

#WWDC18

Creating Great AR Experiences

Session 805

Grant Paul, Human Interface
Omar Khan, Product Design

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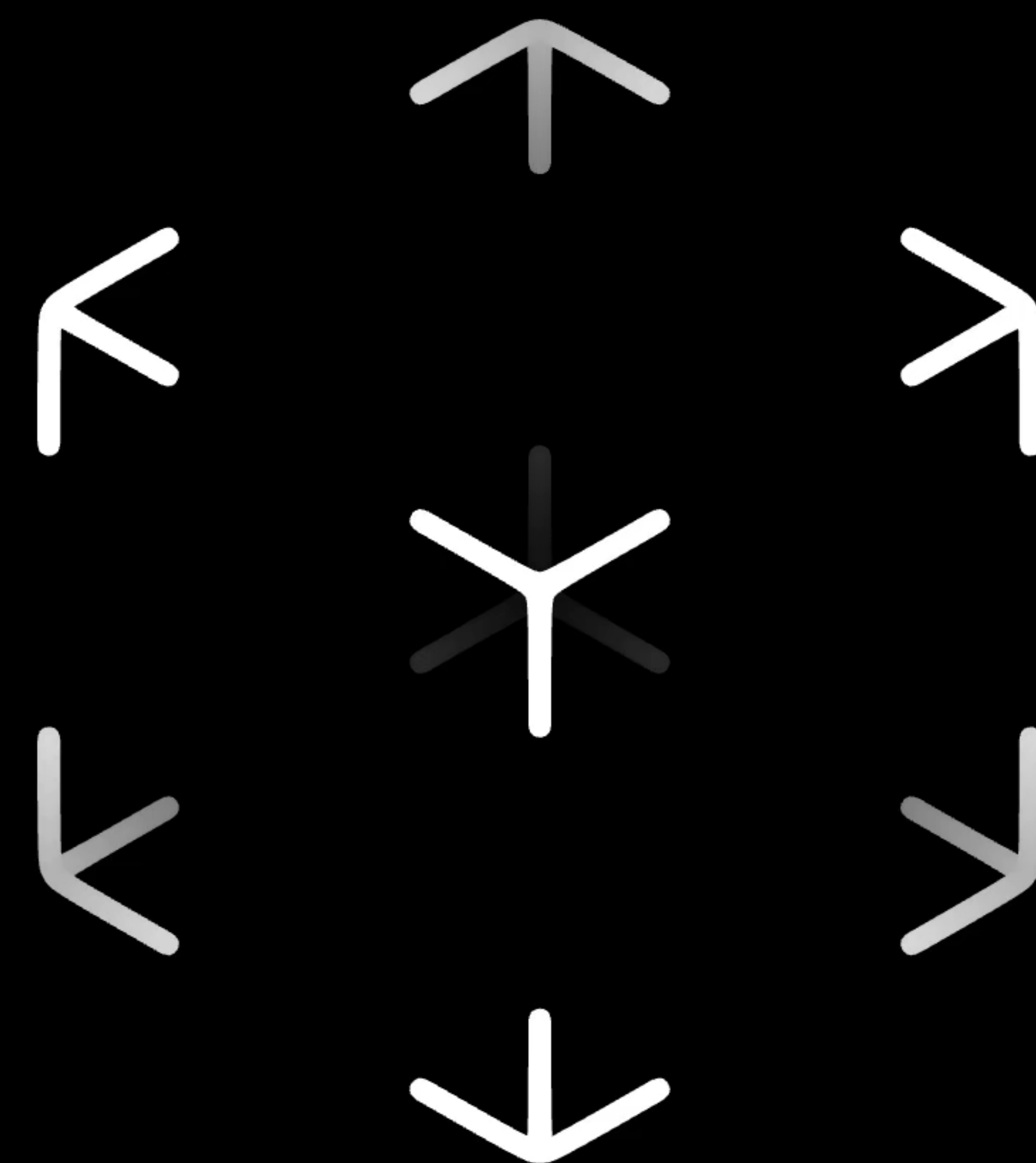
AR

