asaph kalala
graduate digital design portfolio

about me

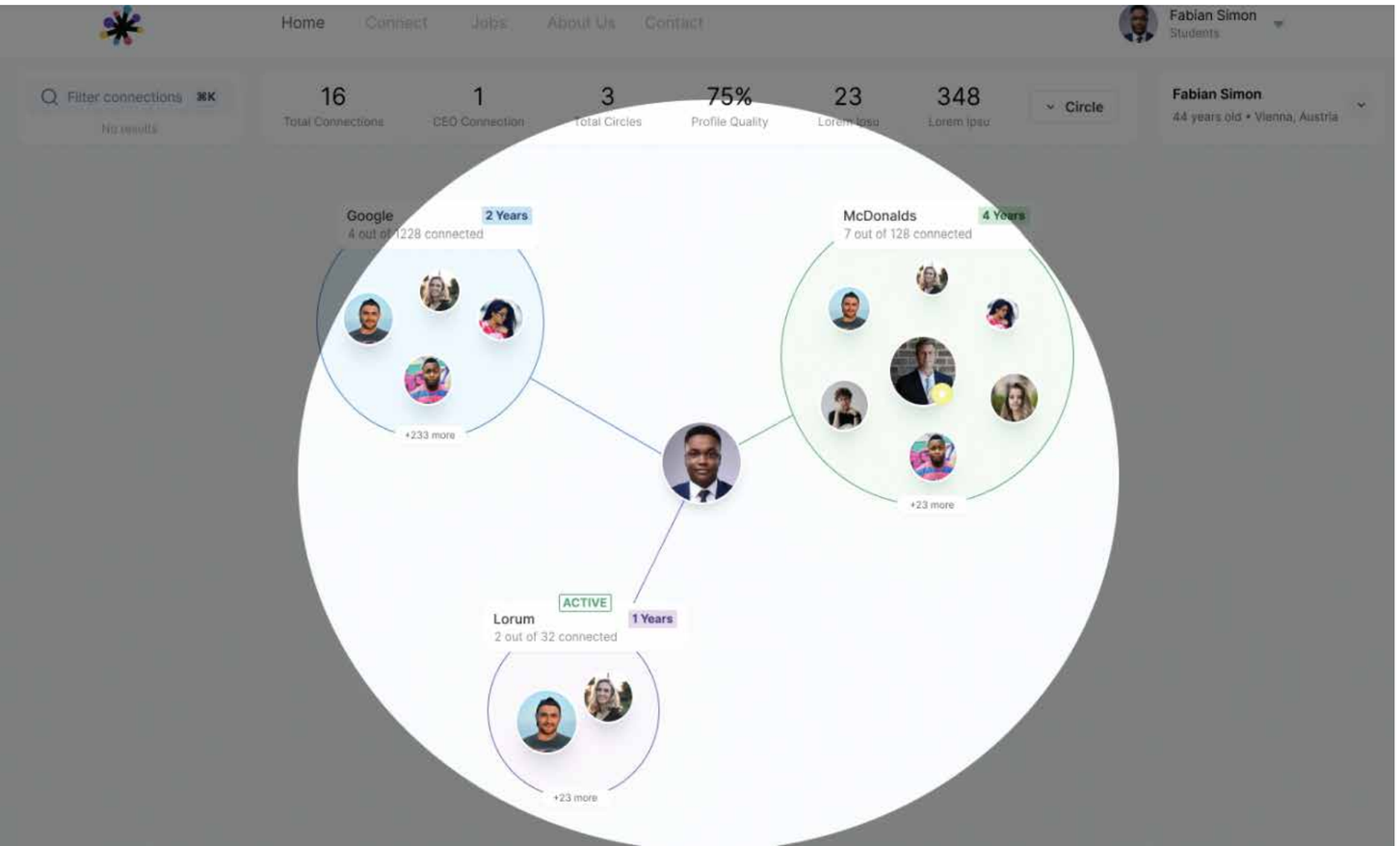
I am a Computer Graphics enthuiast with a strong foundation in computer science and a passion for merging programming, 3D visualisation and design. My expertise spans real-time rendering, procedural modelling, and graphics programming, enabling me to develop efficient workflows and innovative visualisation tools for architectural projects.

With a background in Computer Science, I leverage my proficiency in Python, C++, and GLSL to automate tasks, optimise rendering pipelines, and create custom tools for parametric design. I specialise in Unreal Engine, Autodesk (Python scripting), and 3D APIs, ensuring high-performance visuals while streamlining collaboration between architects and developers.

Graf_us

project 1; graf-us: data visualisation

Graf_us is a platform designed to help users visualise their professional and social networks, highlighting connections that may have been overlooked. With networking becoming more complex in a post-COVID world, Graf_us provides an intuitive interface for students and job seekers to strengthen and better understand their networks. Our SaaS model offers this service for free to users in exchange for anonymised data that helps companies identify culturally compatible candidates.



My role involved leading front-end development, conducting user research, and designing the UX to ensure seamless user interactions.

Problem:

The primary problem Graf_us addresses is the difficulty individuals, especially students and job seekers, face in understanding and l everaging their professional networks. While digital tools like social media and virtual communication have expanded networking opportunities, it's often hard for users to visualise the scope of their connections and identify potential opportunities within their existing networks. The challenge is helping users gain insights into how they can optimise these connections for career development.

Research Findings:

Lack of Network Visibility:
Users, particularly young professionals, struggle to see the full extent of their networks and often miss opportunities to connect with valuable contacts.

Need for Intuitive Tools:
Existing networking platforms (like LinkedIn) are primarily text-based, which can make it hard for users to spot patterns or connections between different contacts visually. Users wanted a more graphical representation to see how their contacts are interrelated.

Interest in Career Compatibility:
Both users and companies expressed interest in a tool that could help match individuals to organizations based on cultural fit, which was often missing from traditional job search platforms.

Preference for Simplified Interaction:
Users preferred a tool that was simple and easy to use, allowing them to quickly visualise their network without a steep learning curve. They found that overly complex software could become a barrier to using the service regularly.

These insights guided the UX design and user research, allowing me to tailor Graf_us to meet the specific needs of its target audience.

User Profile: Sarah, Recent Graduate
Age: 23
Occupation: Recent University Graduate (Marketing)

Background: Sarah has recently graduated with a degree in Marketing and is looking for her first full-time role. She has some professional contacts from internships and university networking events but finds it hard to visualise how they are connected and what opportunities may arise from her network.

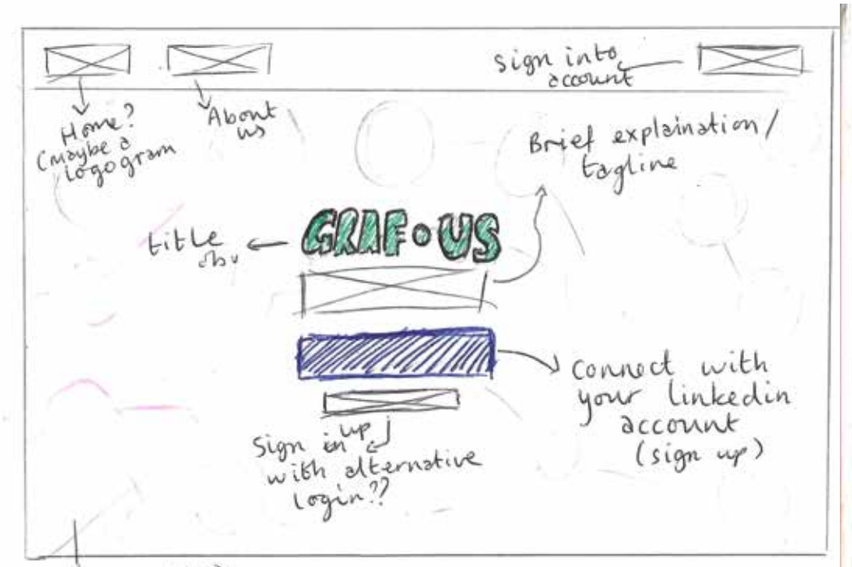
Challenges: Struggles to understand the extent of her professional network.
Unsure how to leverage connections for job opportunities.
Finds existing networking platforms overwhelming and not visually intuitive.

