Production Support Materials

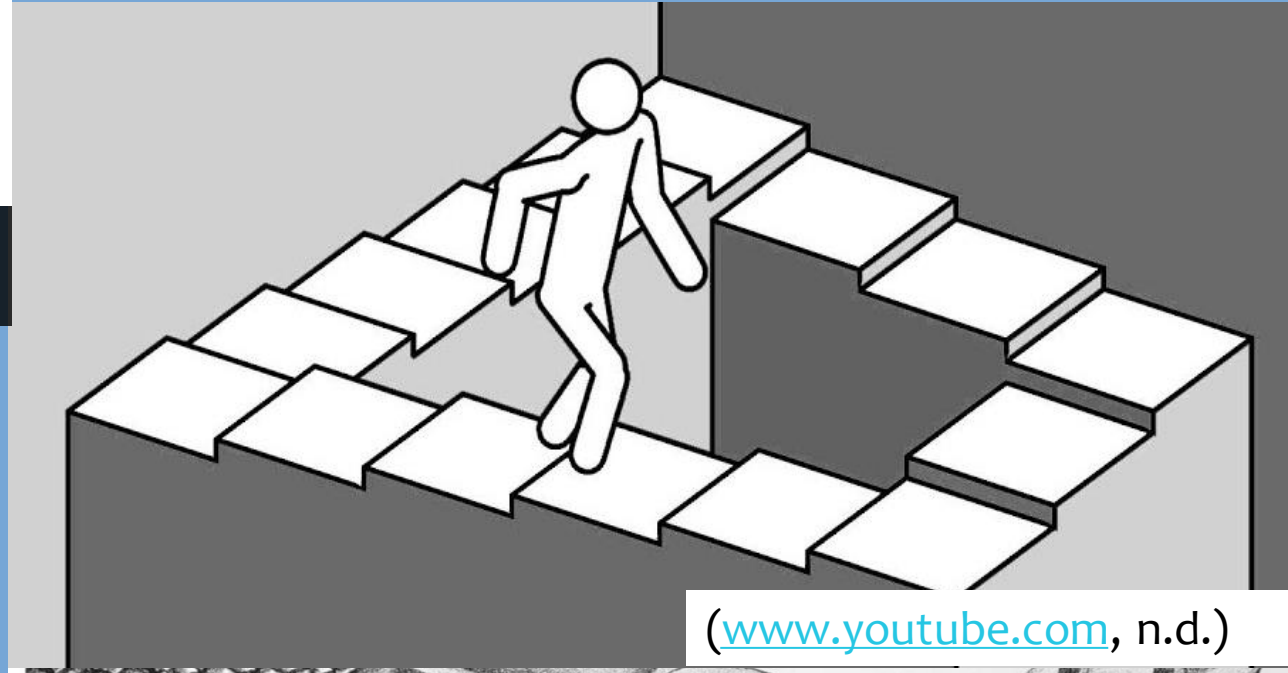
Albert Jian Sheng Tan Mulligan

CGI Tools

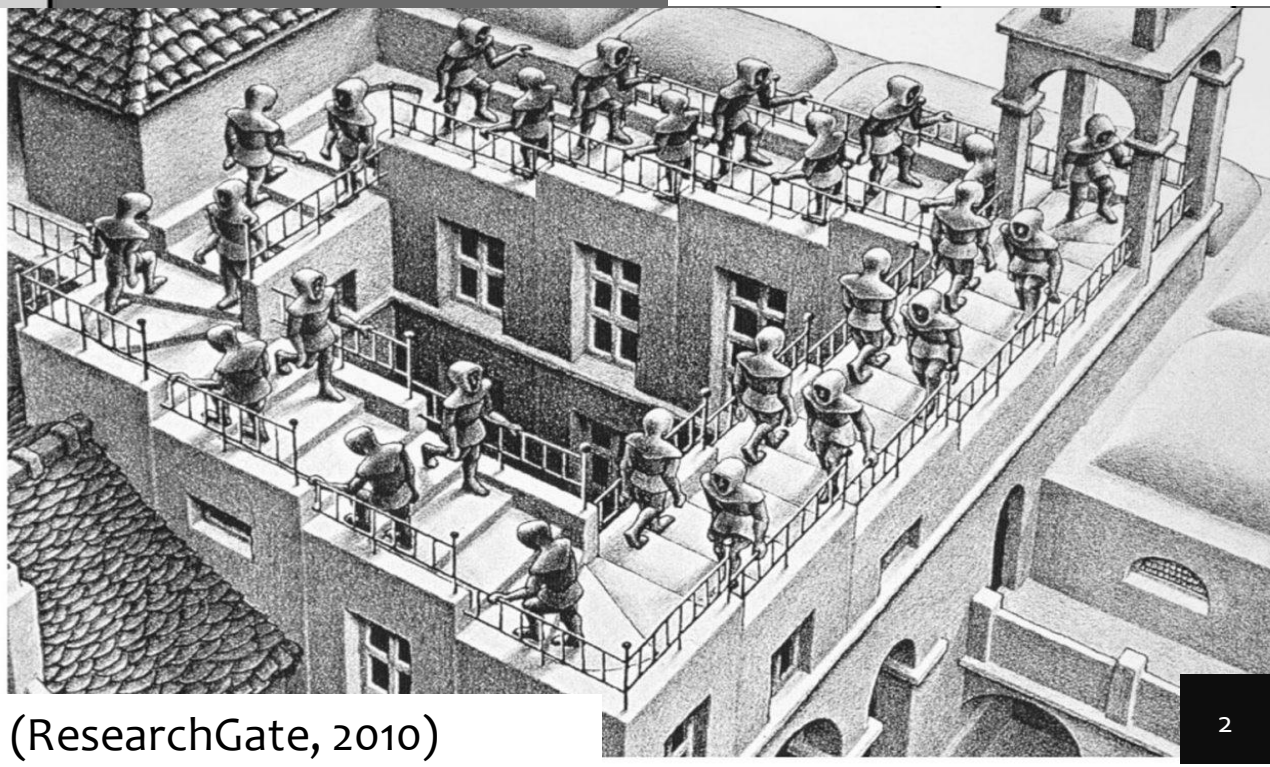
Introduction

The Penrose Staircase

The Penrose Staircase, first invented by Lionel and Roger Penrose, is a hypothetical impossible set of stairs, as depicted on the top. This impossible piece of geometry depicts a set of steps in which the subject either ascends or descends the staircase forever, with each loop having the subject return to the same point. Other artists have used this concept as inspiration, mostly famously MC Escher's "Ascending and Descending", which shows numerous monks infinitely walking up the Penrose steps, depicted on the bottom.



(www.youtube.com, n.d.)



(ResearchGate, 2010)