Augmented Reality

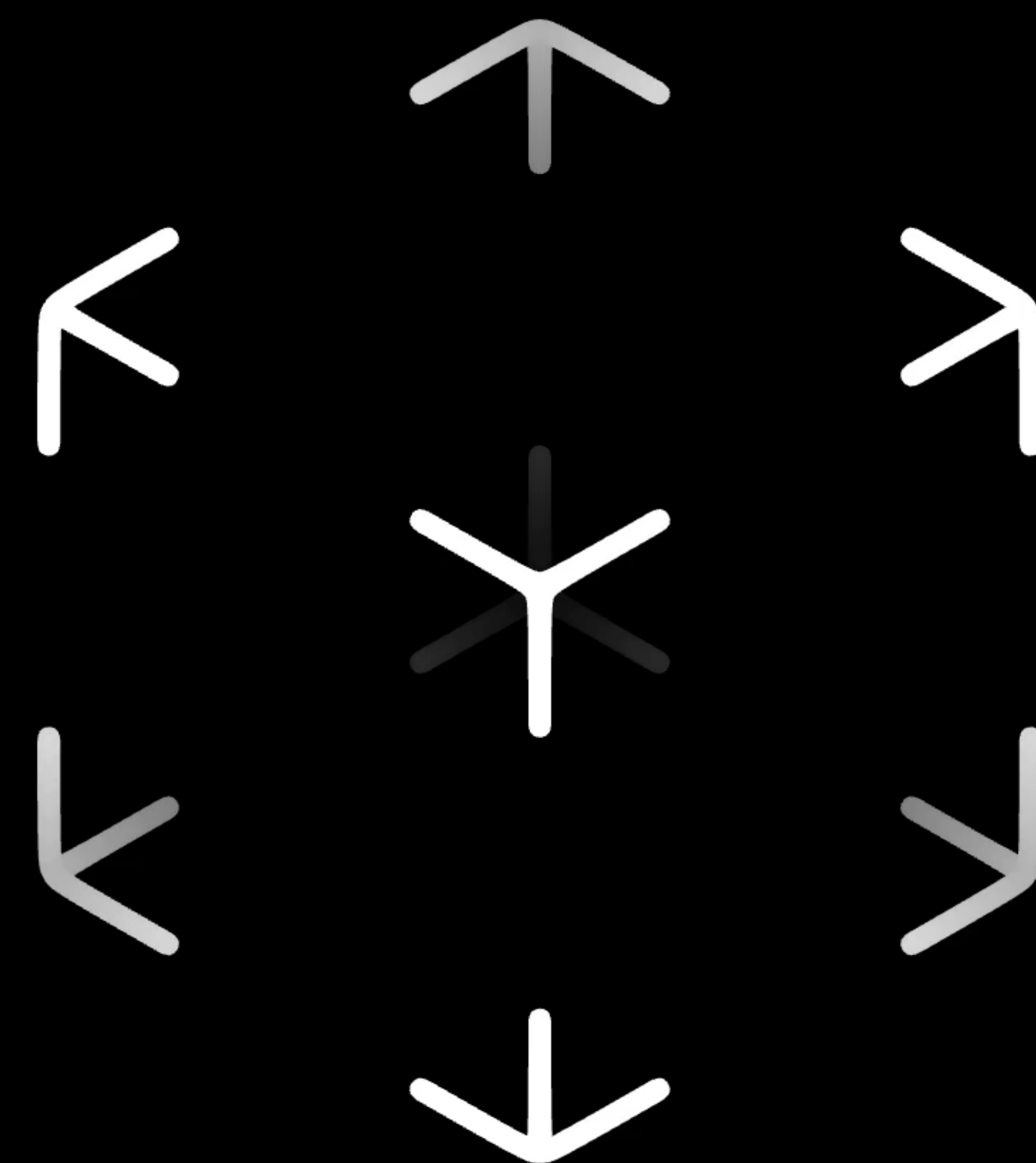
Augmented Reality

Augmented Reality

Augmented Reality



Augmented Reality



AR Interfaces and Interactions

Getting into AR

Getting into AR

Presenting content

Getting into AR

Presenting content

Interactions in the world

Getting into AR

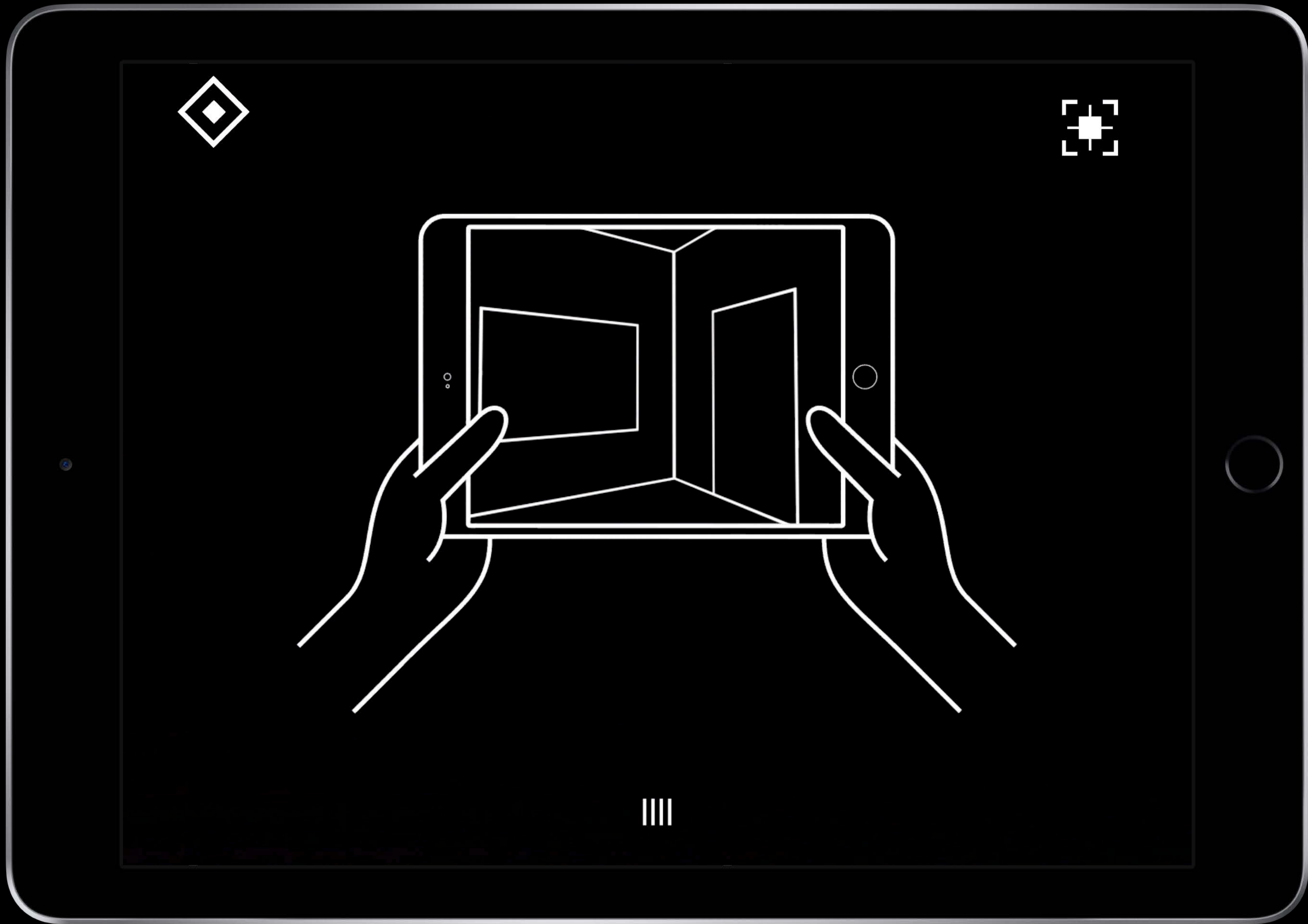
Presenting content

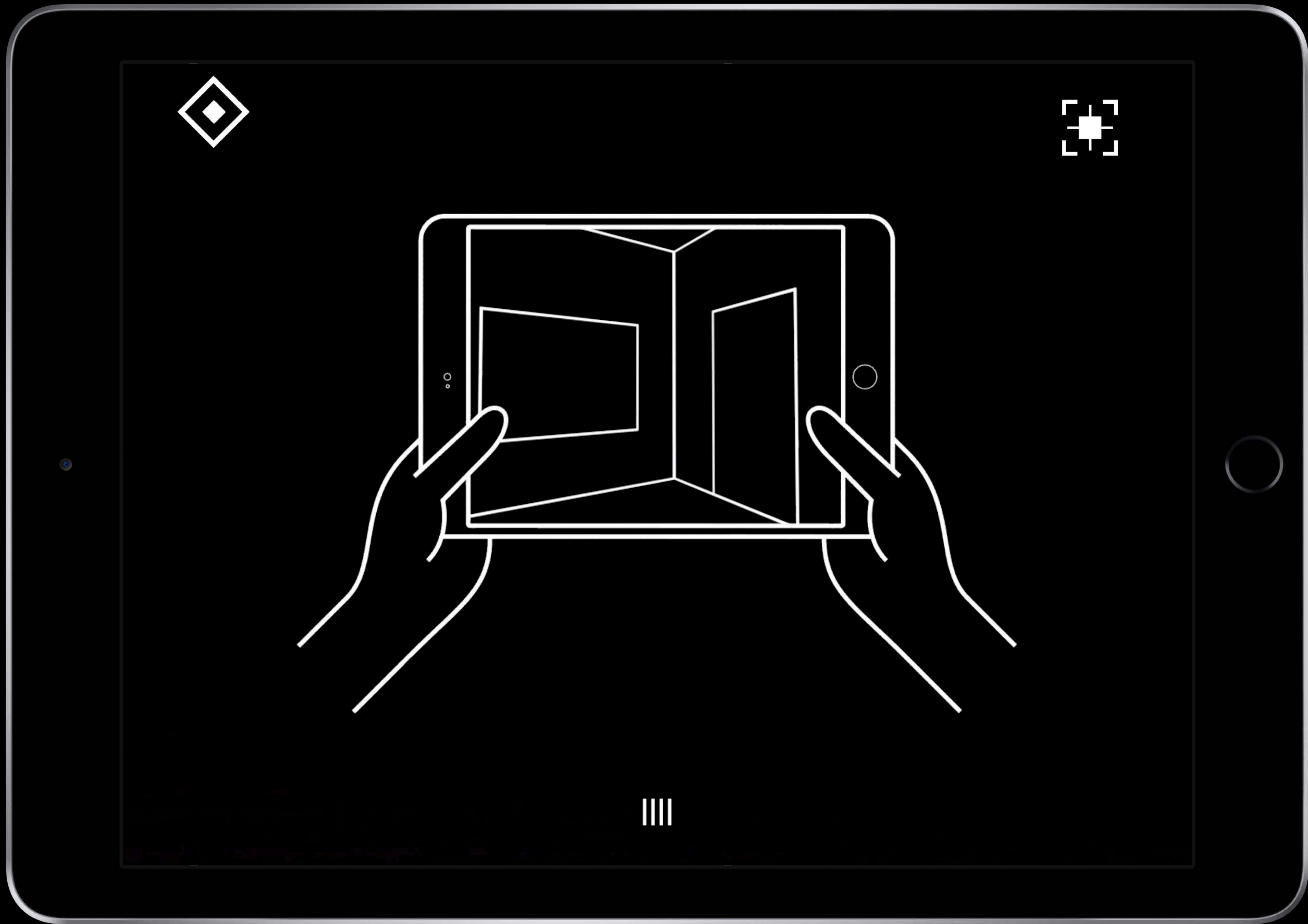
Interactions in the world

ARKit needs to understand the world

Start moving the device

Show a fixed reference





That's it

Except when it's not

Use feedback to guide
towards success

Match your app's style

Balance guidance with efficiency

Getting into AR

Presenting content

Interactions in the world

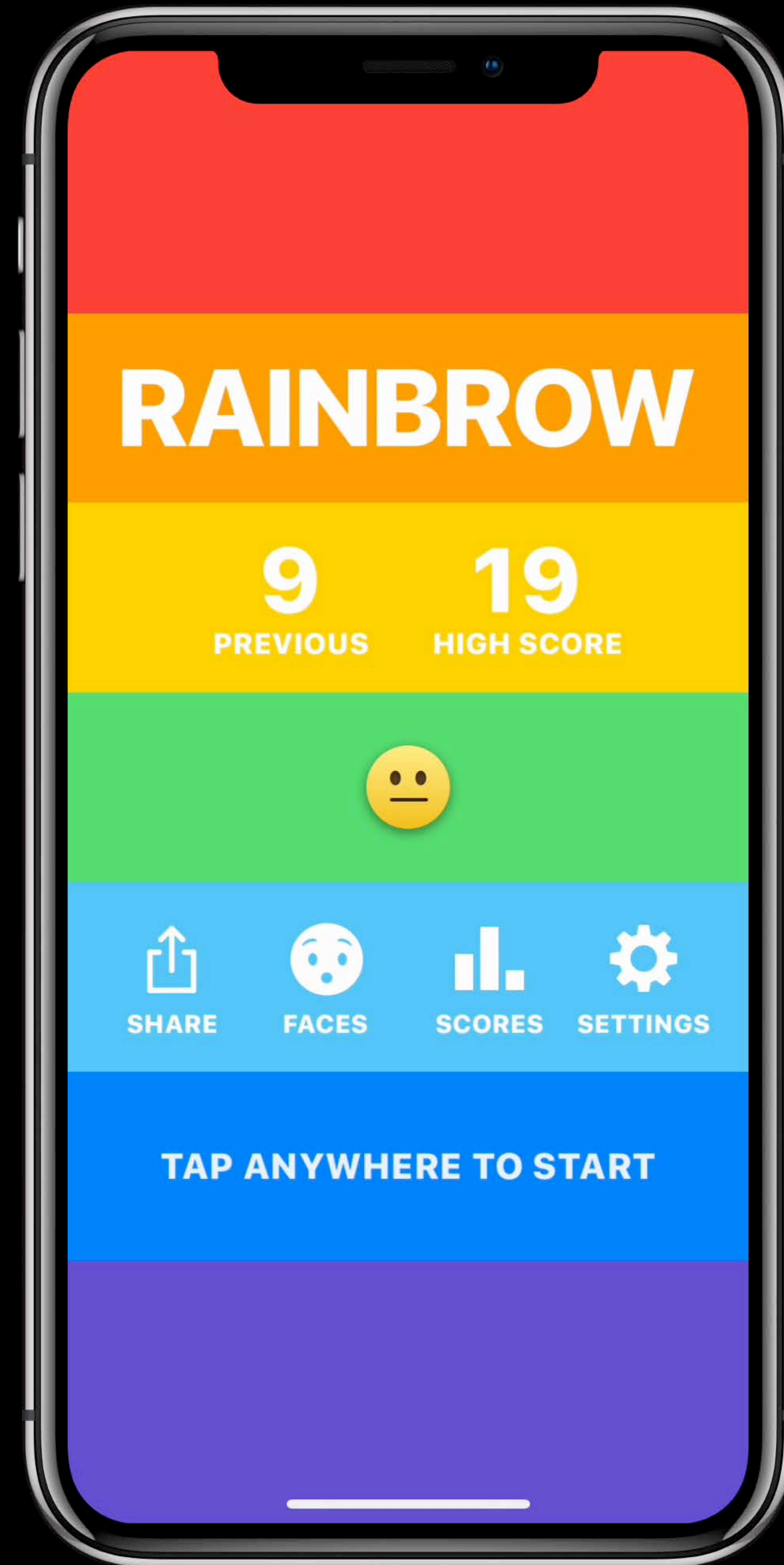
Getting into AR

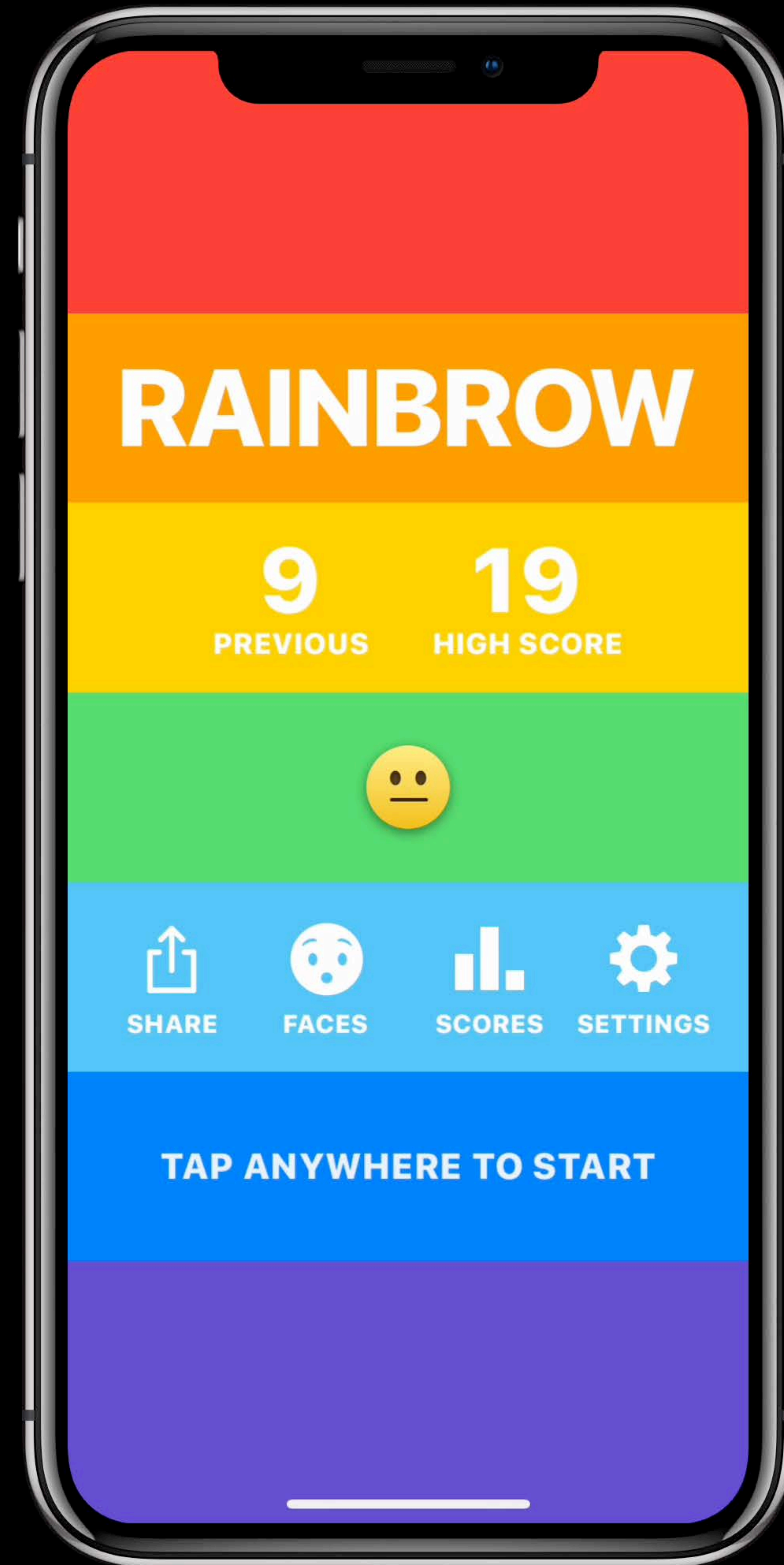
Presenting content

Interactions in the world

ARKit possibilities

2D





VR

No headset required

A silver iPhone 12 Pro Max is shown from the front, centered against a black background. The screen is black and displays the text "THREE YEARS AGO" in a light gray, sans-serif font. The text is centered horizontally and vertically on the screen. The phone's silver frame, including the camera bump on the back and the home indicator bar at the bottom, is visible.