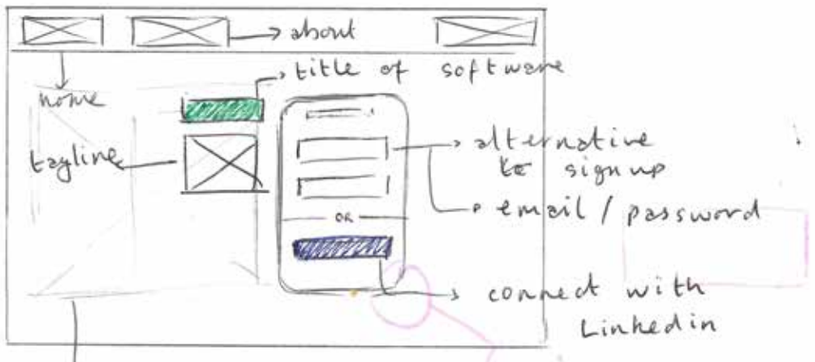
Goals: Wants a tool to visualize and better understand her professional connections.
Seeks to build a strong network that can help her in securing her first full-time job.

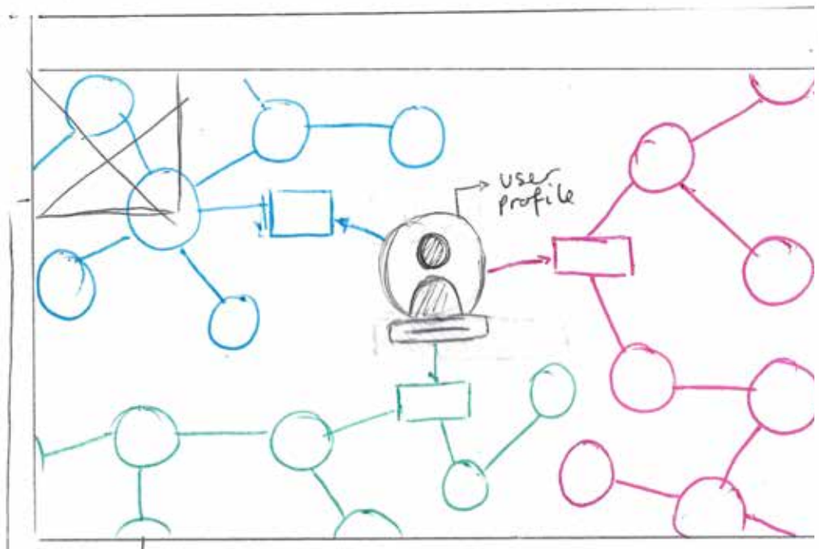
Tech-Savviness: Moderate. Uses LinkedIn and job search platforms but isn't comfortable with complex networking tools.

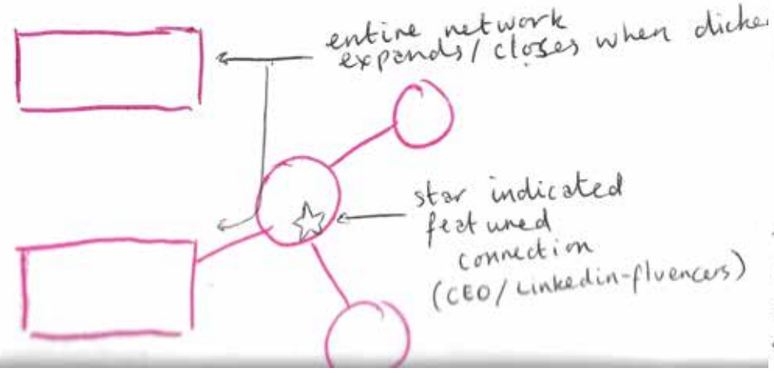
Needs from Graf_us:
A user-friendly platform that provides visual representations of her network.
Insights into potential career opportunities through her connections.

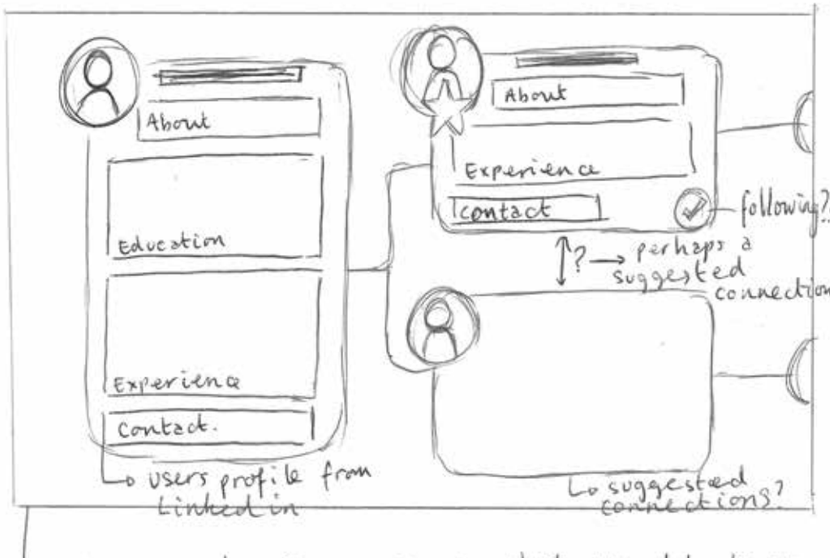
wireframing and prototype







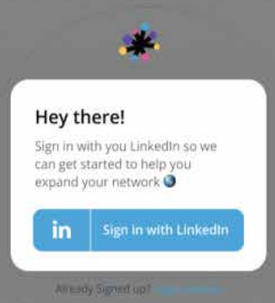




final software screenshots

Did you know?

93% of recruiters use LinkedIn to research and recruit candidates*

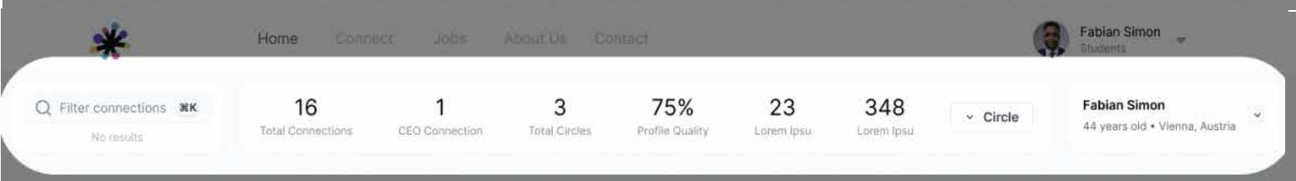


Did you also know?