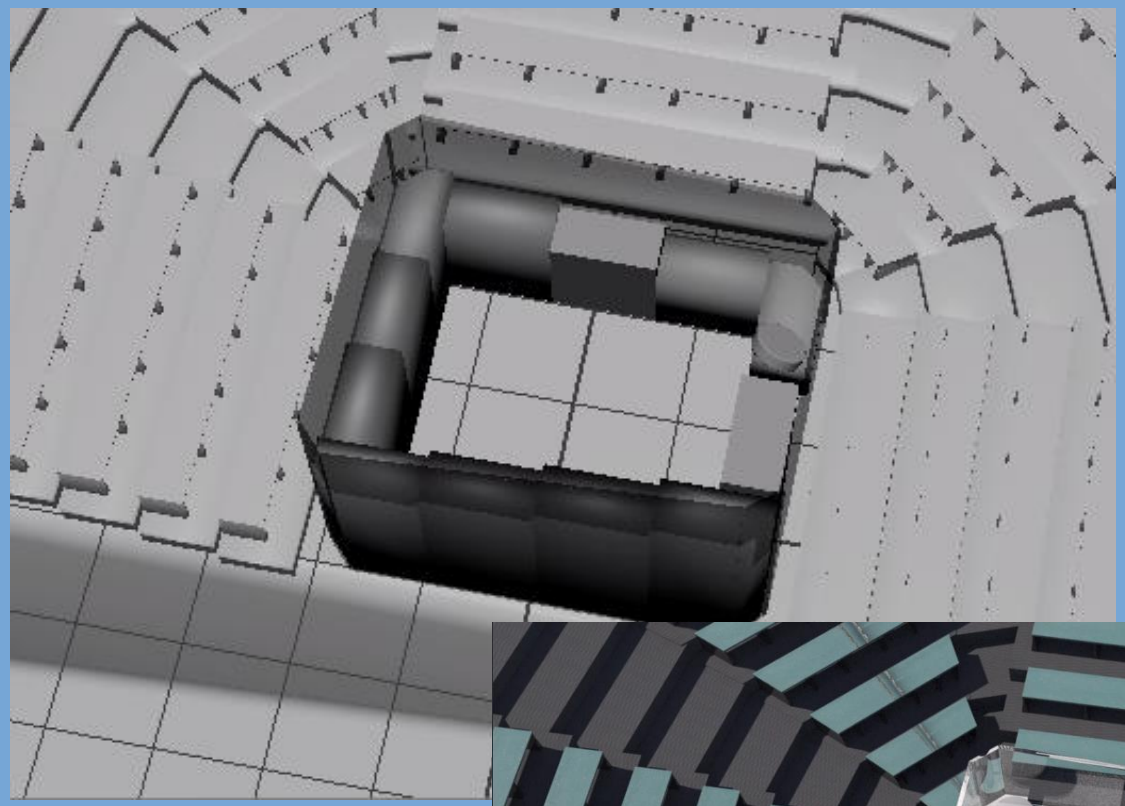
(Krøgh Jørgensen, n.d.)

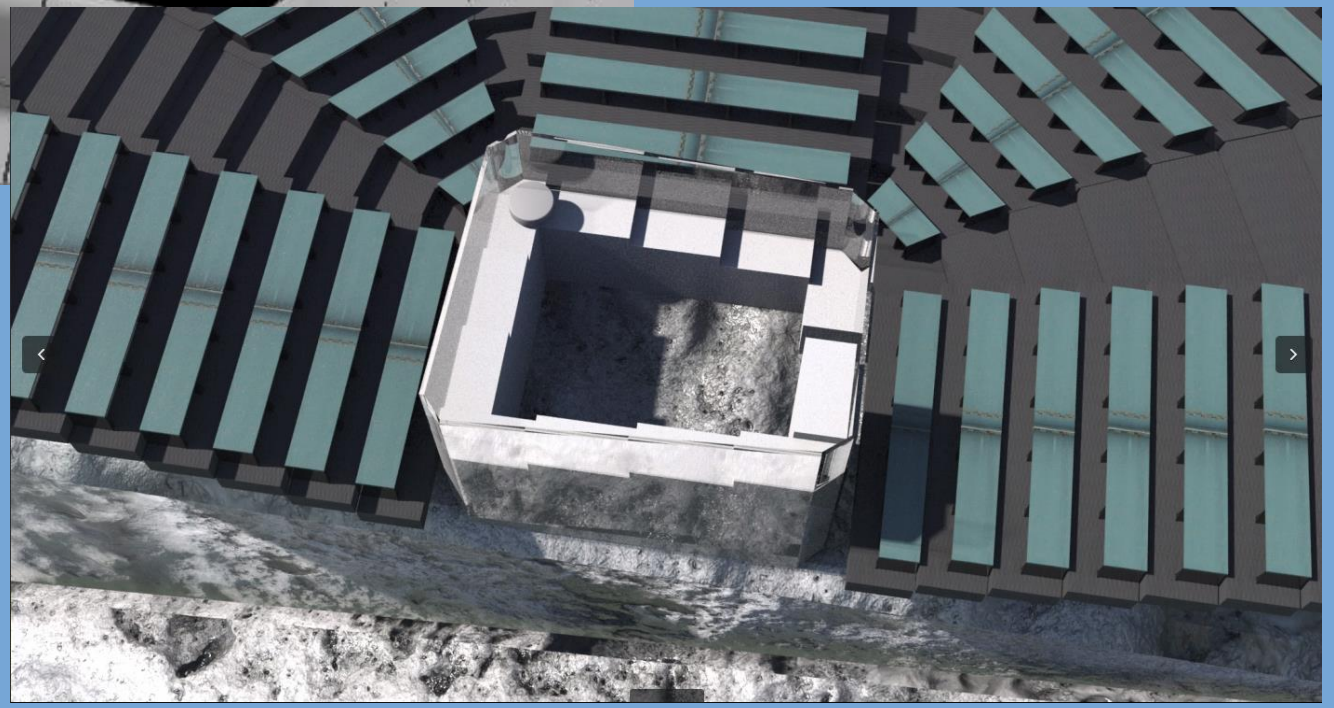
(Athletica, 2022)

Project Theme Concept

Hockey Stadium Theme Composition Criteria

- **The project idea is to create a hockey stadium, in which the central piece is a set of Penrose steps instead of the ice rink that is normally where the game is played. From my primary references, two of which are on the right, the key elements of a hockey stadium were determined to be the ice rink (in this case the steps), the stands including the crowds, the jumbotron in the center, and the glass walls.**
- **The spotlights, which are in the final product, highlight the ice rink, which is based off a hockey game that I saw in person.**