THREE YEARS **AGO**

A silver iPhone 11 Pro Max is centered against a black background. The phone's screen is black and displays the text "THREE YEARS AGO" in a white, sans-serif font. The text is centered horizontally and vertically on the screen. The phone's physical features, including the camera bump on the back, the side buttons, and the home indicator bar at the bottom, are visible.

THREE YEARS **AGO**

Content in AR

Keep text readable

A white perspective frame is centered on a black background. The frame consists of a central rectangle with four lines extending from its corners towards the edges of the image, creating a sense of depth. The word "Perspective" is written in a bold, white, sans-serif font in the center of the frame.

Perspective

A white perspective frame is centered on a black background. The frame consists of a central rectangle with four lines extending from its corners towards the edges of the image, creating a sense of depth. The word "Perspective" is written in a bold, white, sans-serif font in the center of the frame.

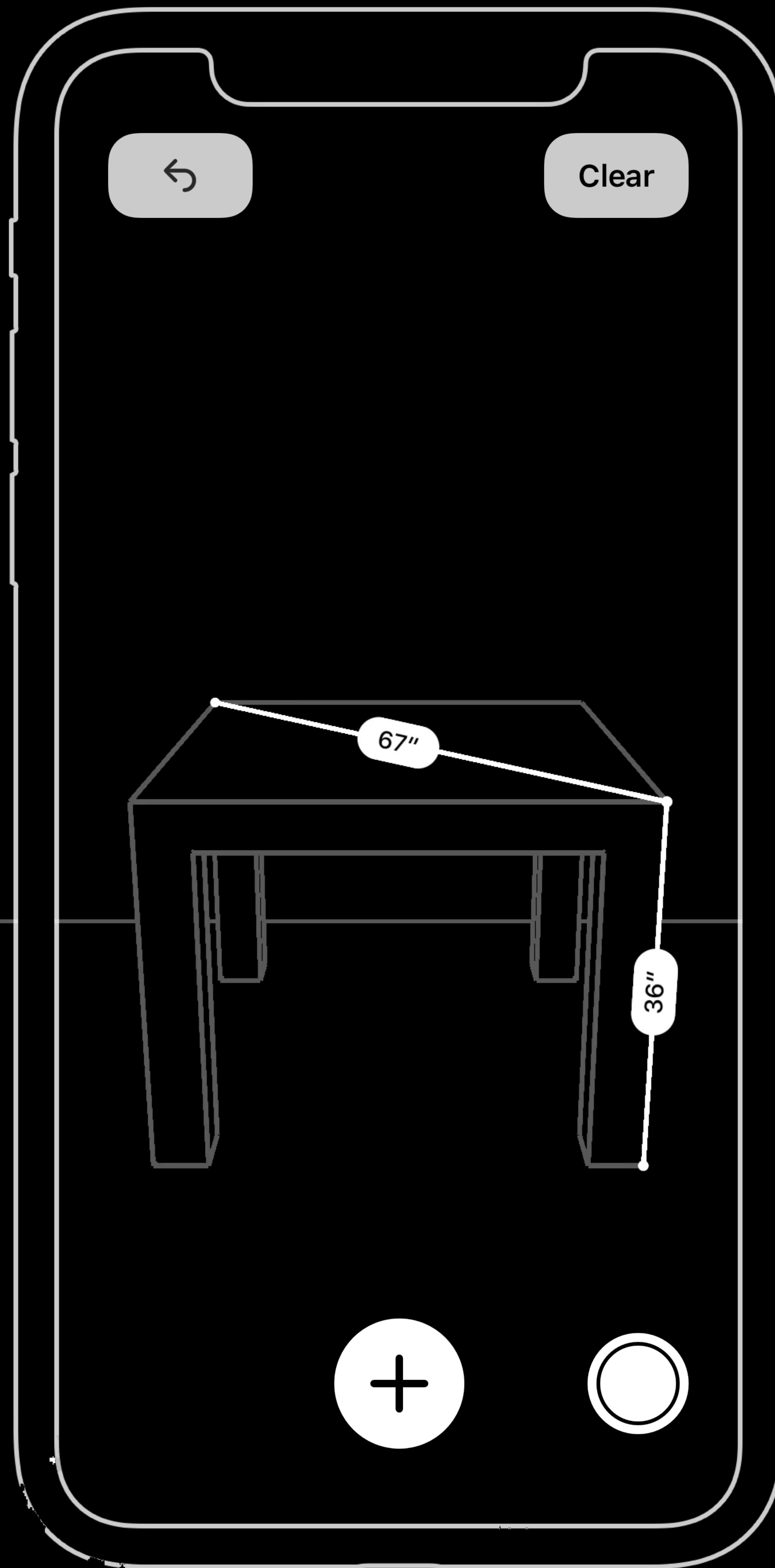
Perspective

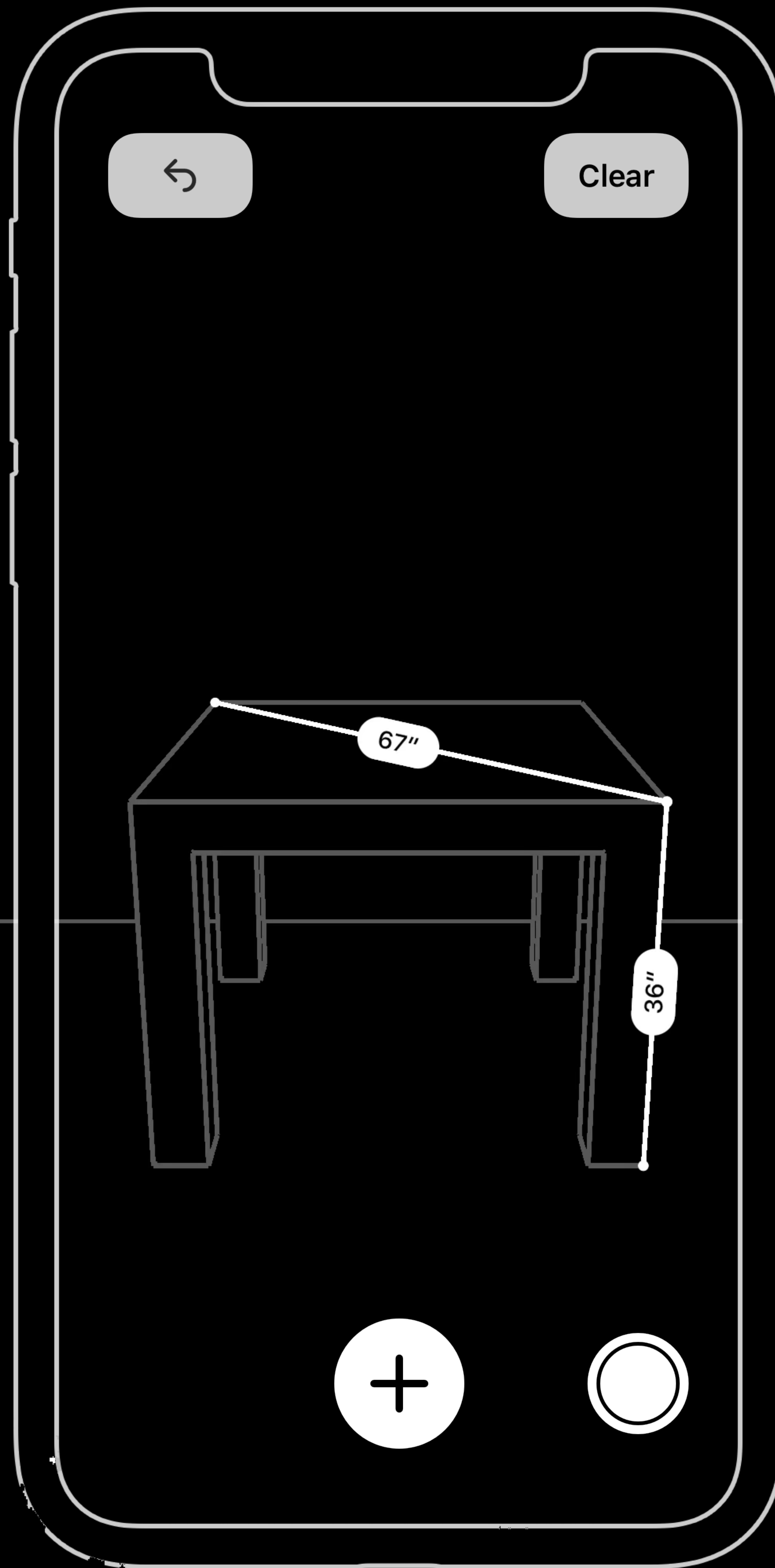
The image features a central rectangular area defined by a thin white border. This rectangle is centered within a larger perspective frame, also outlined in white, which suggests a screen or a window. The background is solid black. The text 'Screen Space' is centered within the inner rectangle in a white, bold, sans-serif font.

Screen Space

The image features a central rectangular area defined by a thin white border. This rectangle is centered within a larger perspective frame, also outlined in white, which suggests a screen or a window. The background is solid black. The text 'Screen Space' is centered within the inner rectangle in a white, bold, sans-serif font.