Using our advanced algorithms and revolutionary blockchain implementation you can expand your network like crazy**

*According to statistics provided by linked on

**According to our completely biased opinion



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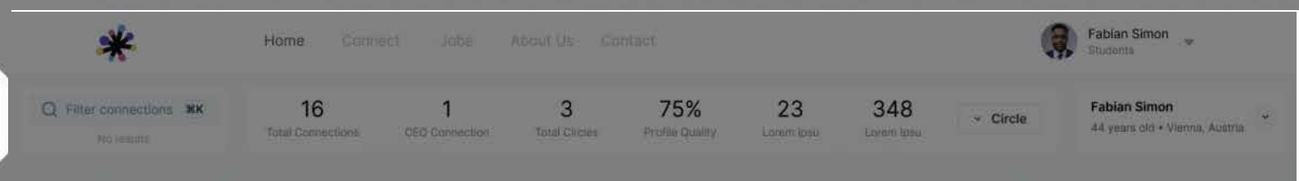
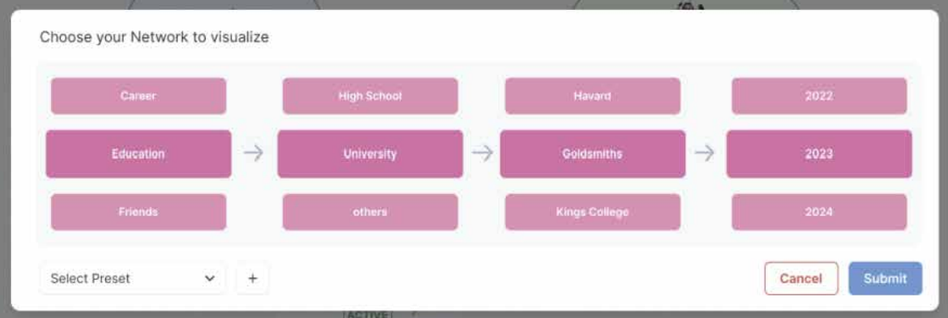




project 2: open gl hair simulation

As part of my final year undergraduate project, An Afro Hair Modelling Tool using Various Computer Graphics Technologies

Role: Developer, Researcher
Technologies Used: OpenGL, C++, GLFW, ImGUI, Autodesk Maya (initial phase)

Key Contributions:
Transitioned from Autodesk Maya to OpenGL for greater control and performance. Implemented procedural hair generation using Bezier curves and De Casteljau's algorithm. Designed a user-friendly GUI with sliders for parameters like density, length, and curliness.

Motivation
Addressed the underrepresentation of Afro-textured hair in 3D modeling tools.

Aimed to provide artists with a specialised tool for creating diverse hairstyles in animation/games.

Technical Implementation
Core Algorithms:

Bezier Curves: Used De Casteljau’s algorithm to model hair curls.
Follow-the-Leader Algorithm: Simulated realistic hair behavior.

Features:
Adjustable parameters (curl tightness, strand density, length).
Interactive camera controls (zoom, rotation).
Real-time rendering with OpenGL.

Challenges & Solutions:
Switched from Maya to OpenGL due to performance limitations. Debugged instability issues in hair simulation.

Example of the style of hair I hoped to achieve with this project

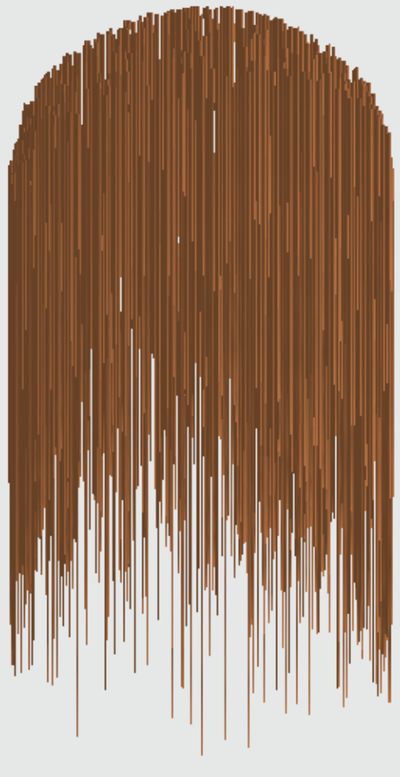
Some code snippets

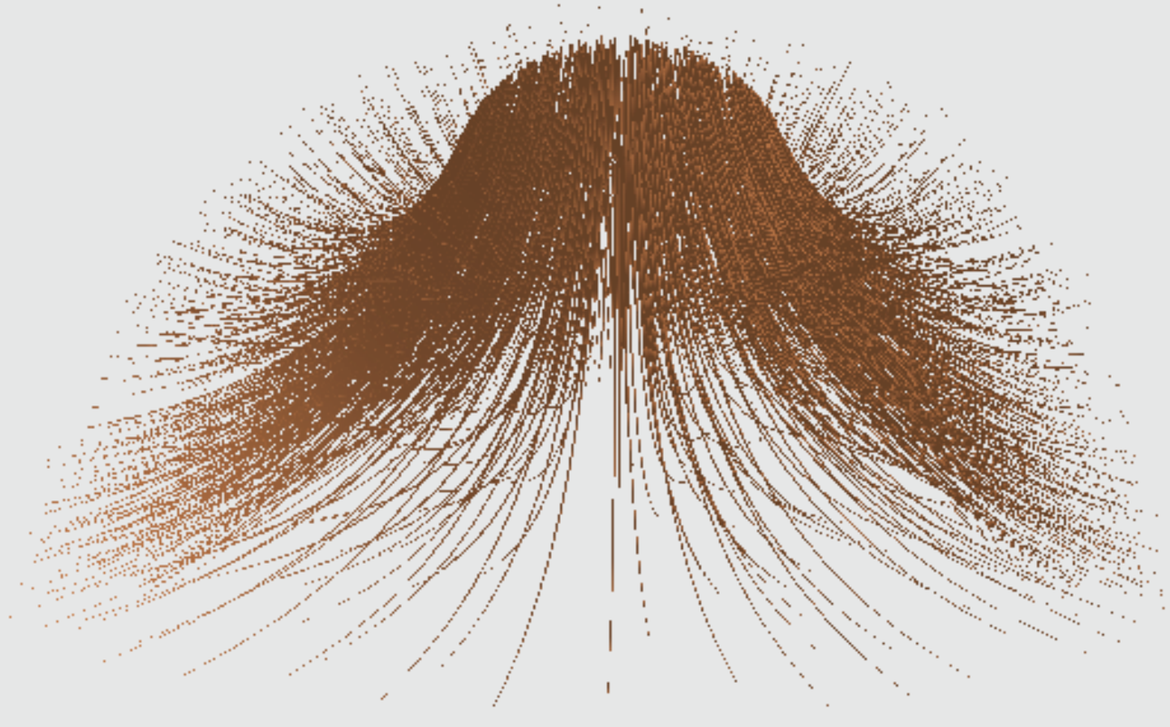
```glm
// Calculate a point on a Bezier curve at parameter 't' (0 to 1)
glm::vec3 bezier_point(float t, glm::vec3* control_points, int num_points) {
    glm::vec3 points[num_points];  // Temporary array to store intermediate points
    std::copy(control_points, control_points + num_points, points);  // Copy control points

    // De Casteljau's algorithm: Recursively interpolate between control points
    for (int k = 1; k < num_points; k++) {
        for (int i = 0; i < num_points - k; i++) {
            points[i] = (1.0f - t) * points[i] + t * points[i + 1];  // Linear interpolation
        }
    }
    return points[0];  // Final interpolated point on the curve
}
```

Snippet 1: Generates smooth curves for hair strands by interpolating between control points.

```glsl
// Compute curliness based on neighboring hair strands (GPU shader code)
float curliness(int globalVertexIndex, float prevCurliness, float globalCurliness) {
    float curliness = prevCurliness;
    int rootVertexIndex = globalVertexIndex / verticesPerStrand;
    int neighbors = 0;

    // Average curliness of neighboring strands for cohesion
    for (int i = -1; i <= 1; i++) {
        int neighborIdx = rootVertexIndex + i;
        if (neighborIdx >= 0 && neighborIdx < numStrands) {
            curliness += positions.data[neighborIdx * verticesPerStrand].w;  // Neighbor's curliness
            neighbors++;
        }
    }
    curliness /= neighbors;  // Normalize
    return clamp(curliness, 0.0, 1.0);  // Ensure within bounds
}
```

Snippet 2: Ensures realistic curl distribution by averaging neighboring strand properties.