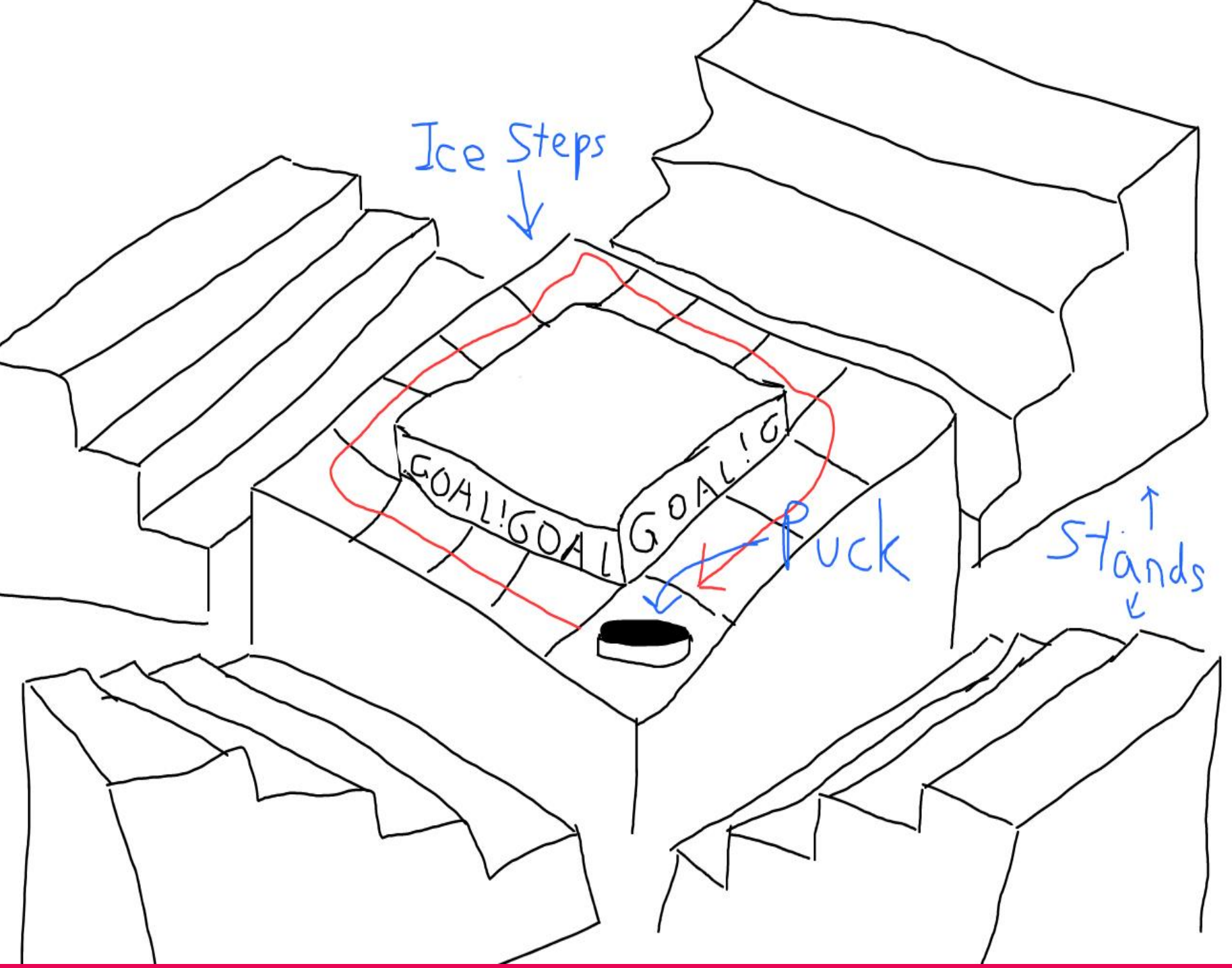


First Design

On the Edge Design

This was my initial design, which I at first envisioned would be like a hockey match being played on the edge of a glacier. However, this idea was scrapped die to feedback that the composition was poor and it did not make practical sense for a stadium to be on the edge of a glacier.

Second Design

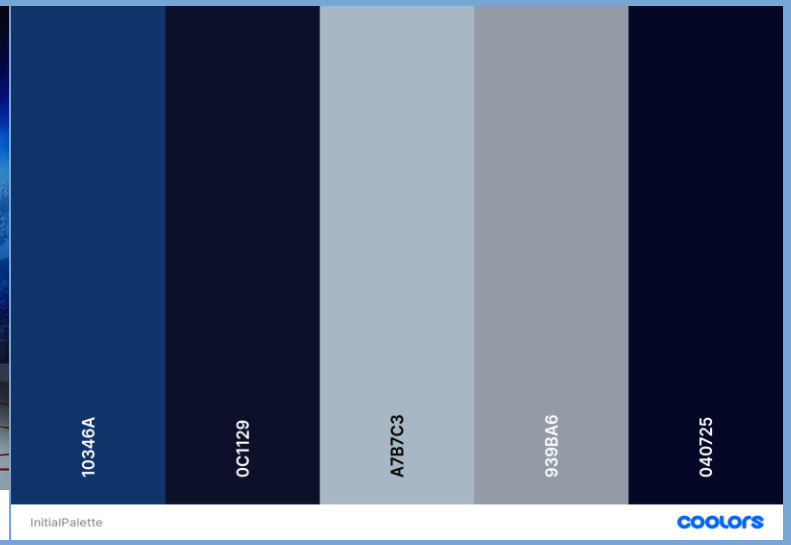


Classic Stadium Design

I changed my design to instead have the seats and stands entirely surround the steps. However, I removed the glass walls in this concept because they would cover the puck. The perspective was to be from this point of view in order to preserve the illusion.

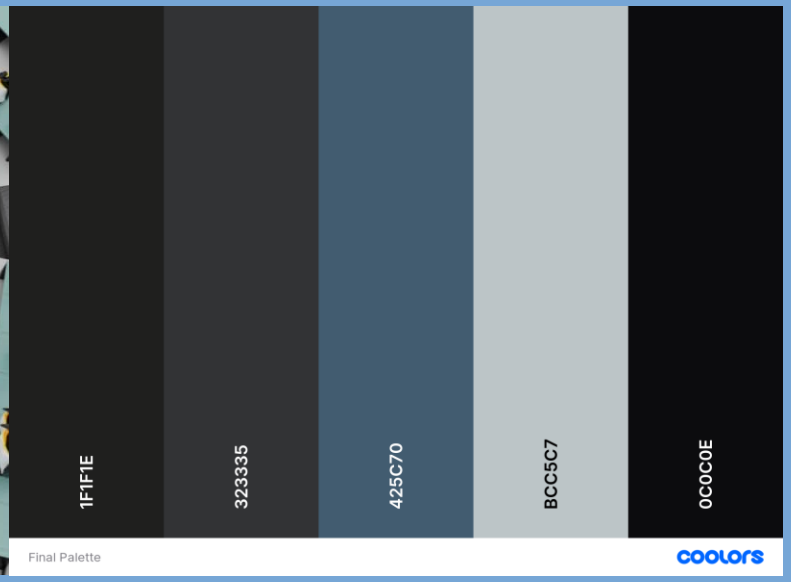
Colour Palette

(www.dreamstime.com, n.d.)



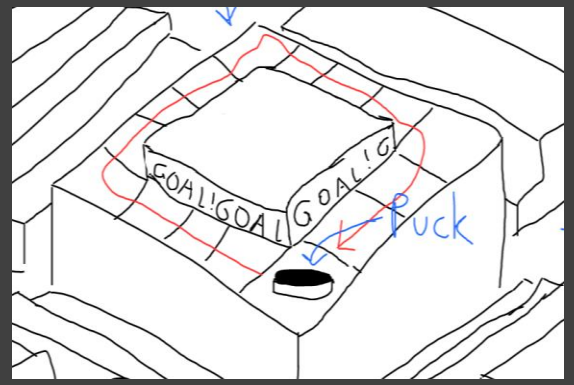
Initial Colour Palette Generated from Primary Resource

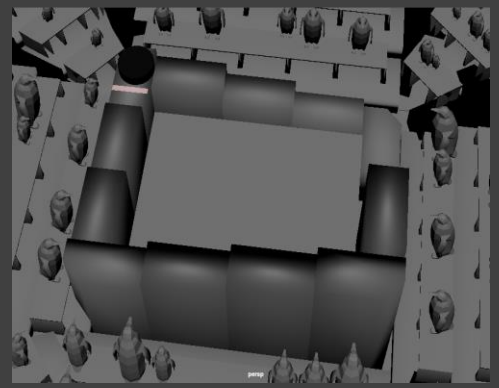
I liked the colour palette of this reference, so I had a colour palette generated online.



Final Colour Palette Generated from Final Product Snapshot

I tried to keep to similar colours, and my used the same colour palette generator to create this colour palette. Mine are darker and duller but overall simliar.

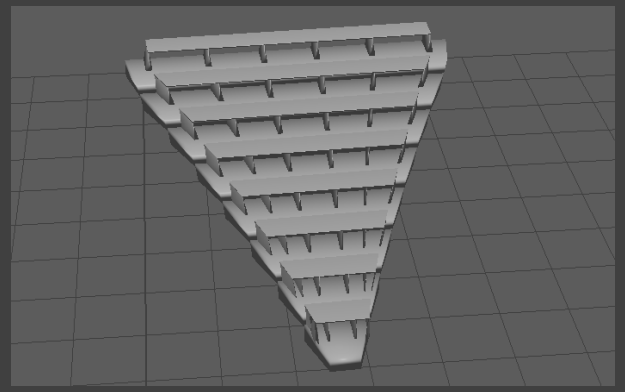




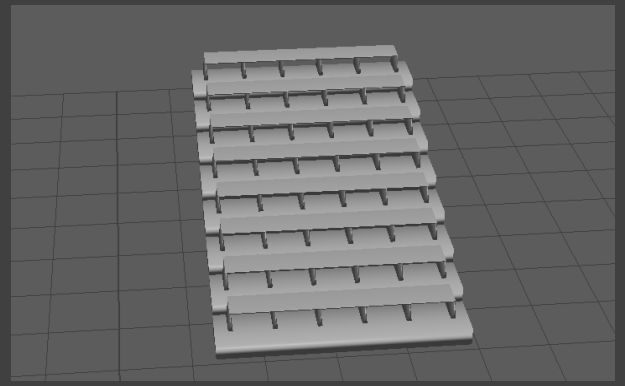
Initial Design vs Final Scene Models

Models

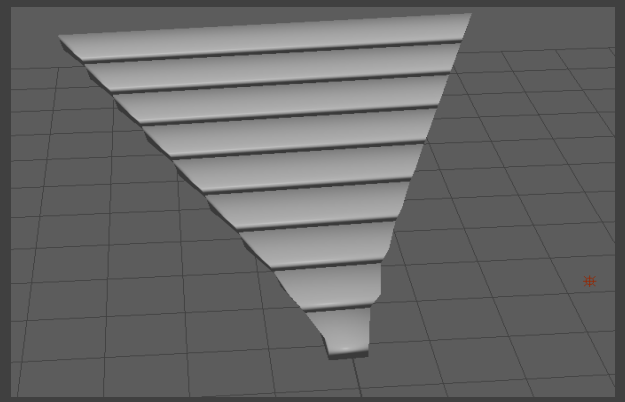
I tried to create similar models based on my design, and added the corner pieces when I decided I didn't like the negative space in the corner.