Screen Space

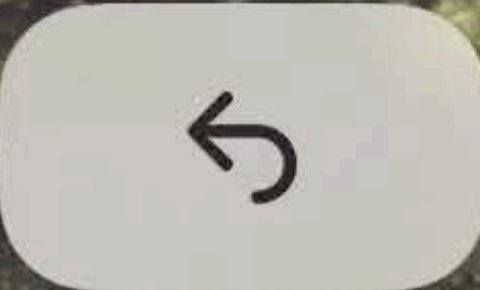
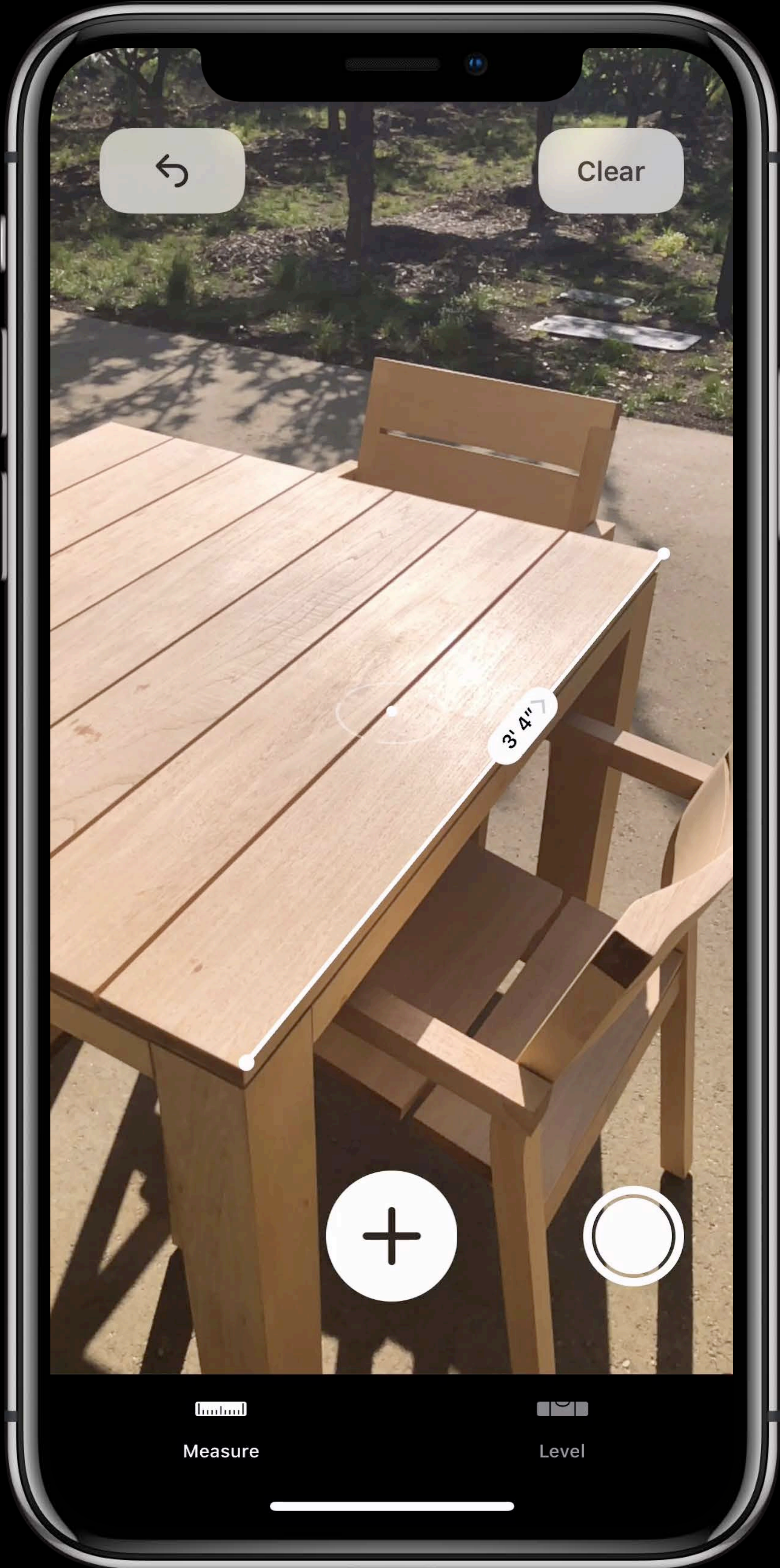




Keep text to a minimum

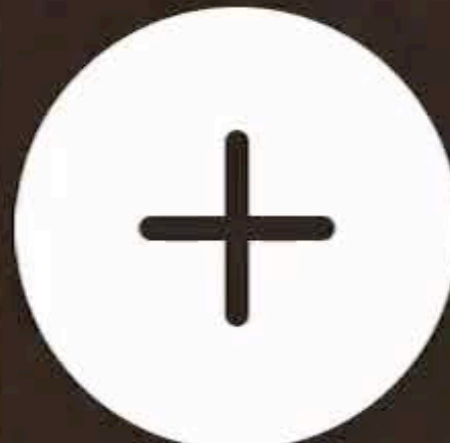
Show details on the display

Transition in and out of AR



Clear

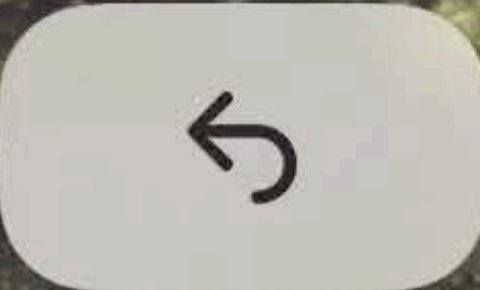
3' 4"



Measure

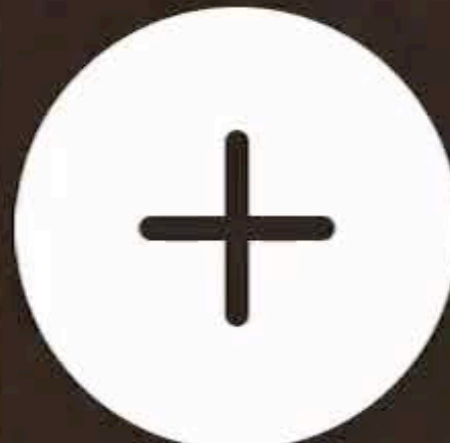


Level



Clear

3' 4"