Visual Demonstration of an attempt of curling hair

Results & User Testing

Feedback:

Artists found difficulty with the UI and also noted limitations in curl realism. Beginners of the software also found the tool accessible for experimenting with hair textures. In the future, I would find a way to integrate machine learning for dynamic curl patterns, expand hair types (braids, twists) and improve physics simulations.

project 3: 3D Modelling and Texturing Low Poly Game Assets

Project Scope & Objectives

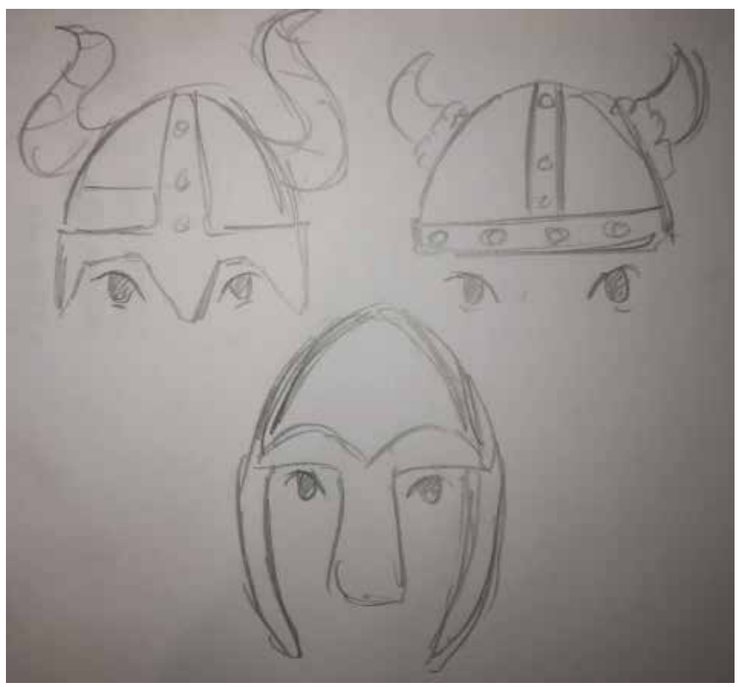
Goal: Create stylized, low-poly assets inspired by Gabriel Soares' bold, cartoonish aesthetic.

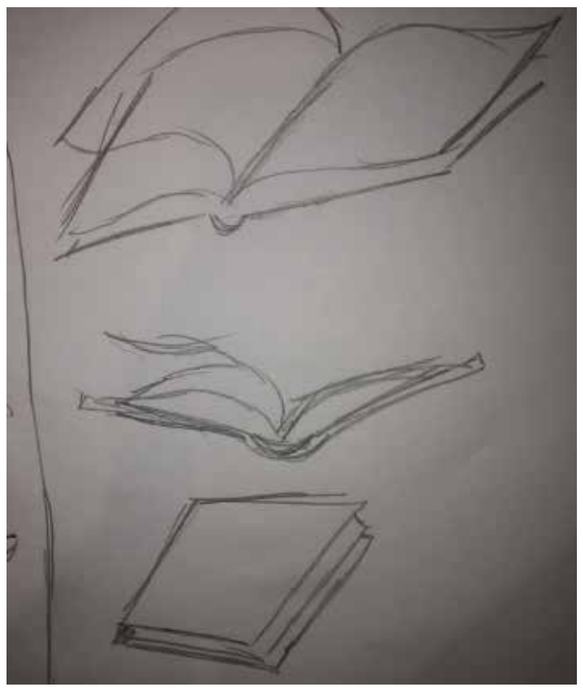
Focus Areas:
Hard-Surface Modeling: Clean topology for deformation (e.g., helmet horns).
Dynamic Shapes: Exaggerated proportions (tall sofa back, curved book pages).
Non-Photorealistic Rendering (NPR): Toon shading and pop-art lighting experiments.

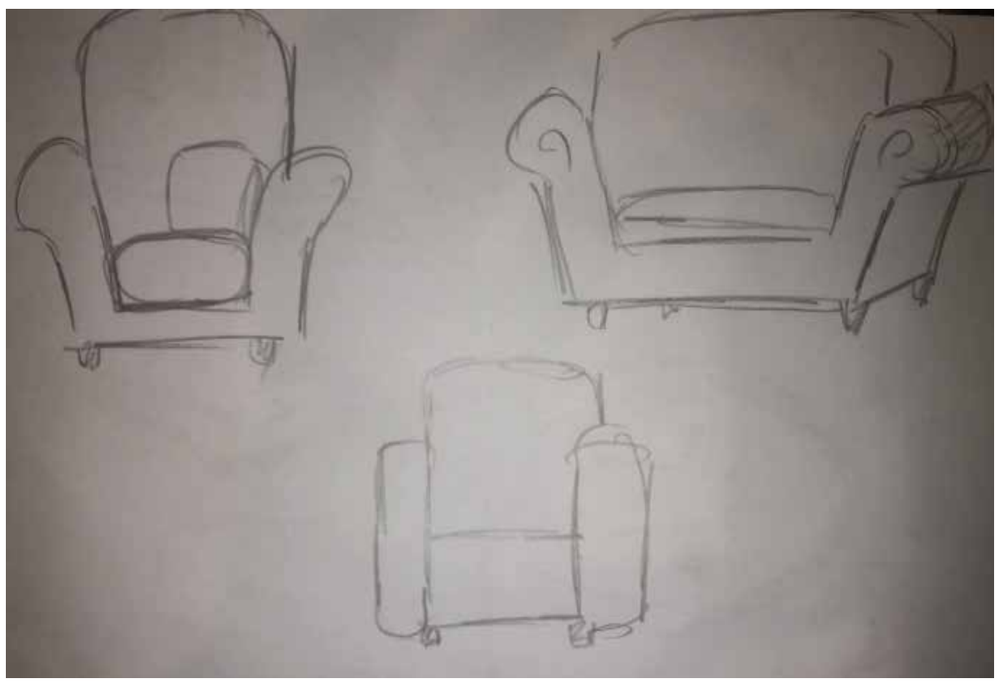
Tools and Pipeline:
Modeling was done using Autodesk Maya and the main features I used were Bend/Nonlinear deformers for curves, edge loops for controlled subdivisions, mirroring for symmetry.

