theme, purple, red and blue neon and lasers" and the Cyberpunk Generator

¹⁵ From PCBway (https://www.pcbway.com/blog/Activities/AUTOPINBALL___SPRING_2020.html)

¹⁶ <https://www.topic.com/anatomy-of-a-pinball-machine>

¹⁷ <https://www.topic.com/anatomy-of-a-pinball-machine>

¹⁸ <https://www.topic.com/anatomy-of-a-pinball-machine>