Measure



Level

Transitions preserve identity





9:41



Object

AR



Presenting Content

Presenting Content

ARKit can power 2D experiences

Presenting Content

ARKit can power 2D experiences

VR is a powerful way to show environments

Presenting Content

ARKit can power 2D experiences

VR is a powerful way to show environments

Use screen space text for readable labels

Presenting Content

ARKit can power 2D experiences

VR is a powerful way to show environments

Use screen space text for readable labels

Show details and controls directly on the display

Presenting Content

ARKit can power 2D experiences

VR is a powerful way to show environments

Use screen space text for readable labels

Show details and controls directly on the display

Transition smoothly in and out of AR

Getting into AR

Presenting content

Interactions in the world

Getting into AR

Presenting content

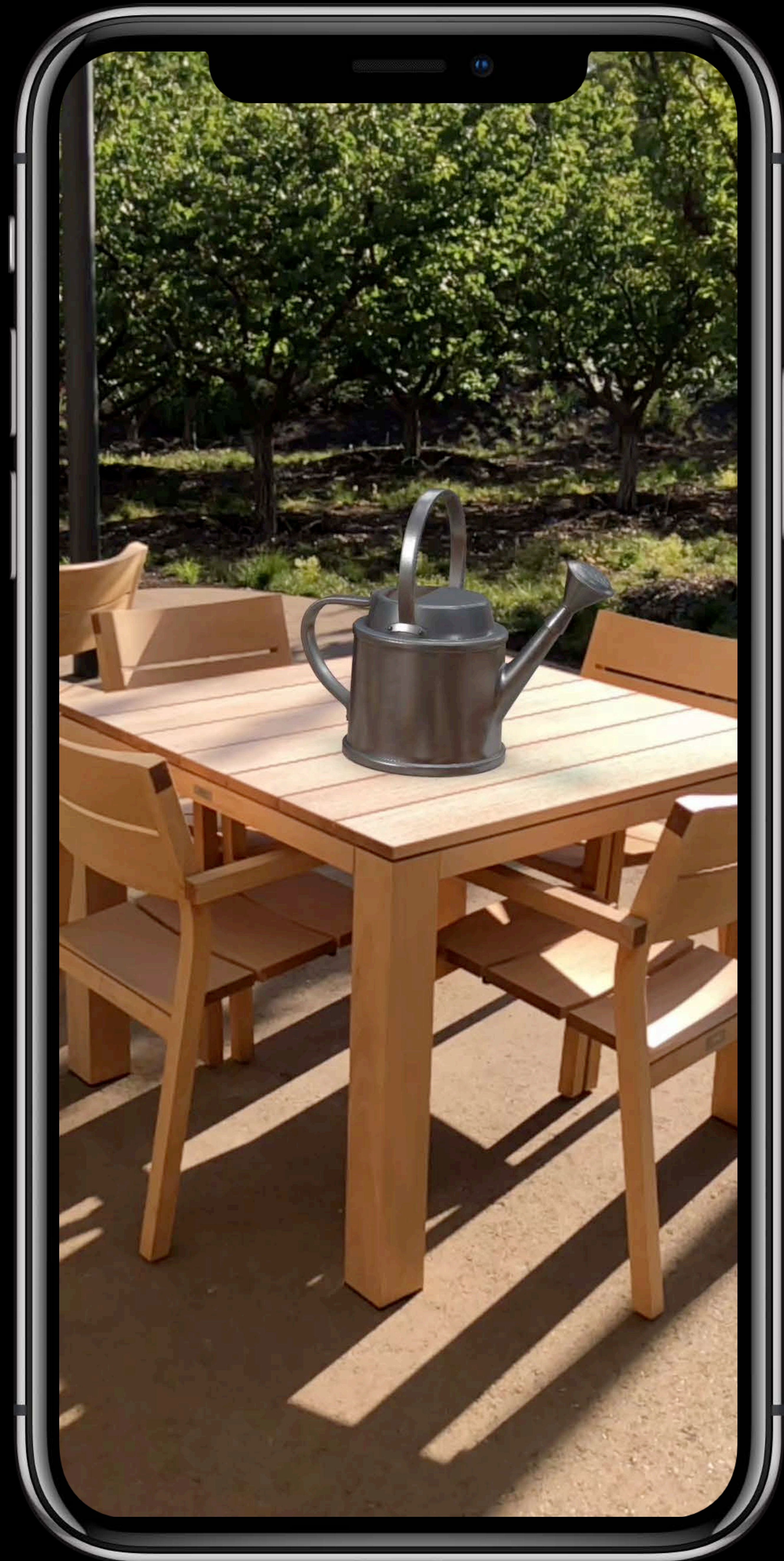
Interactions in the world

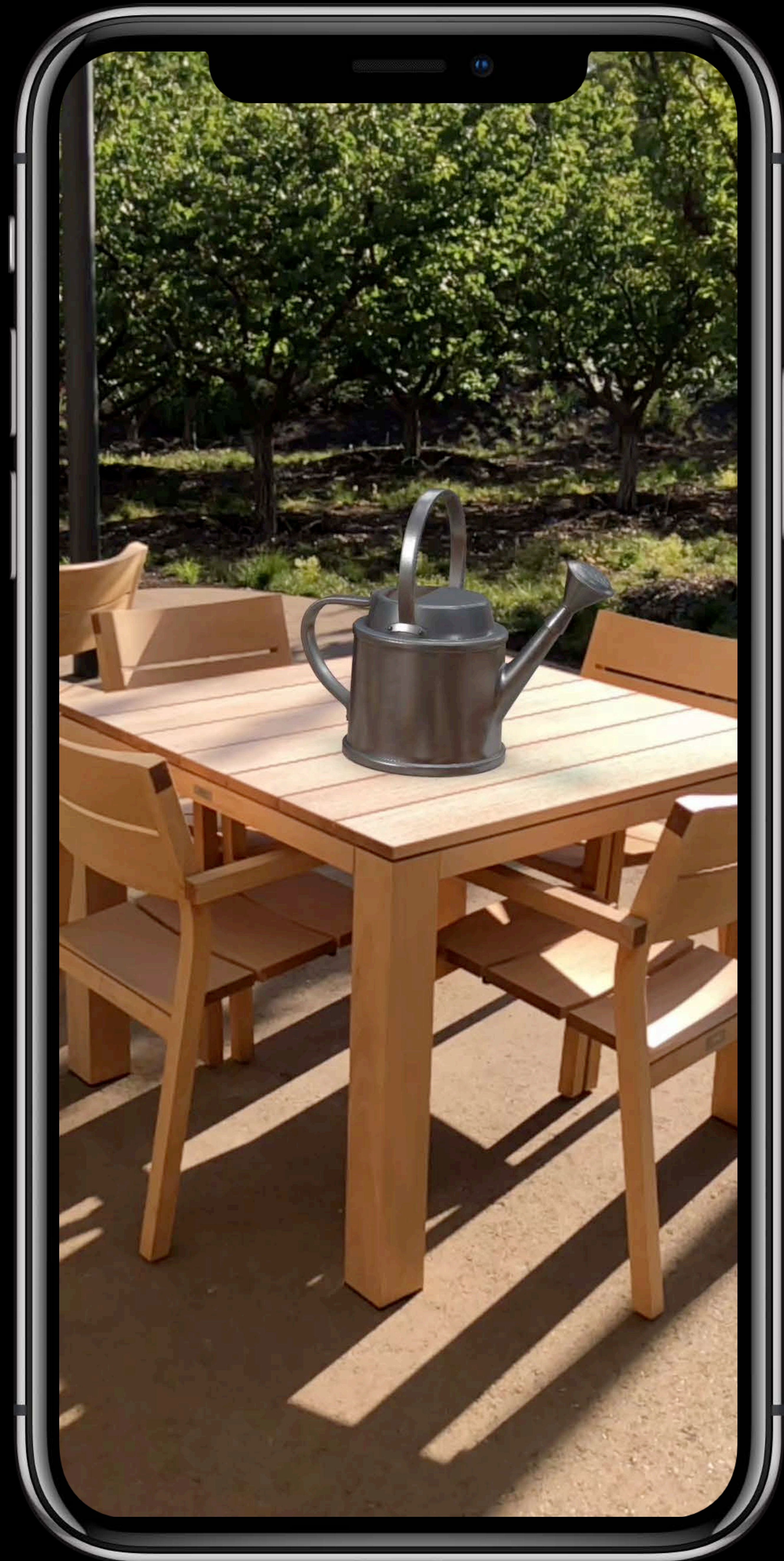
Touch

Touch enables direct manipulation

AR is physical

Gestures you already know











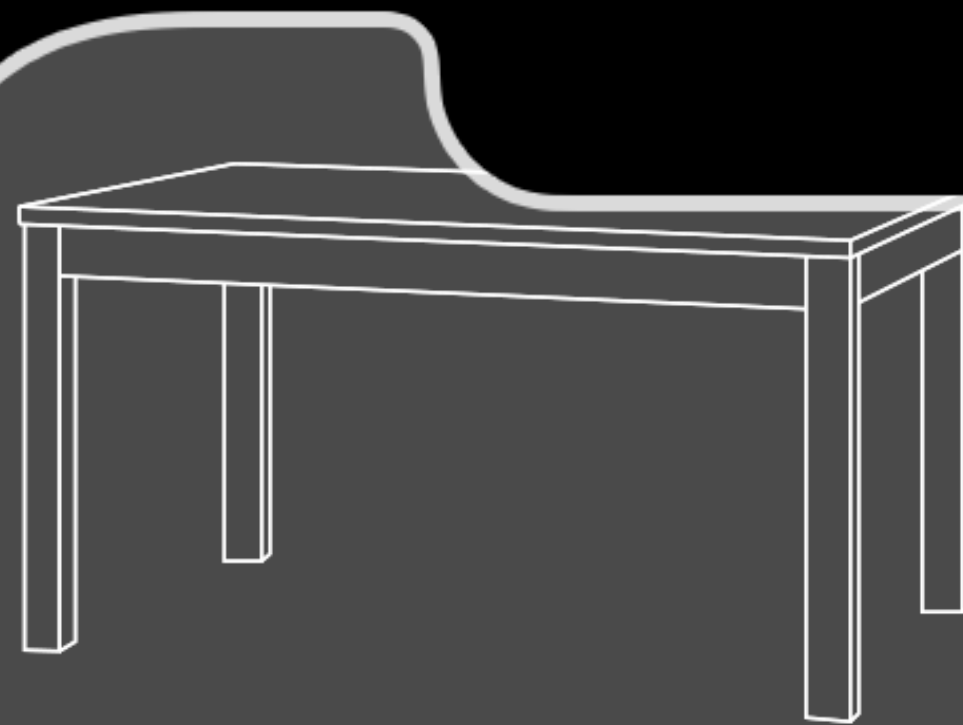


Direct manipulation isn't enough

Touch is 2D

Movement is 3D

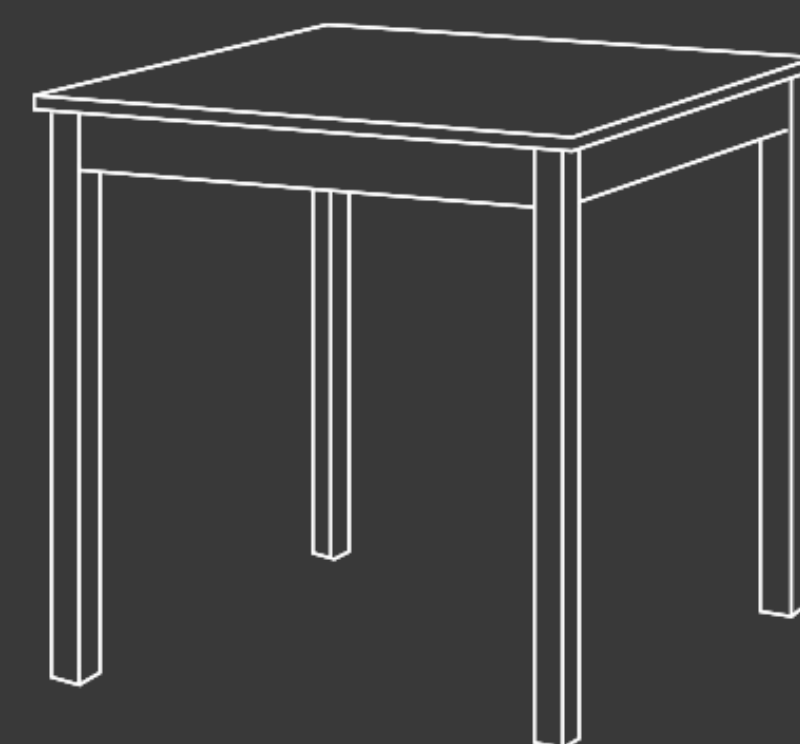
Moving the device is the
primary interaction in AR