For UV Mapping, I used a combination of Maya's UV Editor and Adobe Photoshop for Planar projections for complex shapes and hand-painted textures (metal/wood/ivory).

inspiration and inital 2d sketches







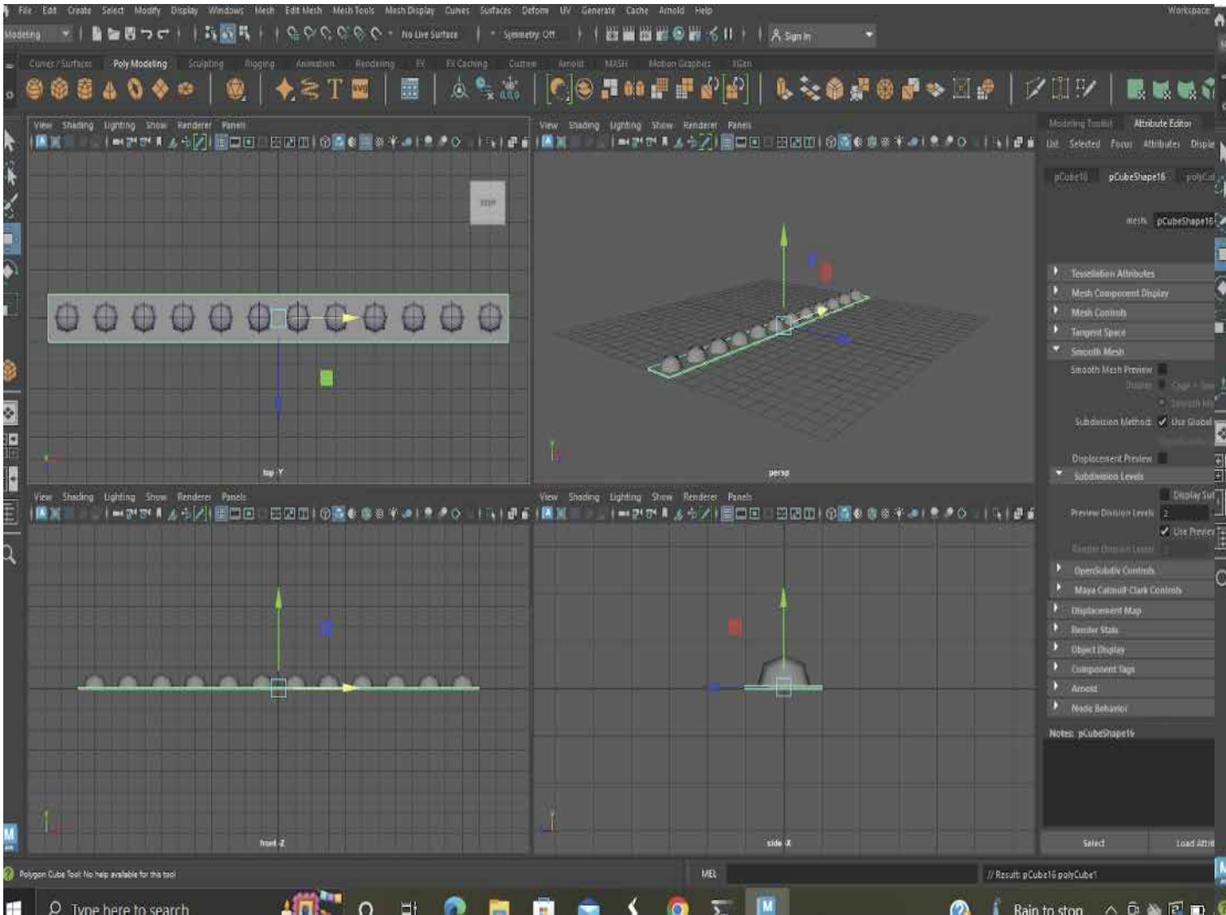
A. Viking Helmet

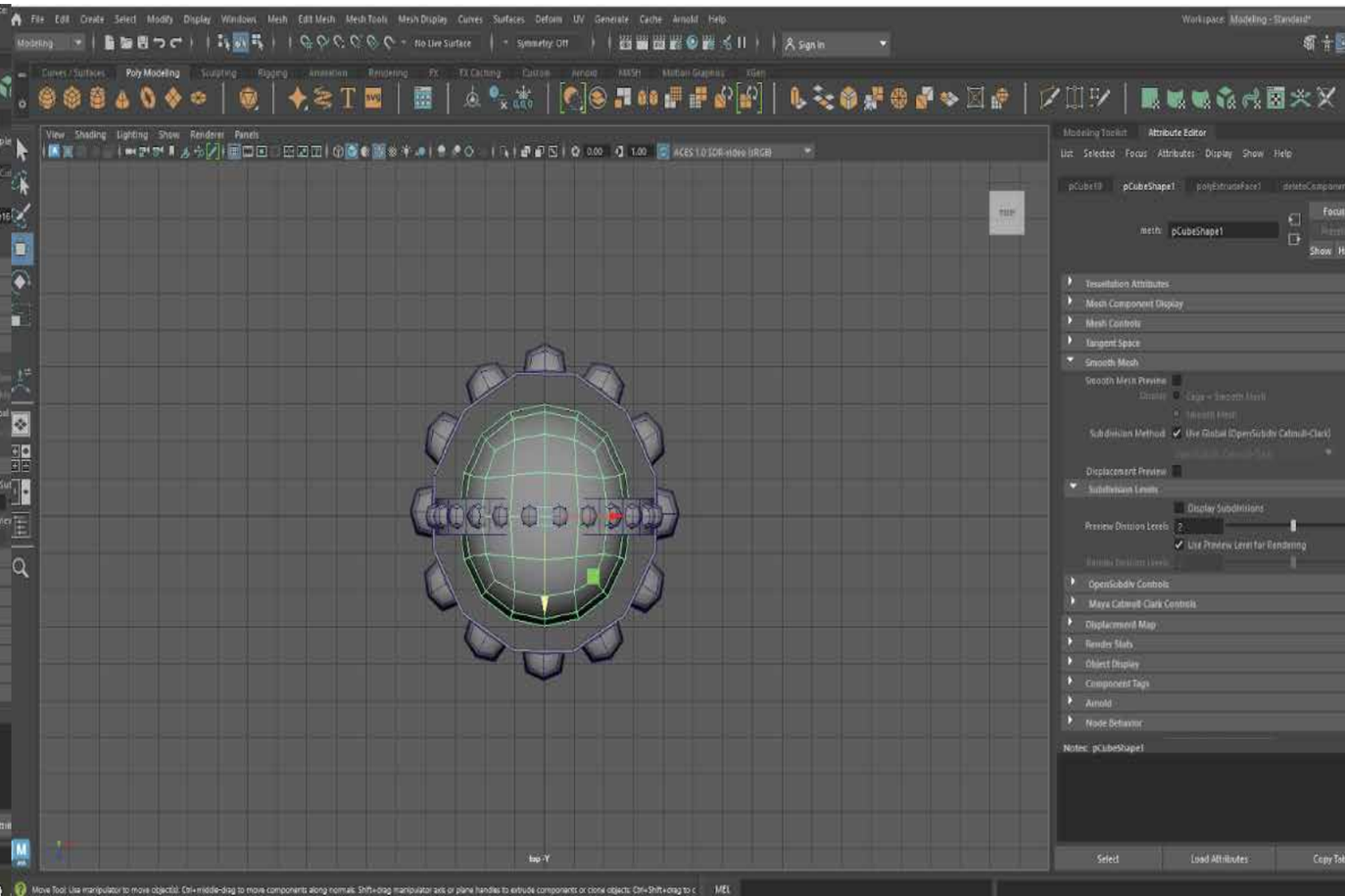
Inspiration: Nordic designs with exaggerated horns.