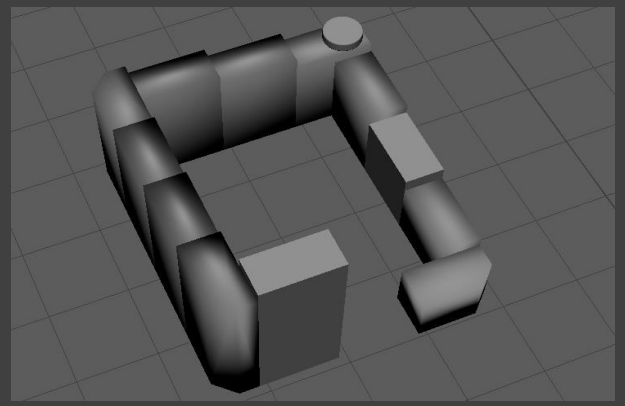
Corner Seats



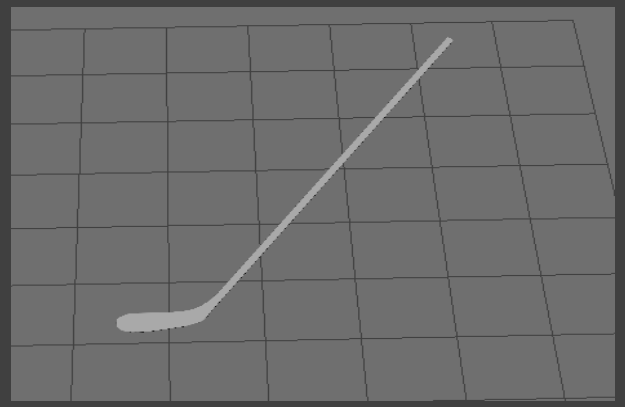
Side Seats



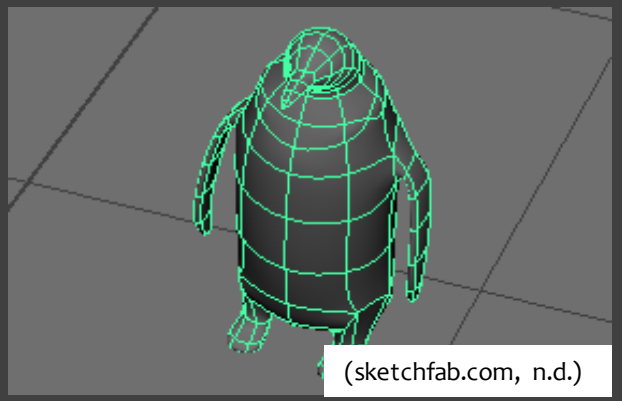
WalkWays



Steps and Puck



Hockey Stick

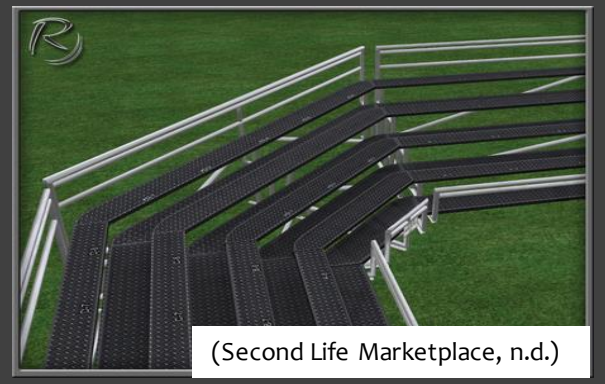


(sketchfab.com, n.d.)

Penguin

Modeling References

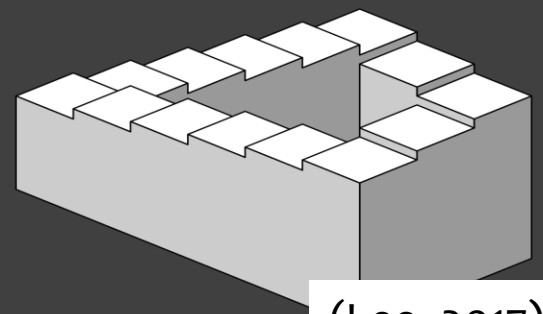
References corresponding to each model



(Second Life Marketplace, n.d.)

(www.gtgrandstands.com, n.d.)

(www.dreamstime.com, n.d.)

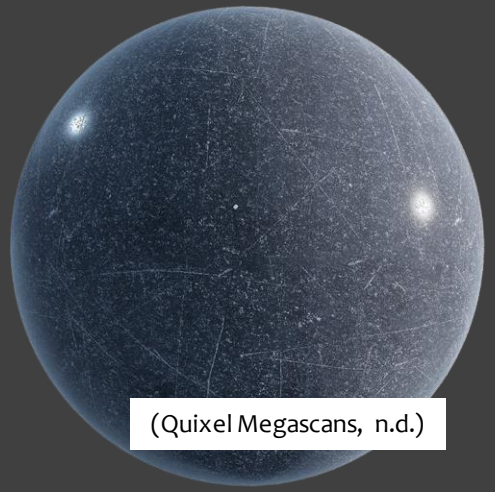


(Lee, 2017)

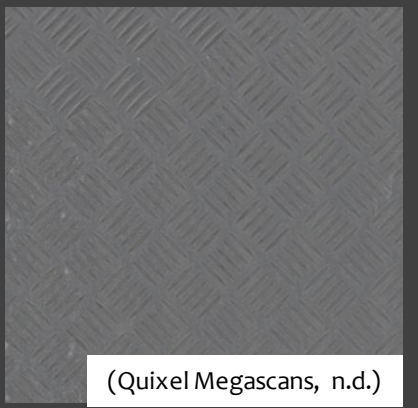
(FIGURE, n.d.)

(www.teliacompany.com, n.d.)

(Gifer.com, 2023)



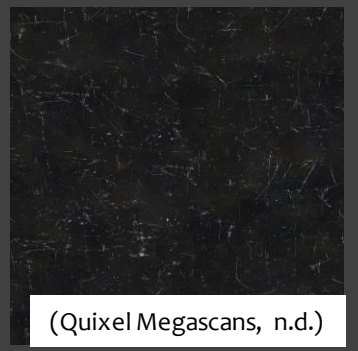
(Quixel Megascans, n.d.)



(Quixel Megascans, n.d.)

Texturing

Most of the textures were found online, and I tried to keep them in line with the colour palette.