MOUNTAIN LION

Table Example

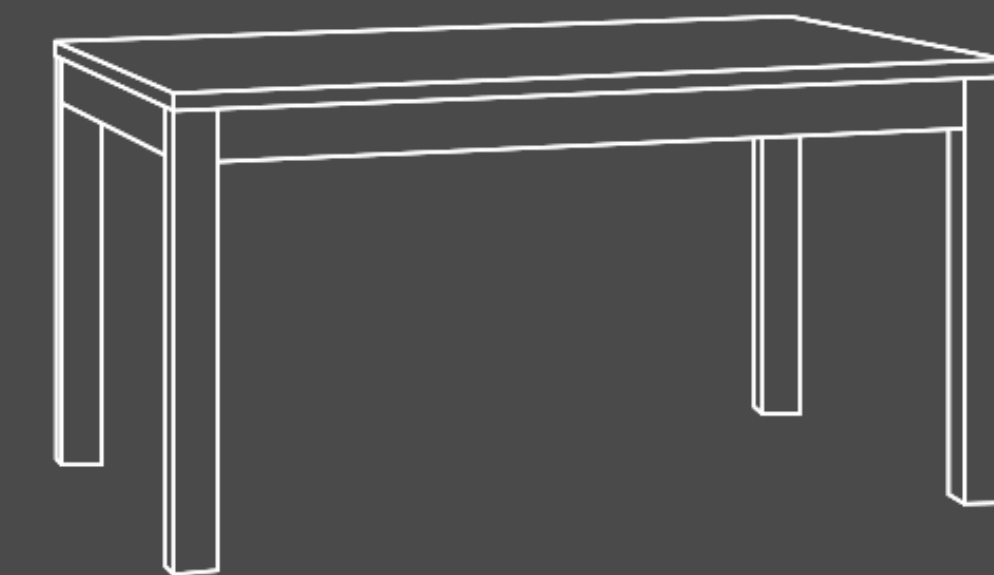
2012



MAVERICKS

Table Example

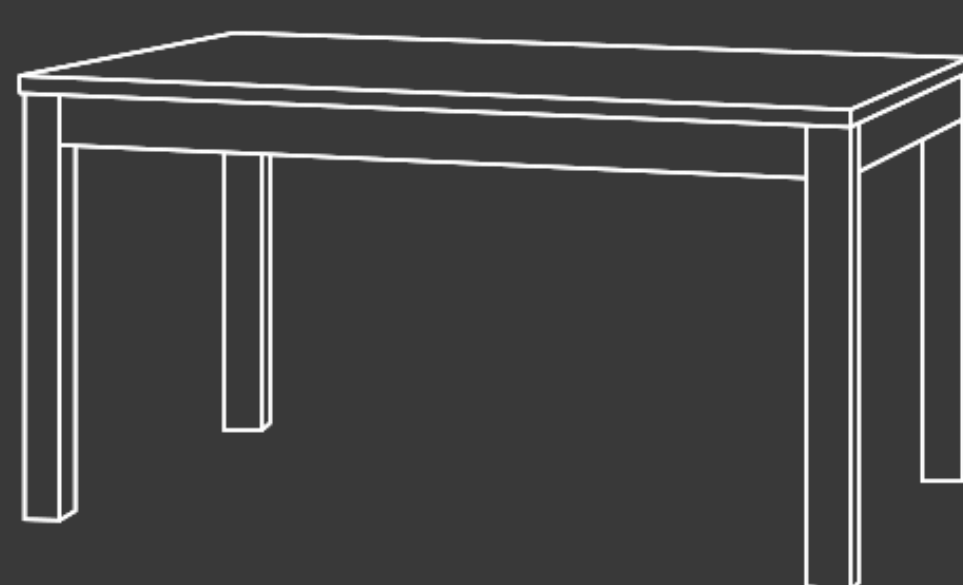
2013



YOSEMITE

Table Example

2014



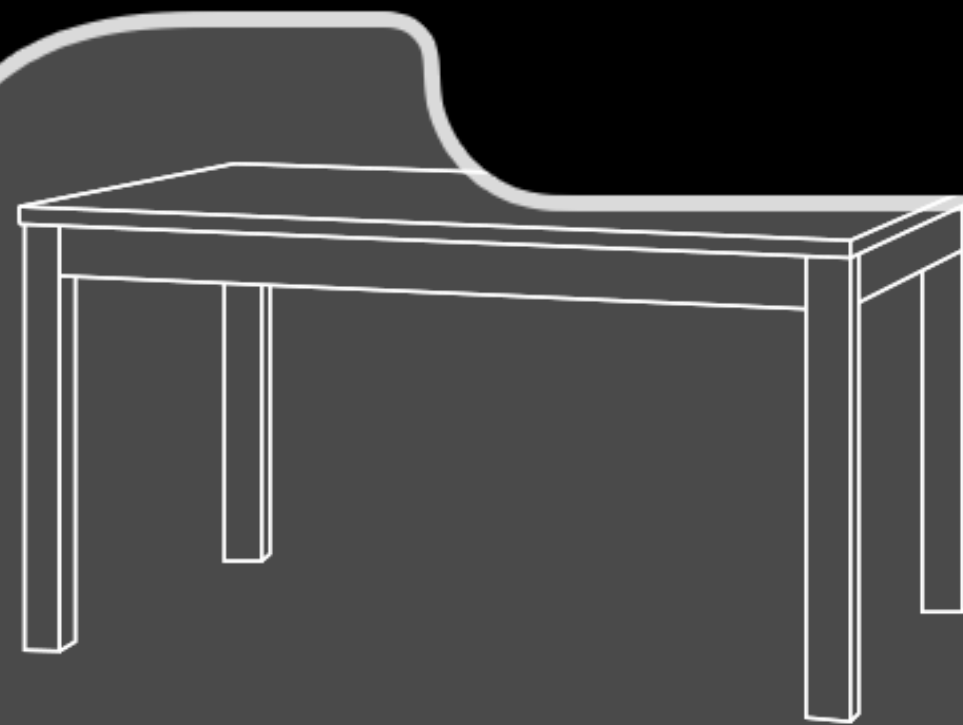
EL CAPITAN

Table Example

2015



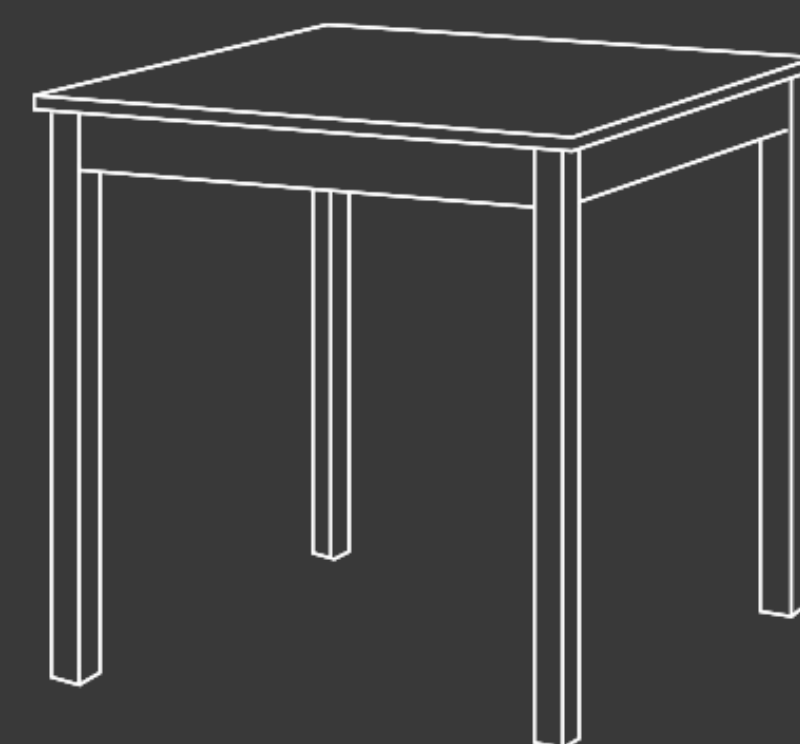
SIERRA



MOUNTAIN LION

Table Example

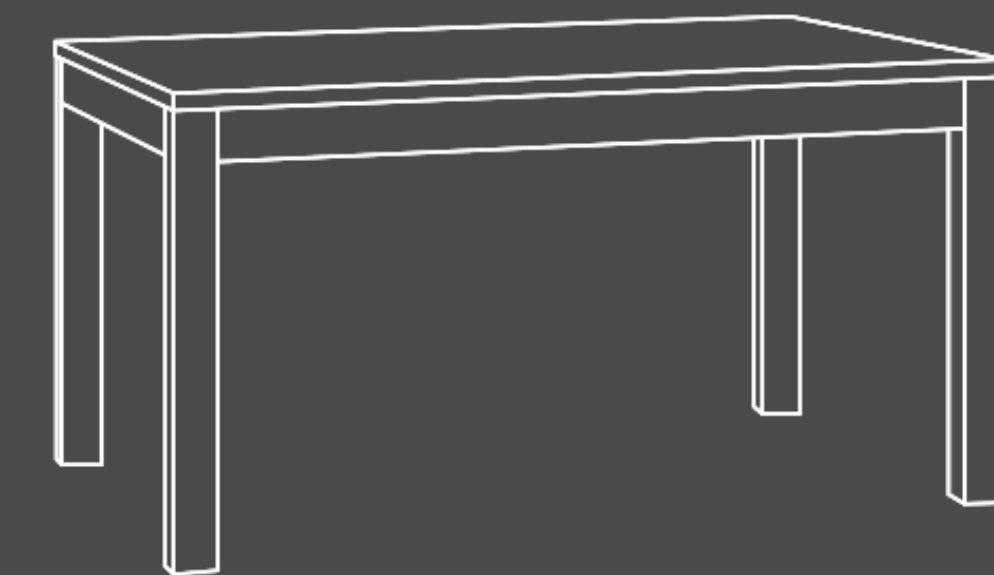
2012



MAVERICKS

Table Example