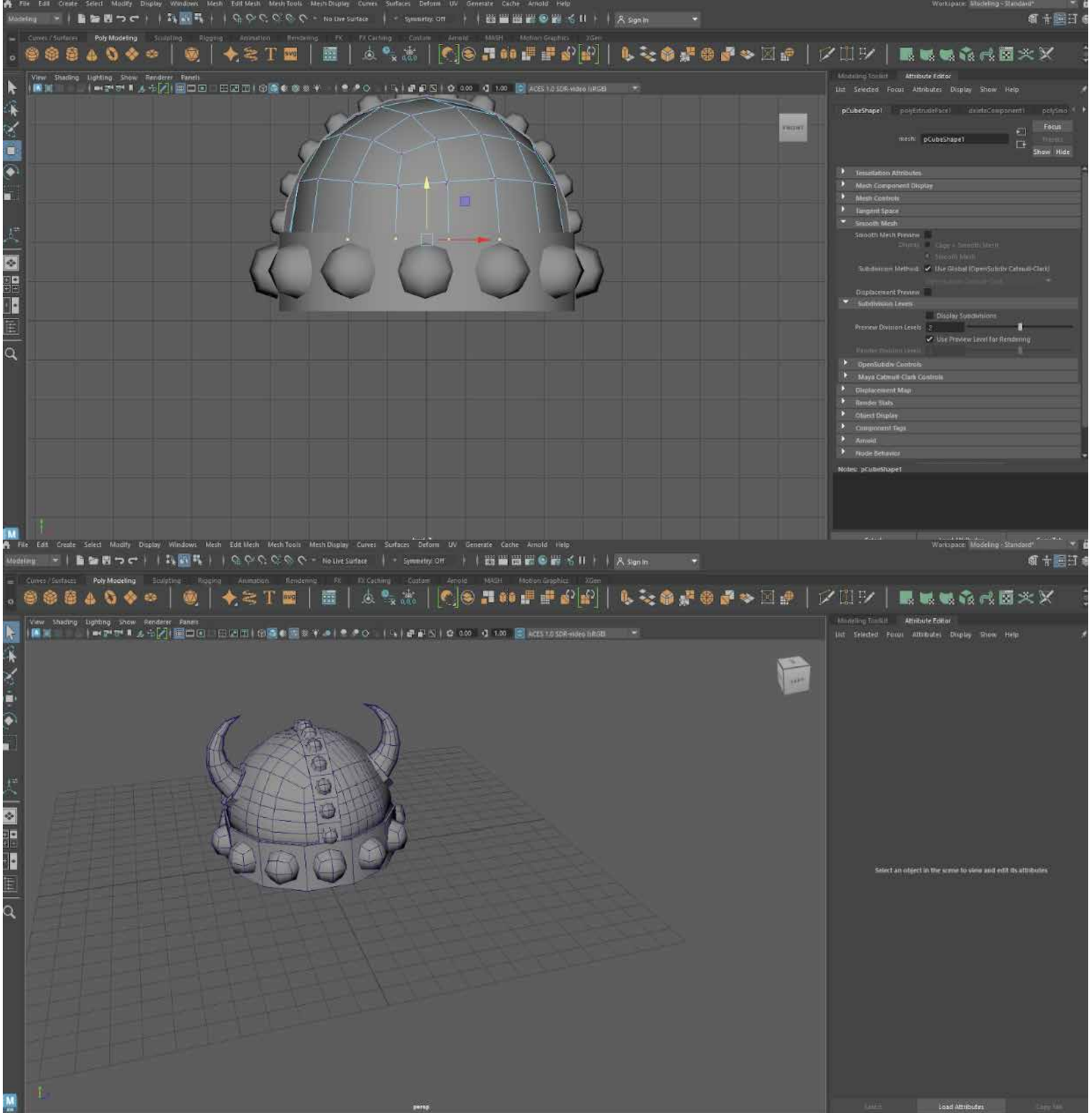
Technical Challenges:

Horn Curvature: Used Bend deformer with 180° curvature for circular rings.

Stud Placement: Scaled and duplicated spheres using Grid Snap for precision.



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Tangent Space
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Displacement Map
Render Stats
Object Display
Component Tags
Arnold
Node Behavior
Notes: pCubeShape1
persp
Select an object in the scene to view and edit its attributes
Load Attributes

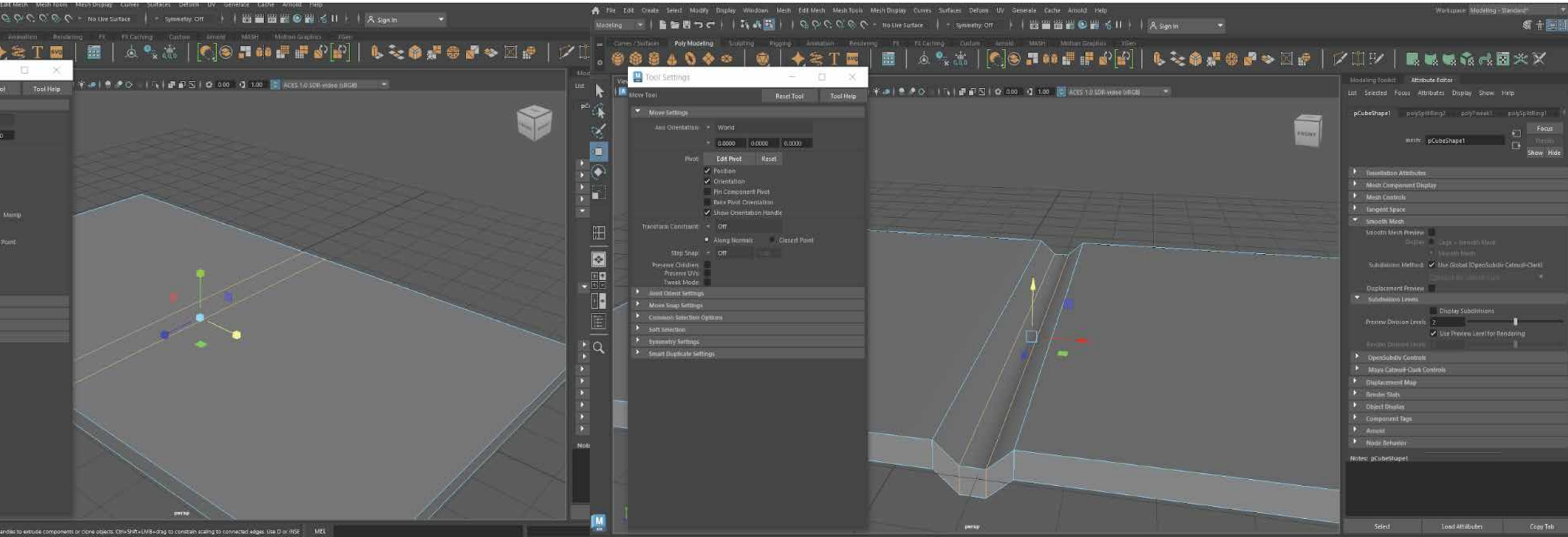
B. Open Book (Mid-Page Turn)