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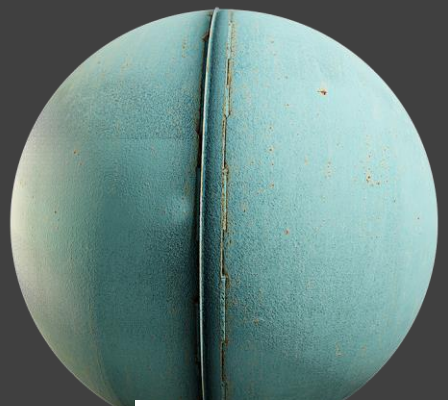
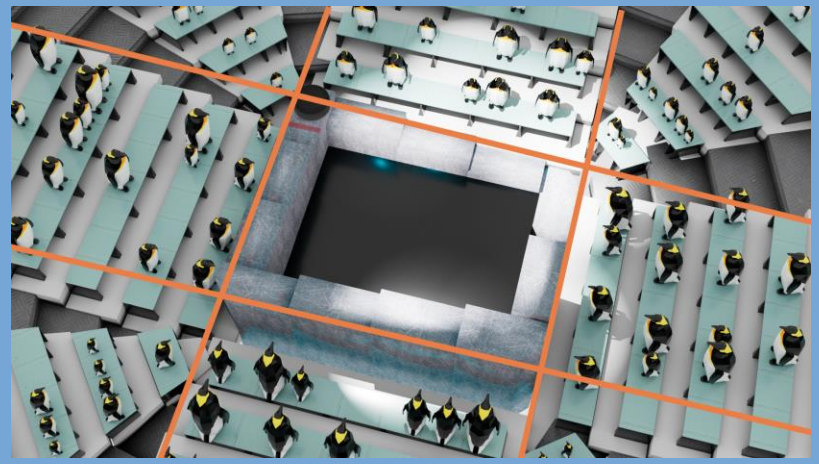


(Quixel Megascans, n.d.)

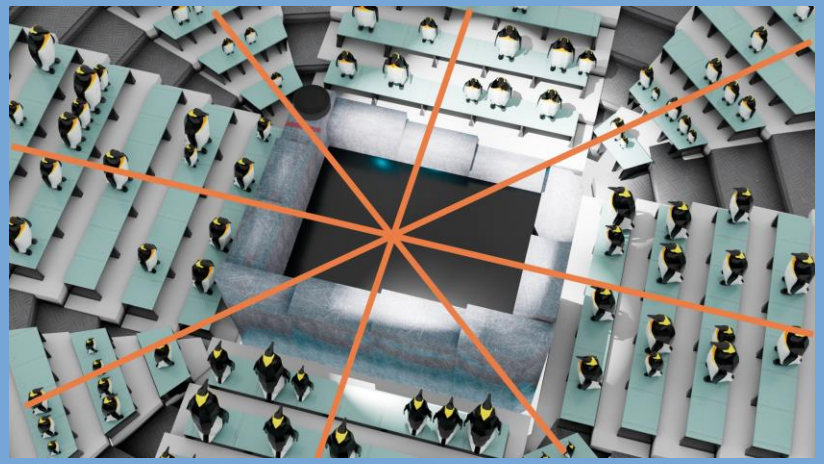
(sketchfab.com, n.d.)

Composition

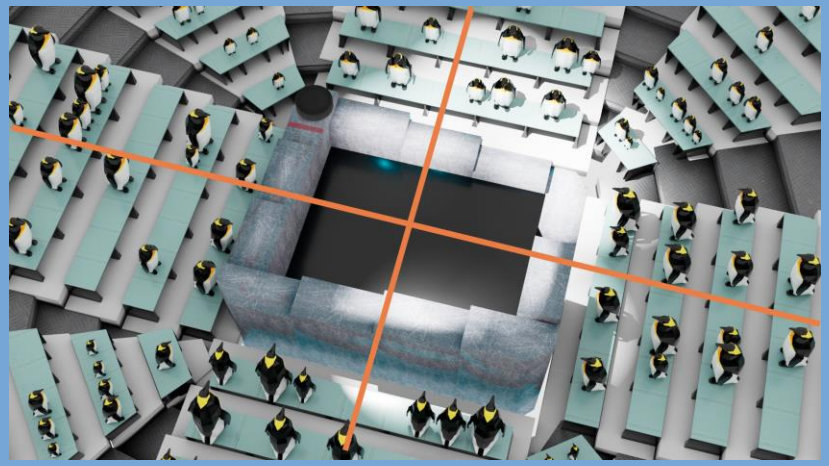
Composition Rules used for Production



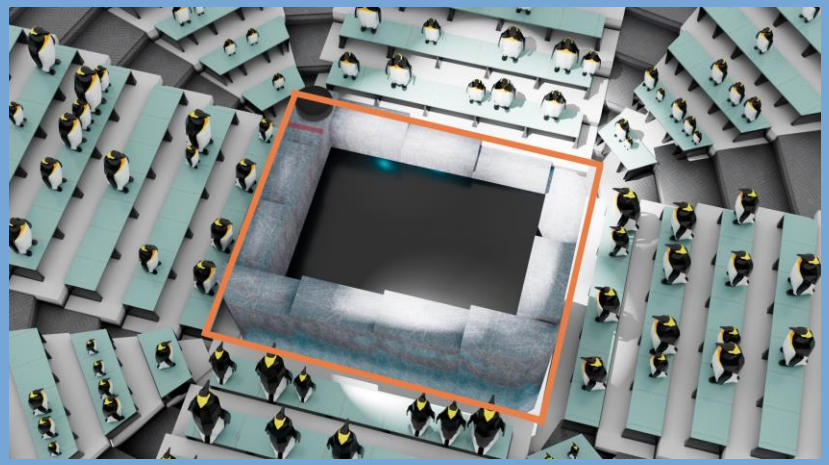
RULE OF THIRDS



DIAGONALS



SYMMETRY



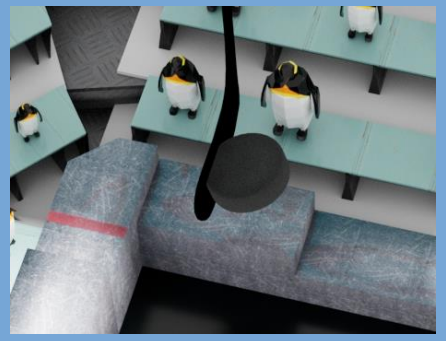
FRAMING

Narrative

Thought Process

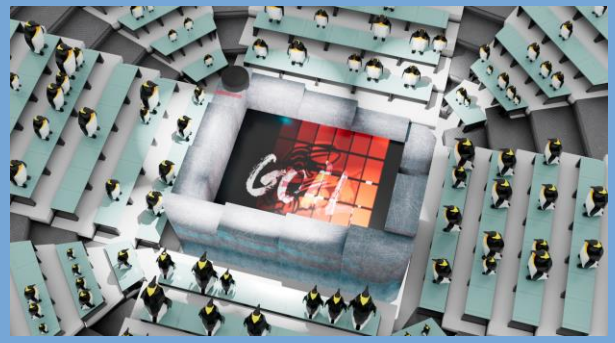
Instead of having the puck endlessly move around the steps in a monotone manner, I thought it would be more interesting and challenging to have the puck be struck and fly across the steps and bounce around the corners. The puck could then cross the boundary to score a goal. Therefore, the mood of the scene would be a happy one, where the penguins would be celebrating the scoring of a goal. I envisioned these components that I would need to create for a comprehensive narrative.

Storyboard



Hockey Stick Strikes Puck

Puck bounces around stadium and scores a goal



Penguins Celebrate and Jumbotron Activates

Penguins and lights return to initial state for loop

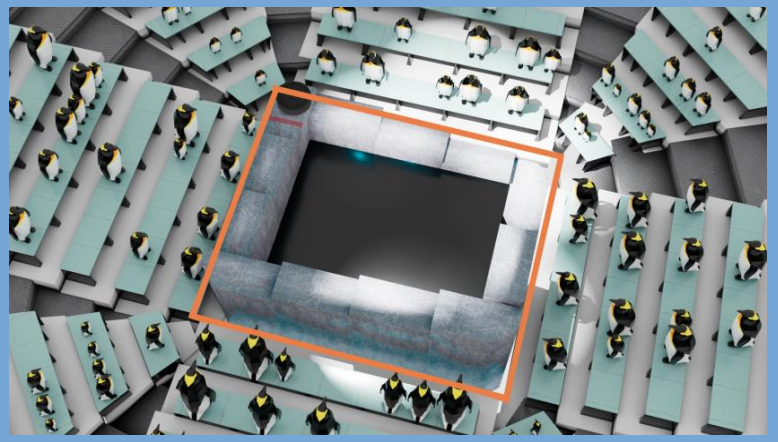
Animation

Animation Rules used for Production

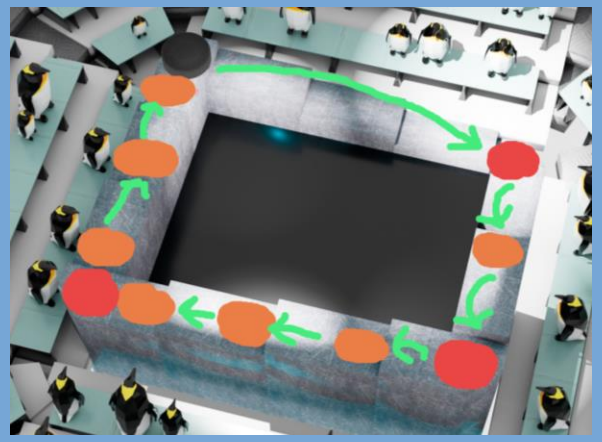
Staging – My entire stadium is setup to look like a frame/stage to highlight the steps and puck.