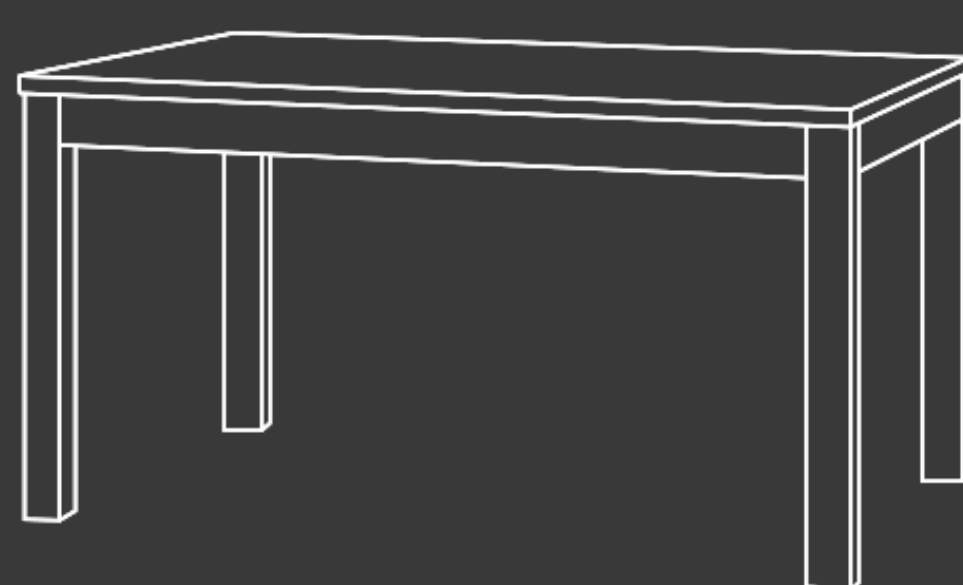
2013



YOSEMITE

Table Example

2014



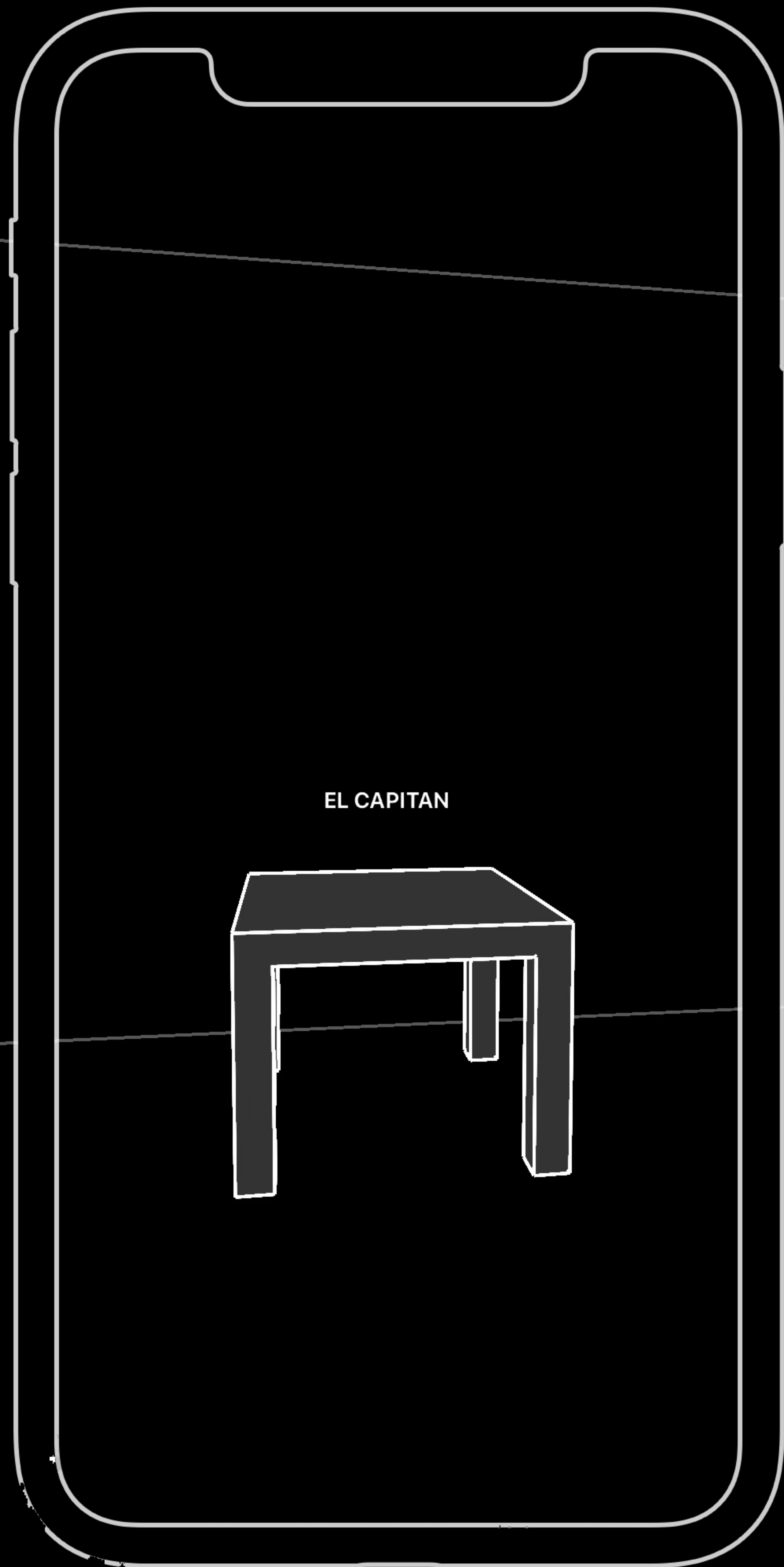
EL CAPITAN

Table Example

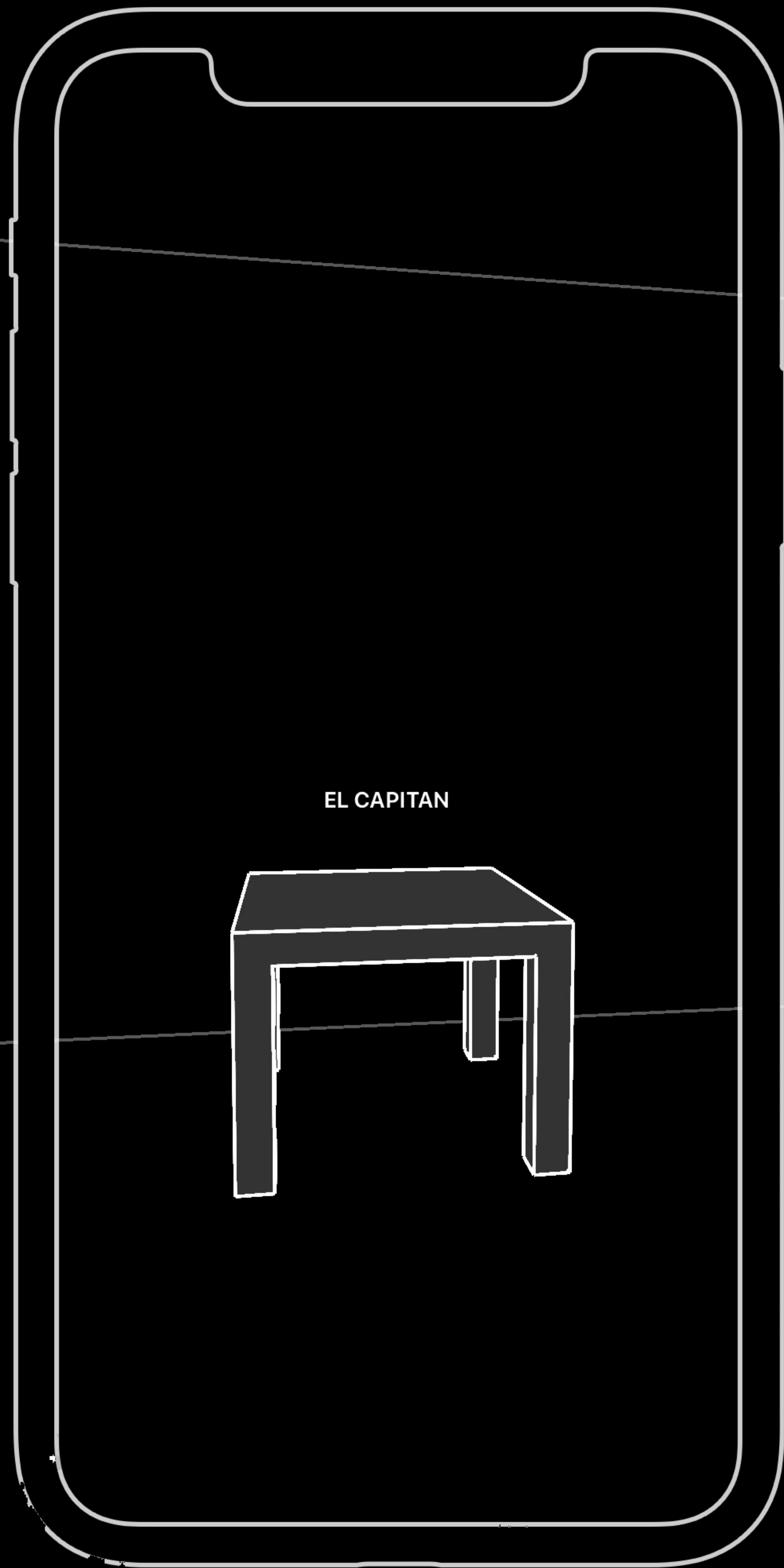
2015



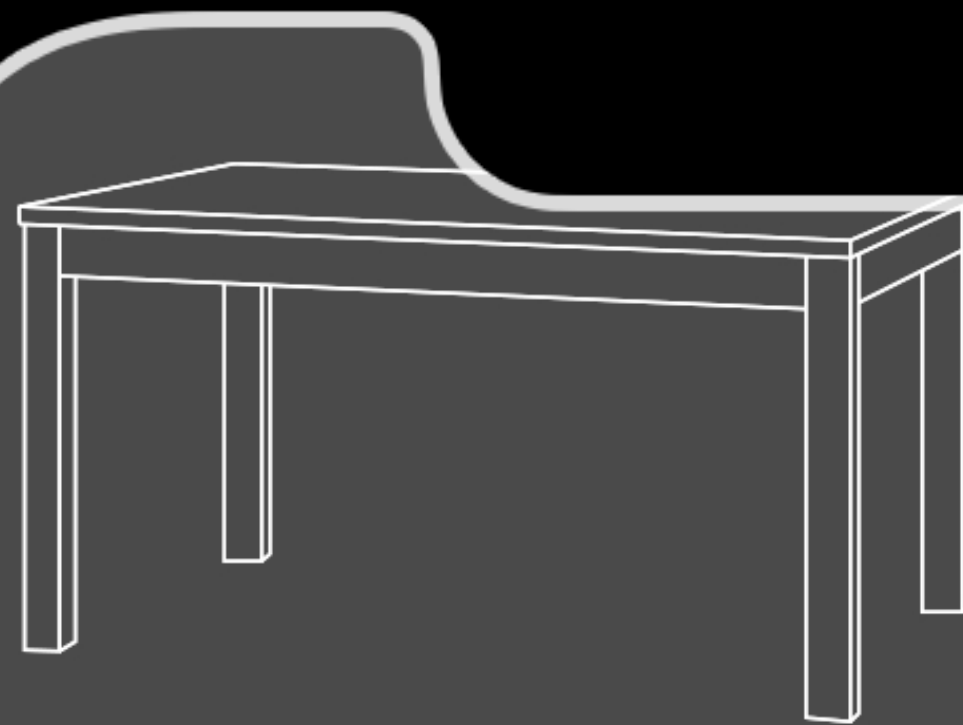
SIERRA



EL CAPITAN

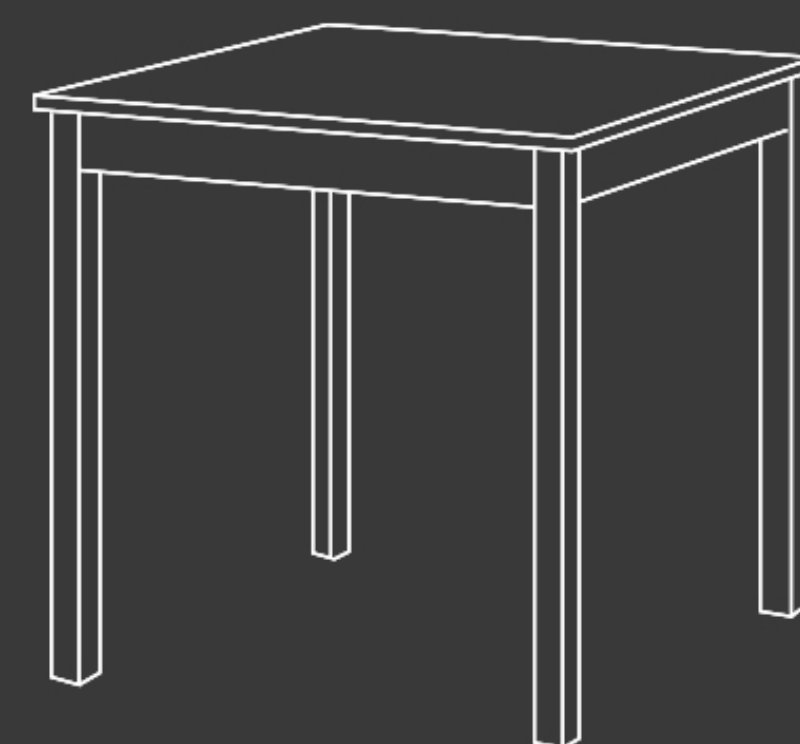


EL CAPITAN



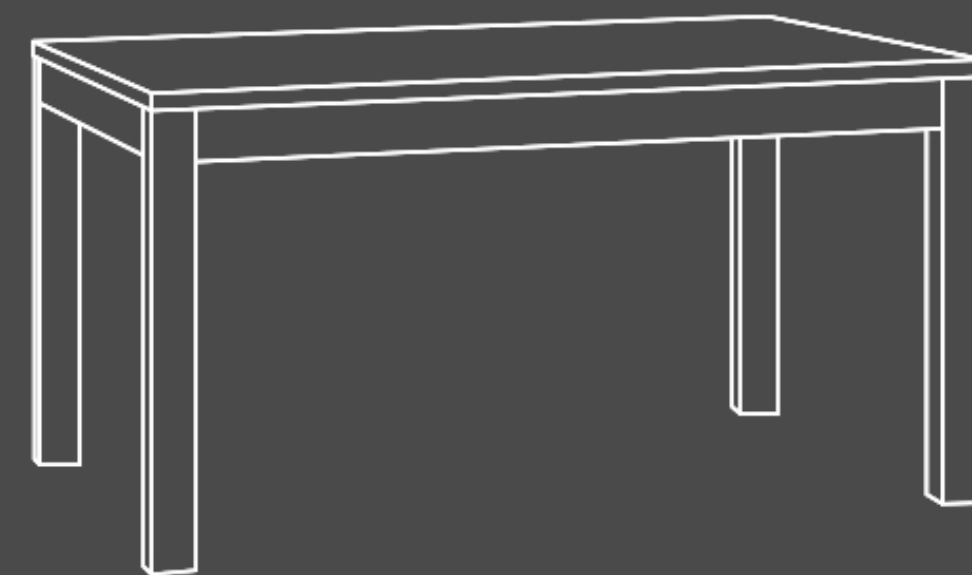
MOUNTAIN LION
Table Example

2012



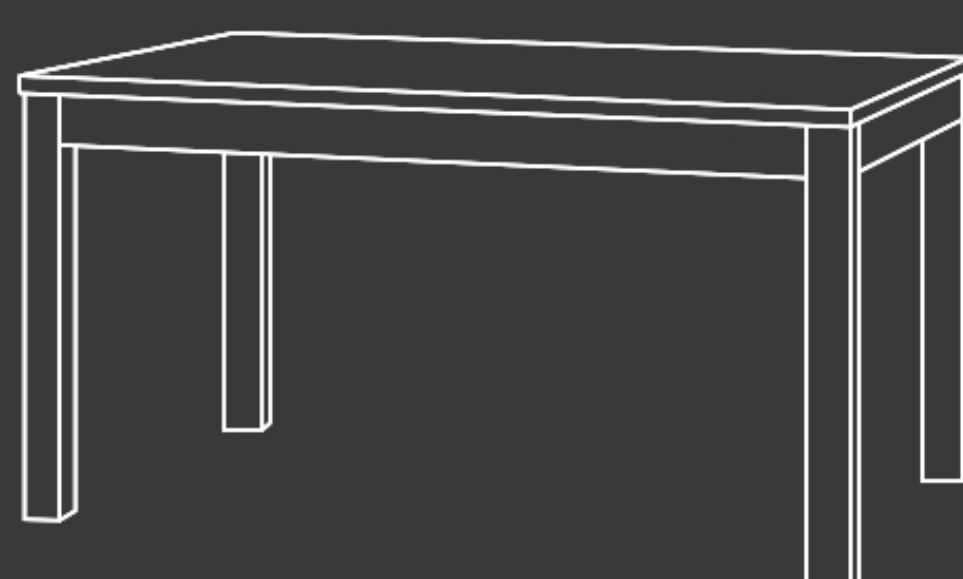
MAVERICKS