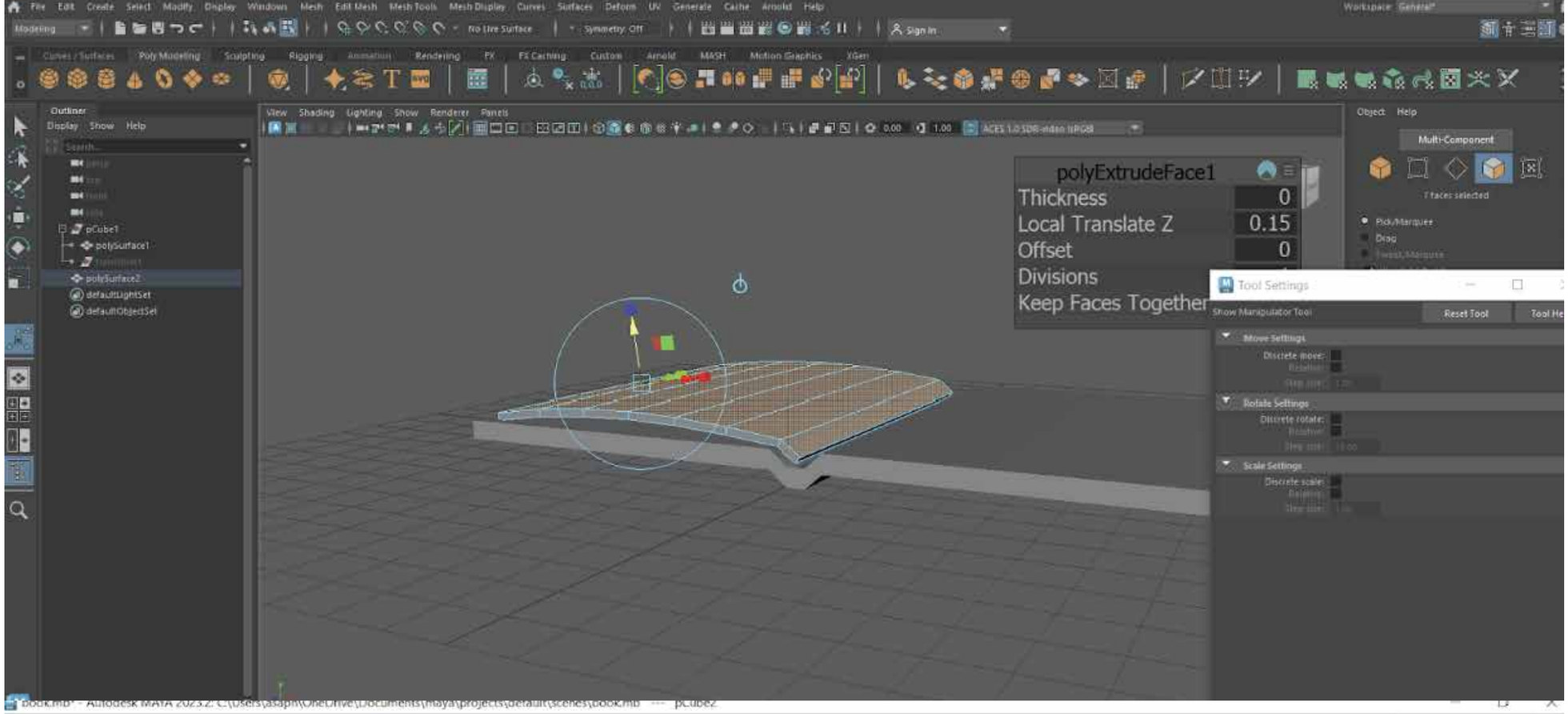
Dynamic Element: Simulated a page "caught in motion."

Solutions:

Edge Loops: Added geometry for spine flexibility.

Failed Attempt: Abandoned flat cube page-turn; opted for skewed extrusion.