Pose to pose – The puck was animated pose to pose, with each corner being the key poses and the bounces being the intermediate frames.

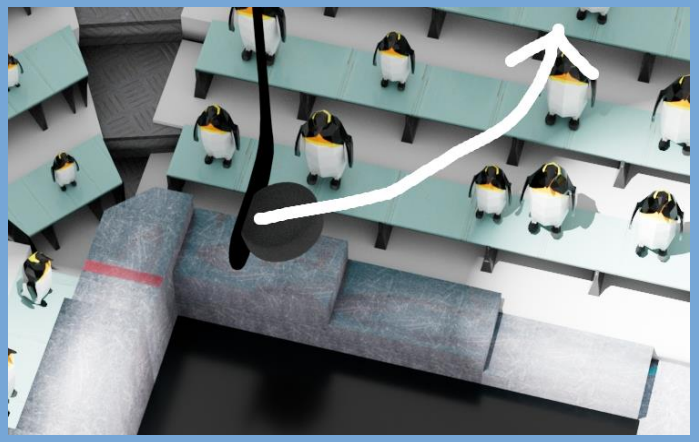
Follow through - The hockey stick follows through after contact, and the back of the puck lags behind the front as it falls off each step.



Staging



Pose to Pose



Follow Through

Animation

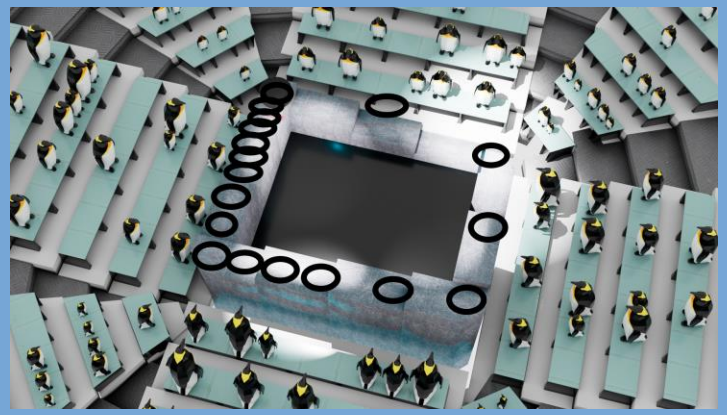
Animation Rules used for Production

Ease in Ease out – The puck movement accelerates very quickly (ease), but decelerates much slower(ease out). The spotlights also follow the same rule.

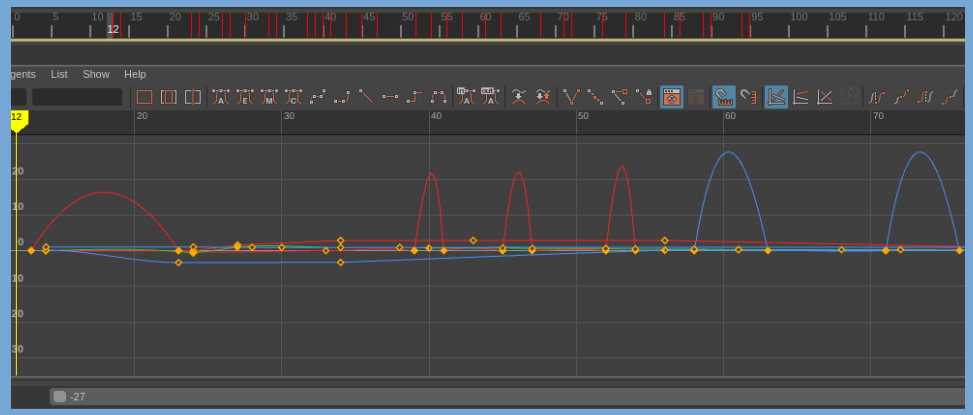
Arcs – Arcs were used heavily to describe the trajectory and orientation of the puck movement.

Timing – The timing of the puck position/bounce make a huge difference for realism of the movement.

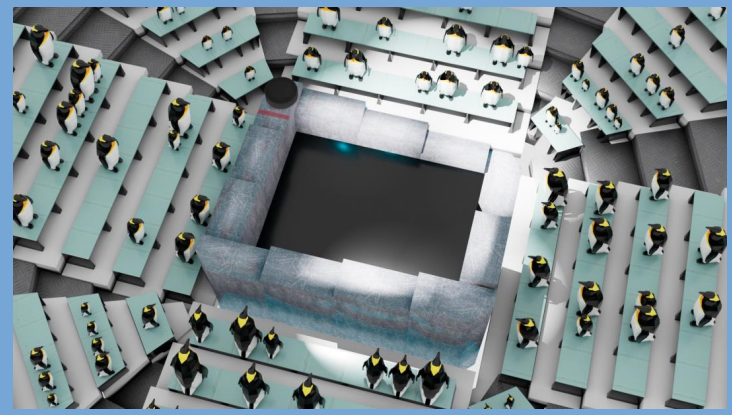
Appeal – All the components were made to appeal visually to a viewer.