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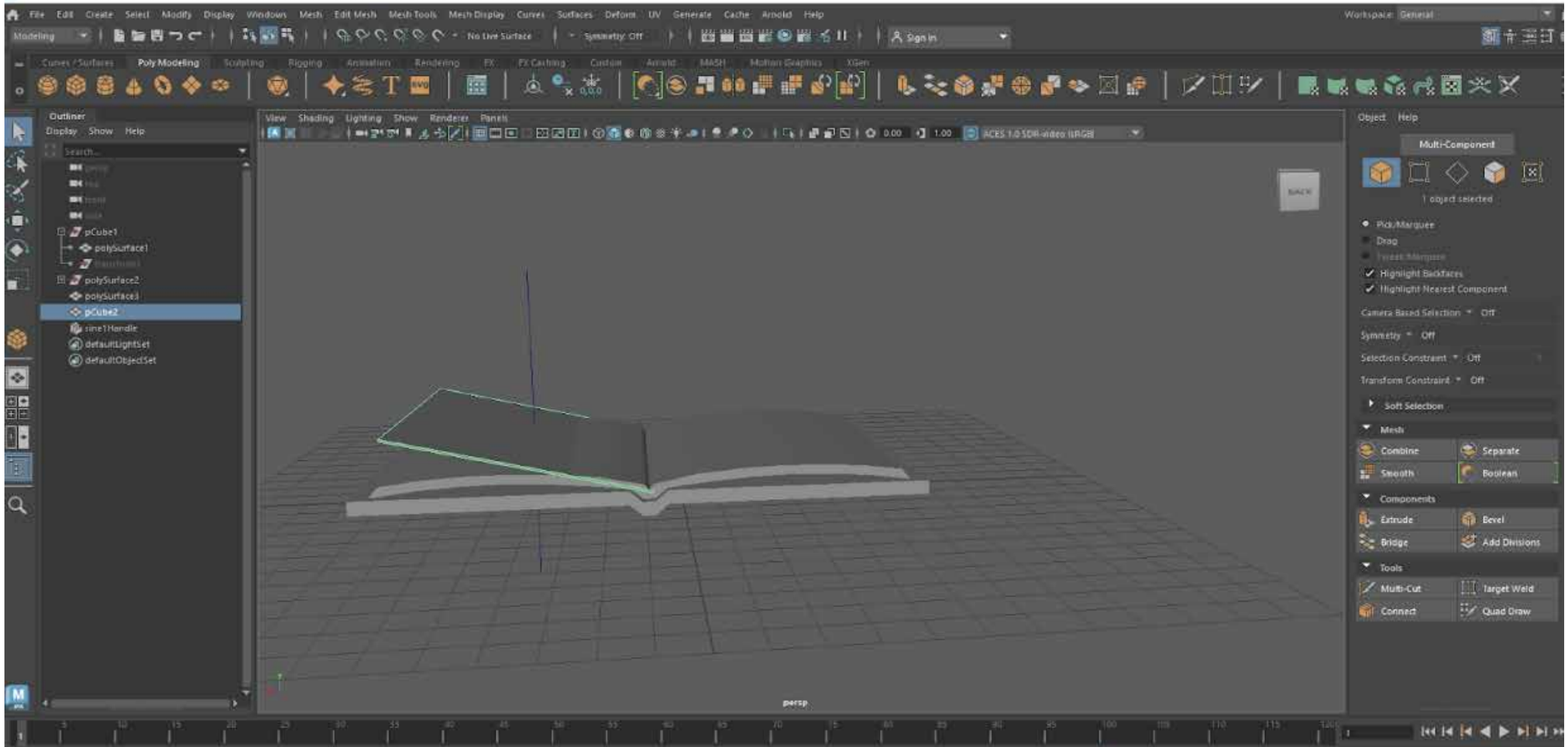
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Symmetry Off
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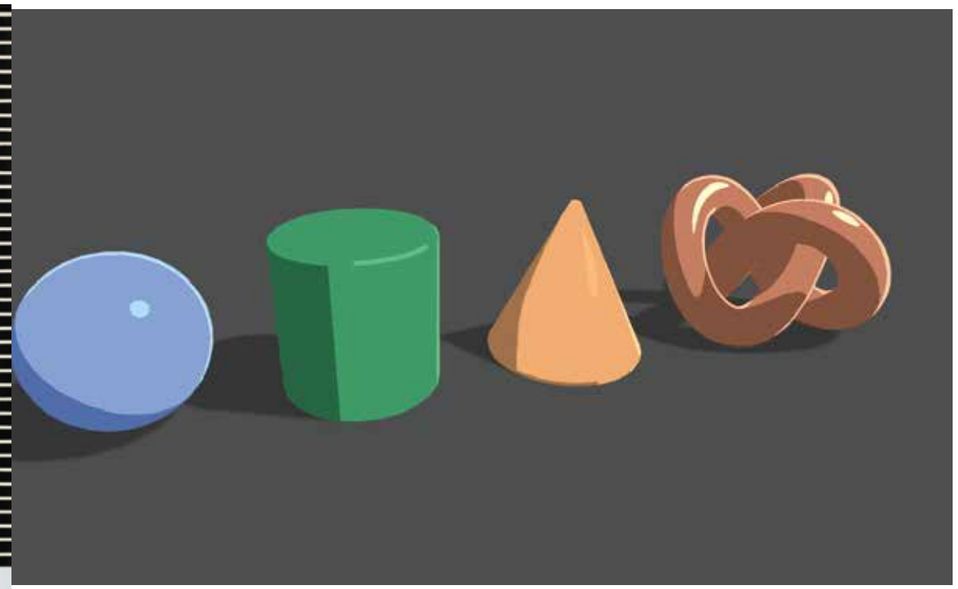
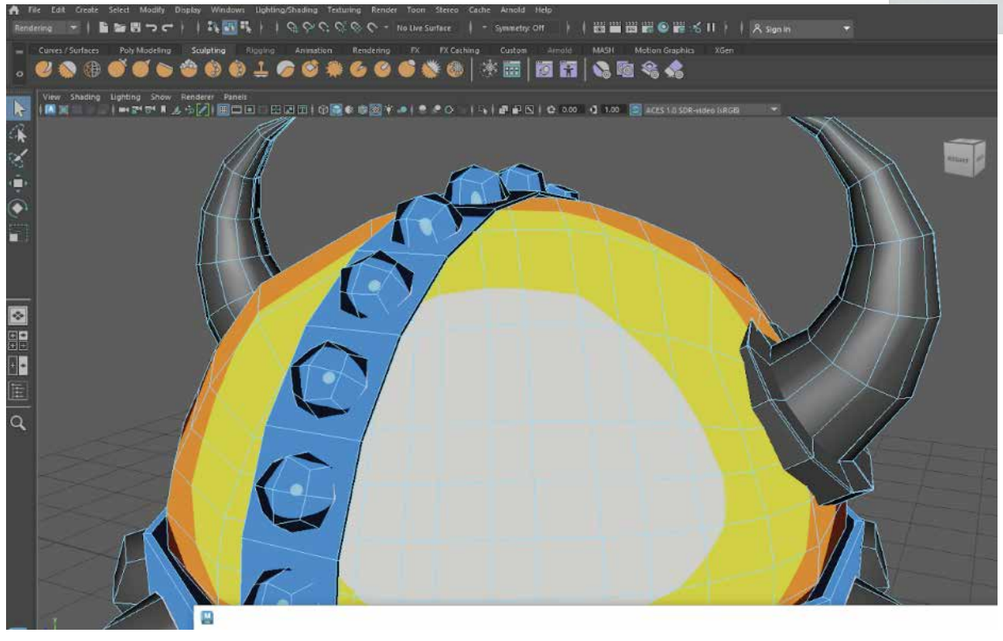
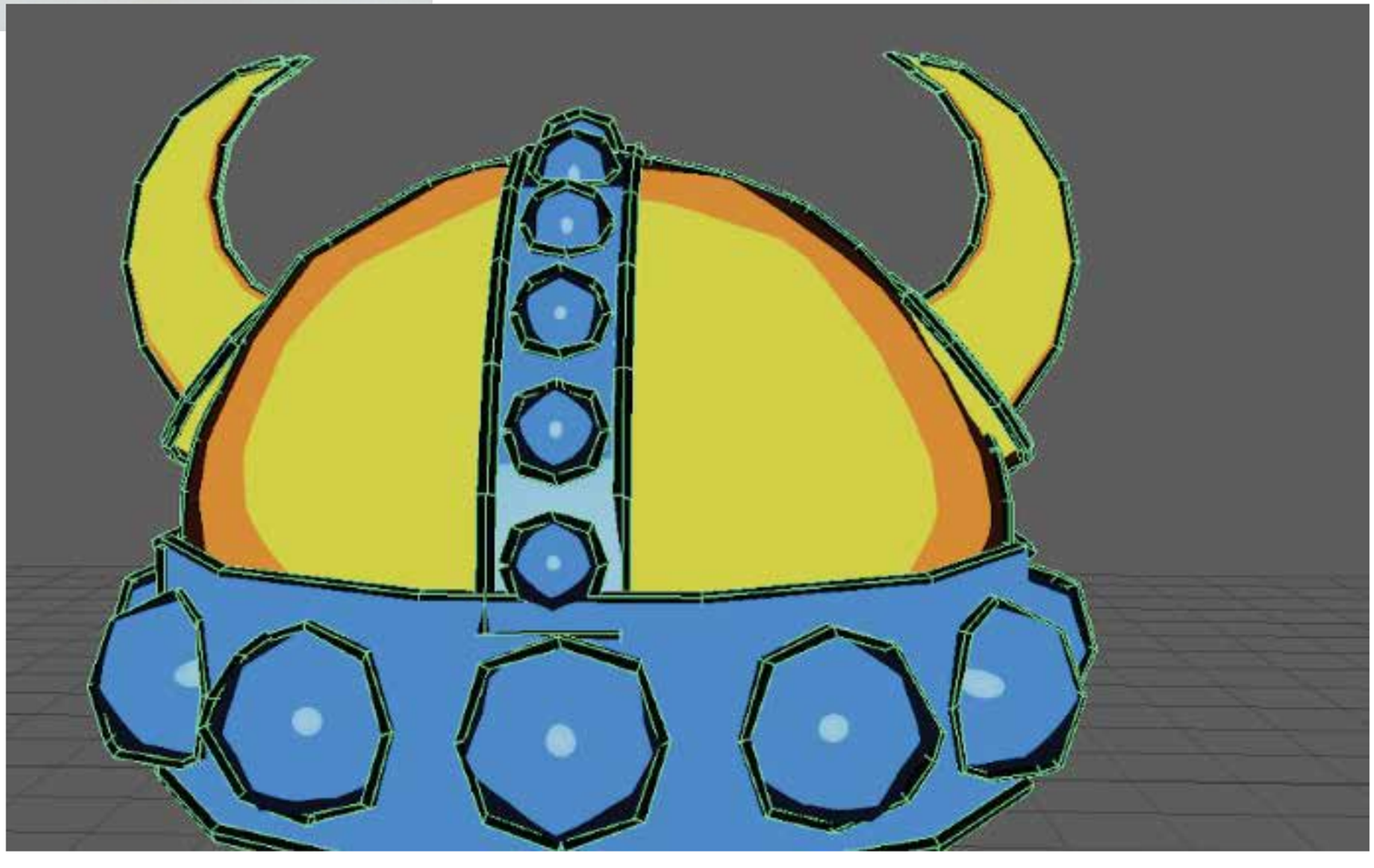
Tools
Multi-Cut
Target Weld
Connect
Quad Draw

creating a toon shader (with inspiration)







Successes

Cohesive Stylization Across Assets, successfully maintained Gabriel Soares' signature bold, exaggerated proportions and clean silhouettes in all models.

Established a unified aesthetic through:
Exaggerated scale, sharp bevels for a stylized yet polished look. Limited color palette to reinforce cohesion, mastery of deformers for organic shapes.
Used to create the helmet's curved horns (180° bend) and circular bands without manual vertex tweaking.
Applied controlled curvature to the sofa's backrest for a smooth, ergonomic shape.

Problem-Solving:

Initially struggled with uneven bending; resolved by adding edge loops for better geometry control.

Improvements & Future Work

Try procedural texturing with Adobe Photoshop and Substance Painter.
Use more advanced animation tools (Sine/Warp Deformers) The book's "turning page" relied on static extrusion, lacking fluidity. Experiment with Sine Deformer to simulate page flutter with amplitude/frequency controls.
Warp Deformer to add asymmetrical bends for organic motion.

thank you for your consideration

get in touch :)
email: asaphkalala@gmail.com