Ease Out



Timing and Arcs

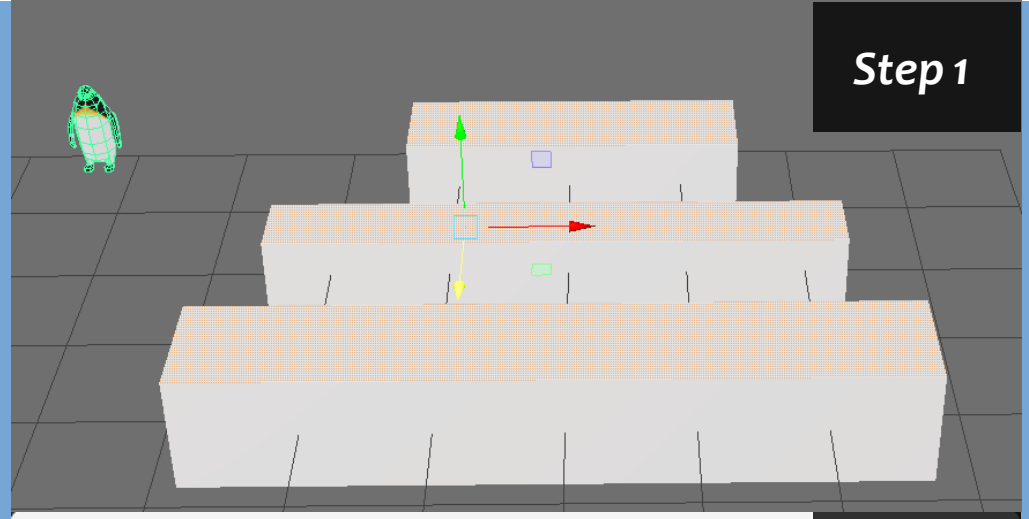


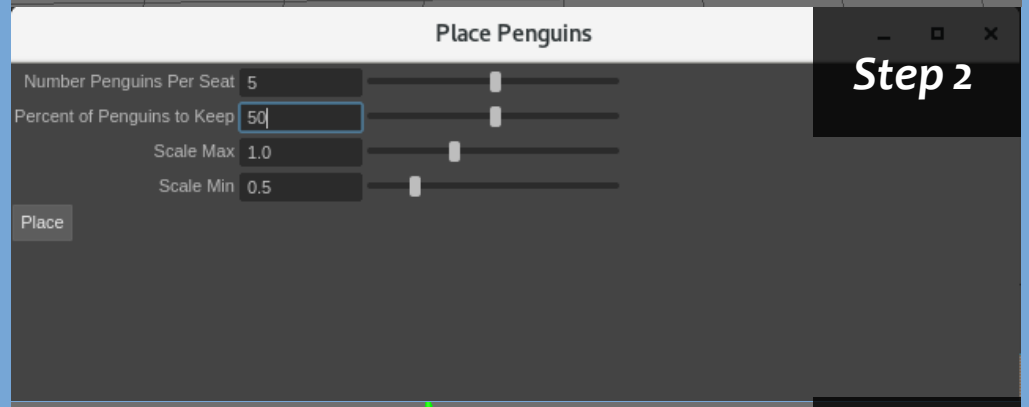
Appeal

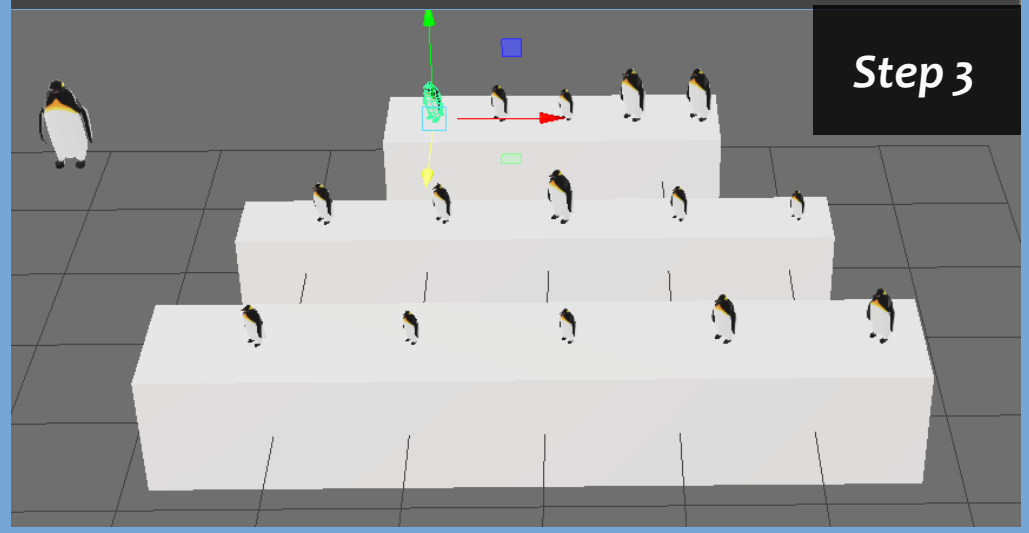
Script Algorithm

The Penrose Staircase

My script takes the input geometry and copies it to the faces. First, it separates the geometry and the faces by the order that they were selected. It then orders the points by distance to find the shortest edges in the SortSides() function. Using the midpoints of each edge, it return x number of evenly spaced points between them in the CopyToPoints(), and chooses a random user-input percentage of them to have a penguin placed there. The penguins are then rotated based on what sector of the stadium they are on in order to face the center. It also randomizes their sizes based on user input minimum and maximums. The UI was created based on these input criteria of number of penguins per face, what percentage to keep and the maximum and minimum scales of the penguins.

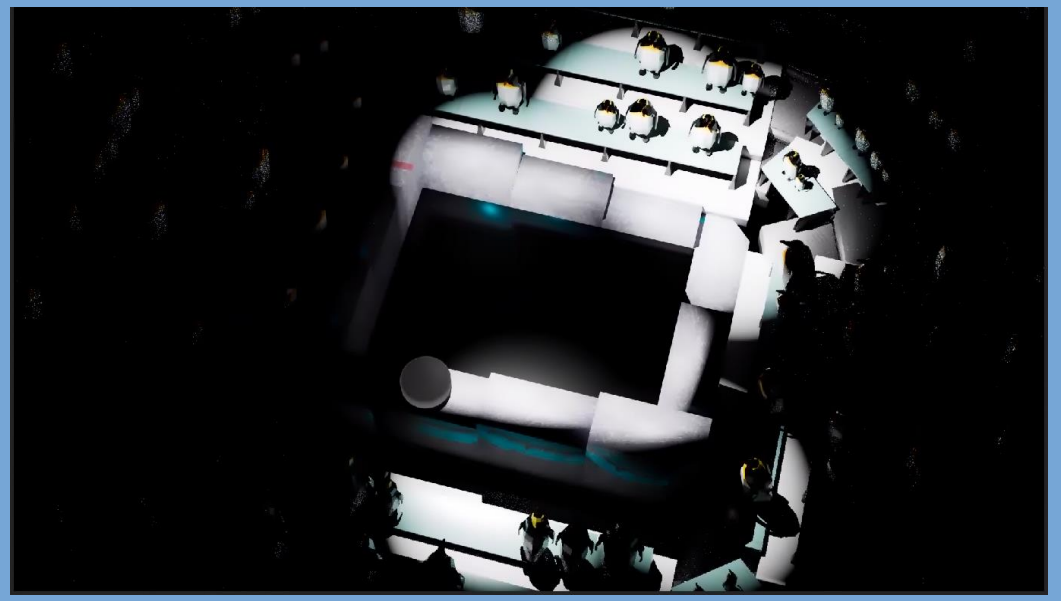


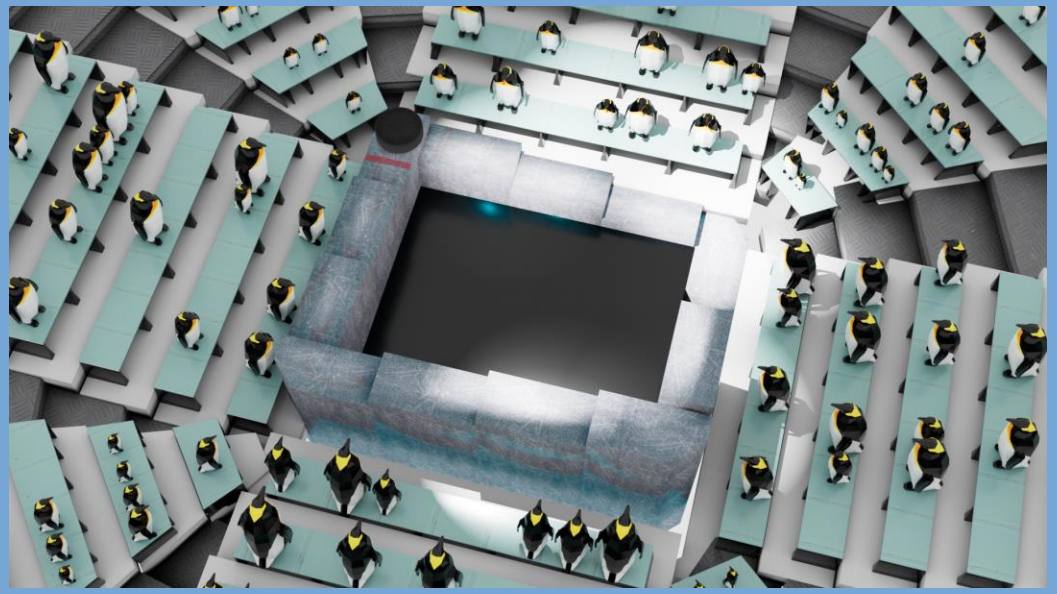




Lighting Design

I saw this lighting setup once at a hockey match, which was similar to this reference photo below. The spotlights moved around the rink to highlight the players, which I tried to recreate in my lighting setup. The scene was then too dark and a skydome light was added. The spotlights intensity was then turned up to highlight their presence.

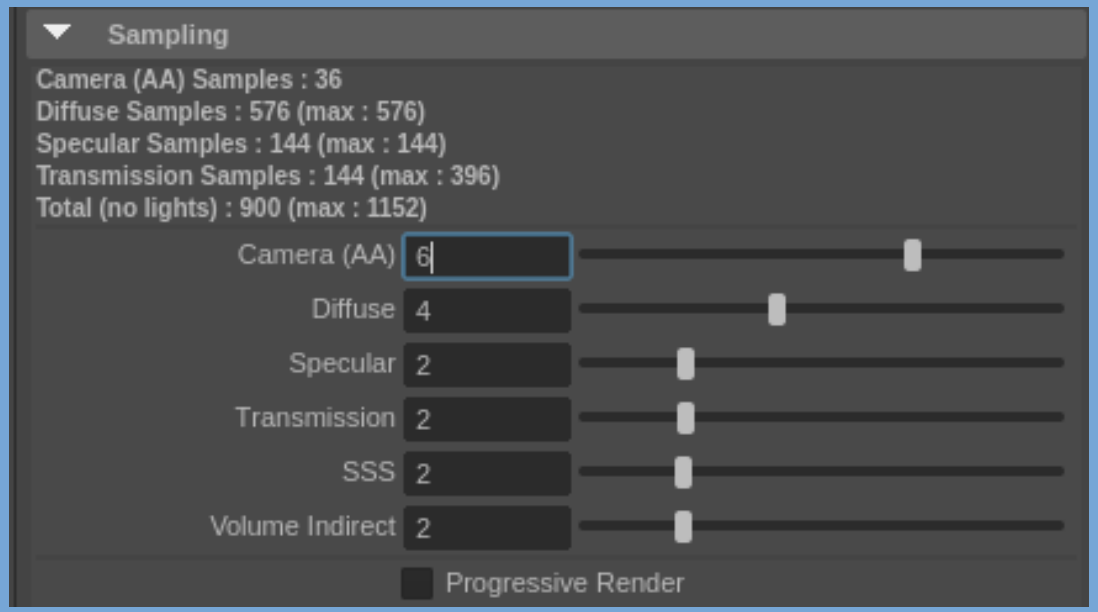


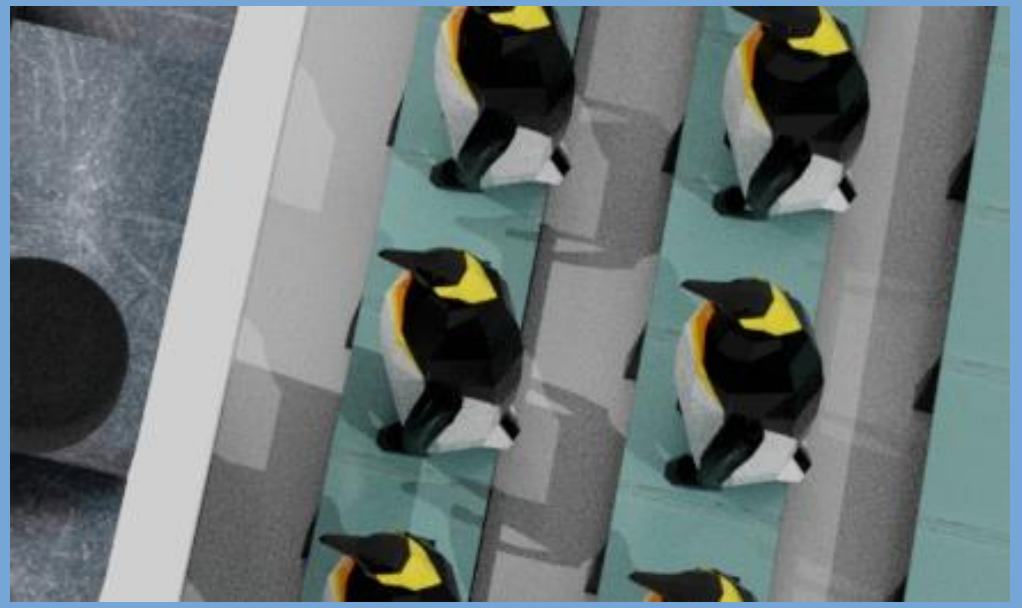


Rendering

The Penrose Staircase

My first render at default setings had a bit of specularity, so I turned up my render samples to these settings.

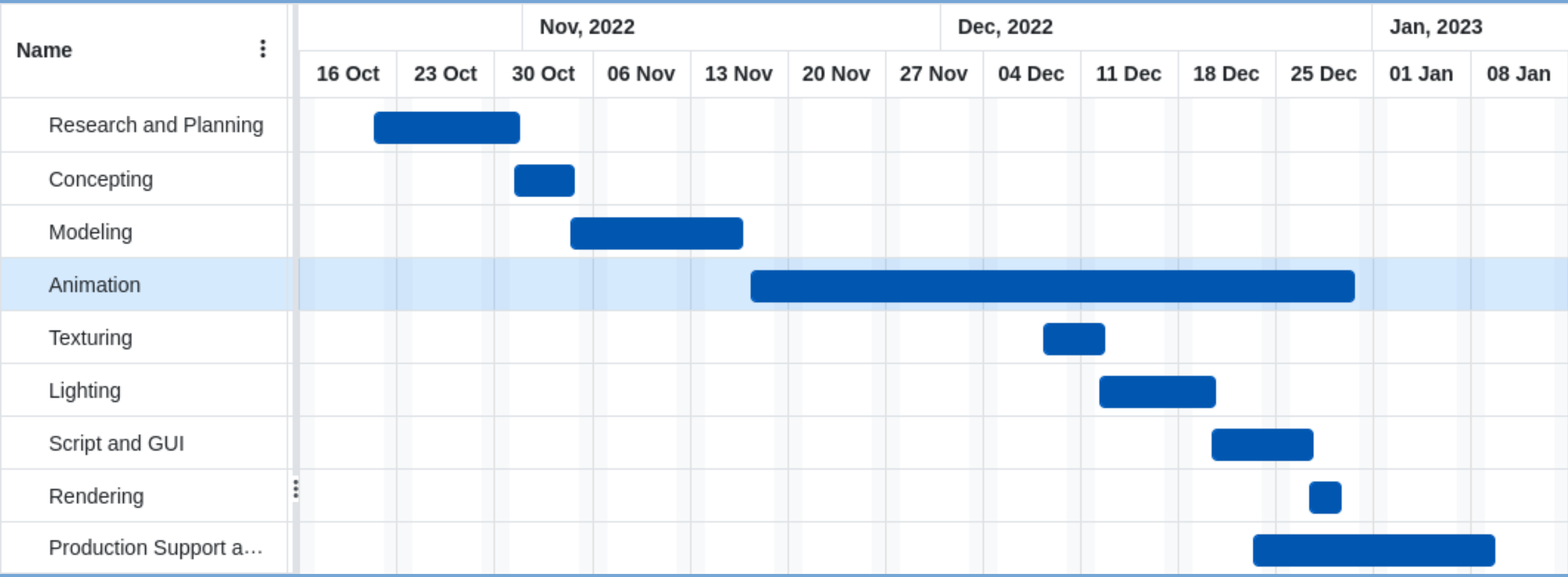




Default Render Settings

Final Rendering Settings

Gantt Chart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Nov, 2022
Dec, 2022
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06 Nov
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20 Nov
27 Nov
04 Dec
11 Dec
18 Dec
25 Dec
01 Jan
08 Jan
Research and Planning
Concepting
Modeling
Animation
Texturing
Lighting
Script and GUI
Rendering
Production Support a…

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Quixel Megascans. (n.d.). *Quixel Scratched Painted Iron*. [online] Available at: https://quixel.com/megascans/home?search=scratched&search=metal&assetId=scksebop.

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