Table Example

2013



YOSEMITE
Table Example

2014

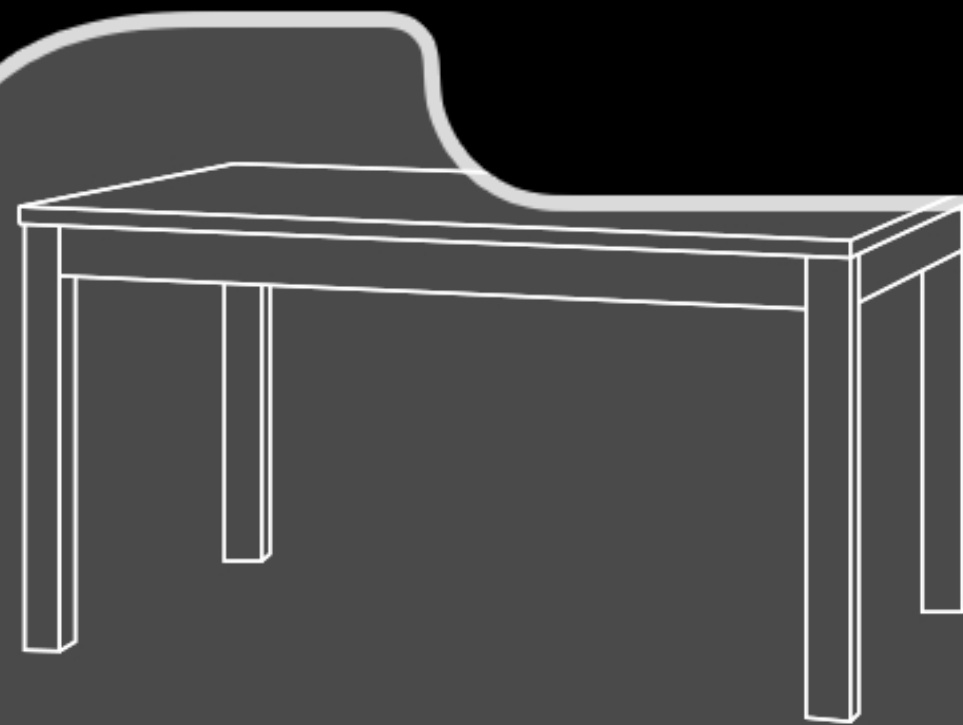


EL CAPITAN
Table Example

2015



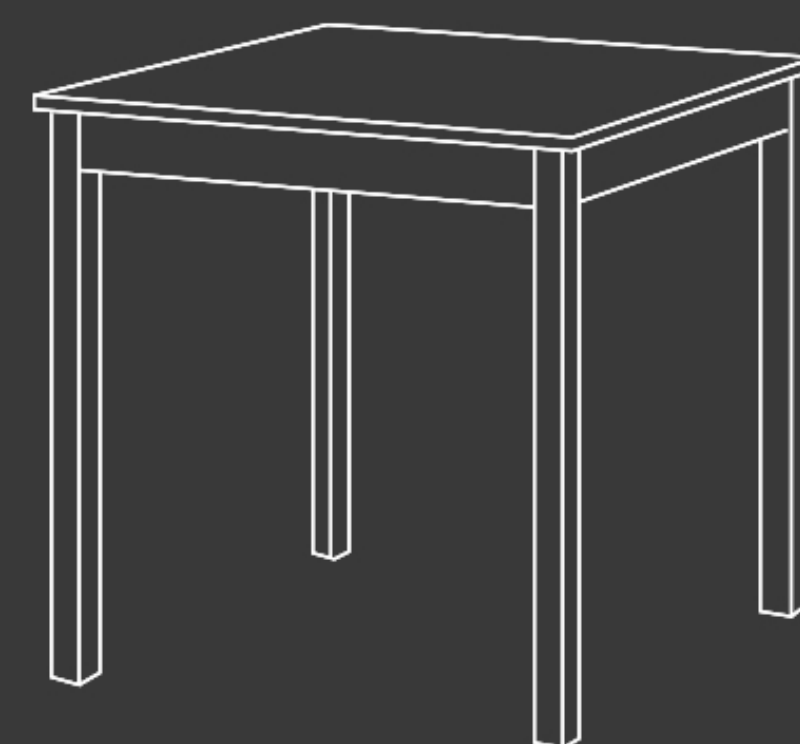
SIERRA



MOUNTAIN LION

Table Example

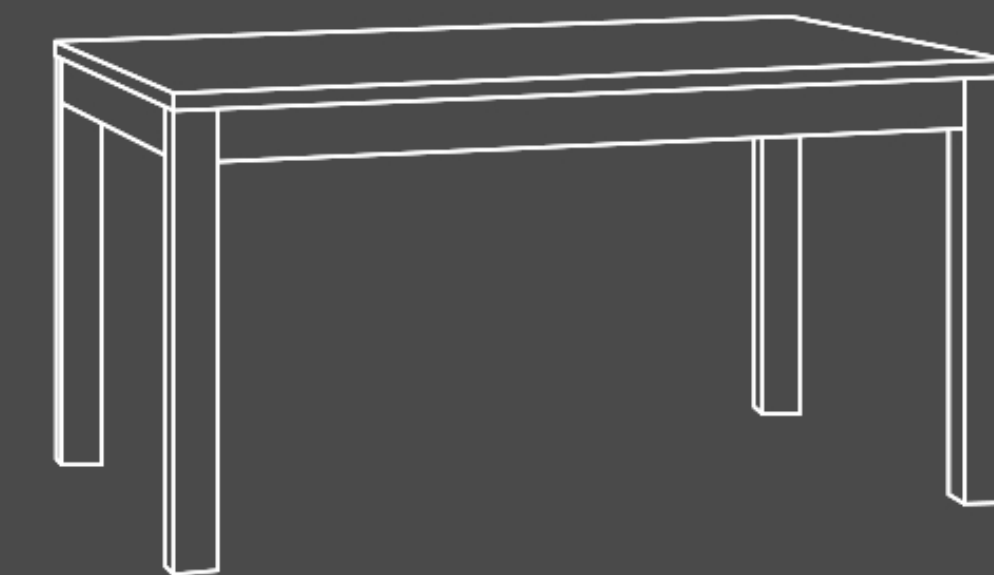
2012



MAVERICKS

Table Example

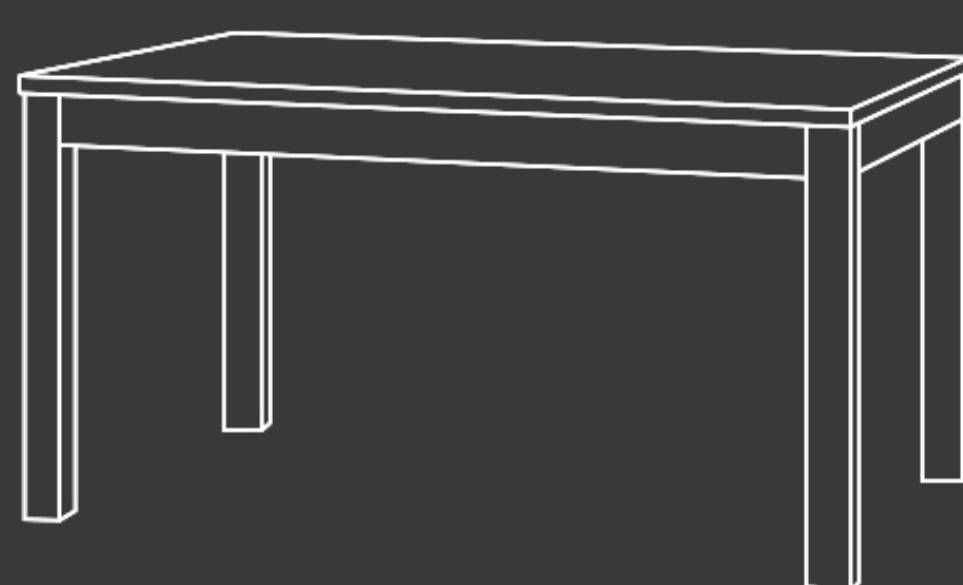
2013



YOSEMITE

Table Example

2014



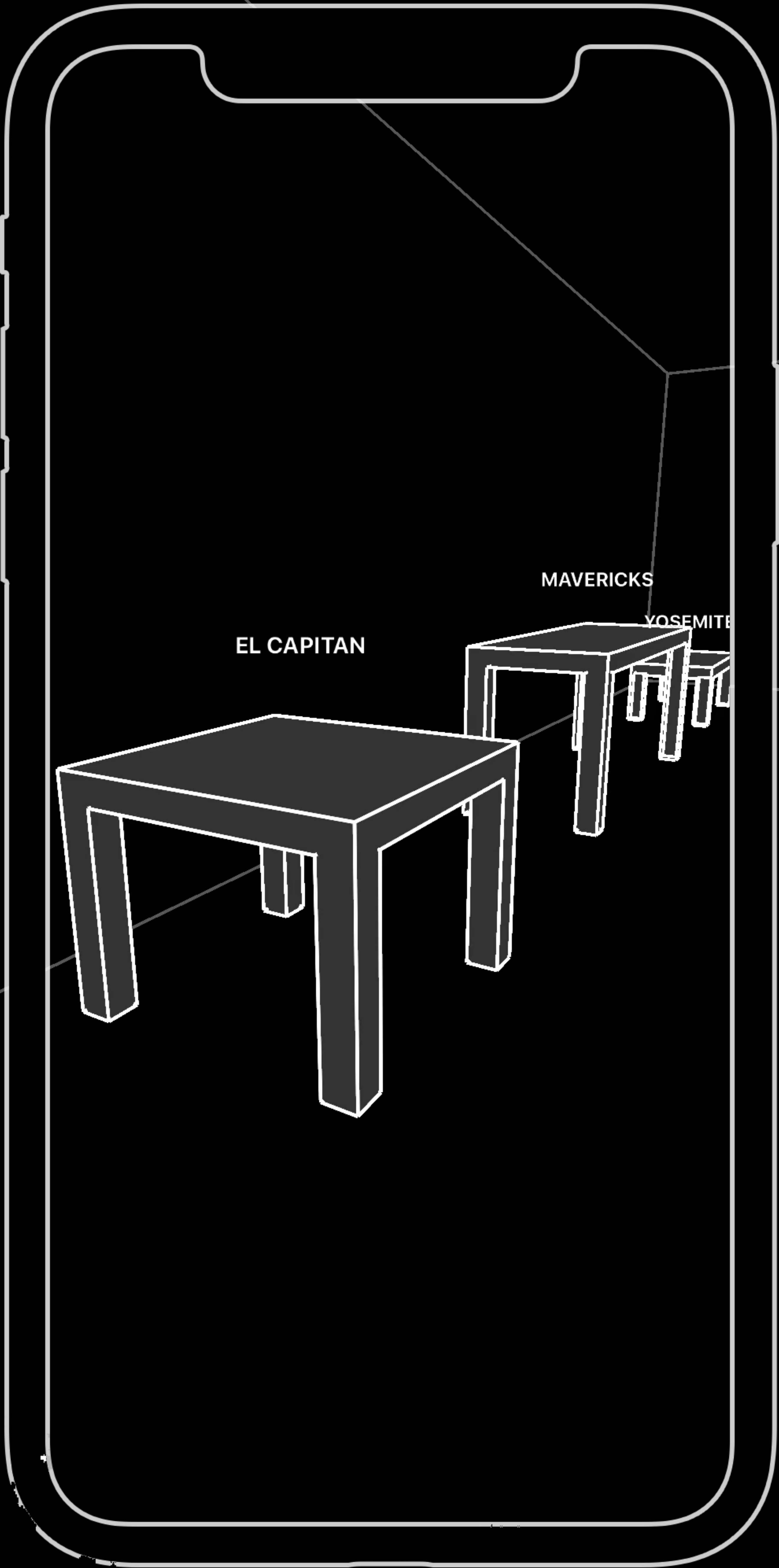
EL CAPITAN

Table Example

2015



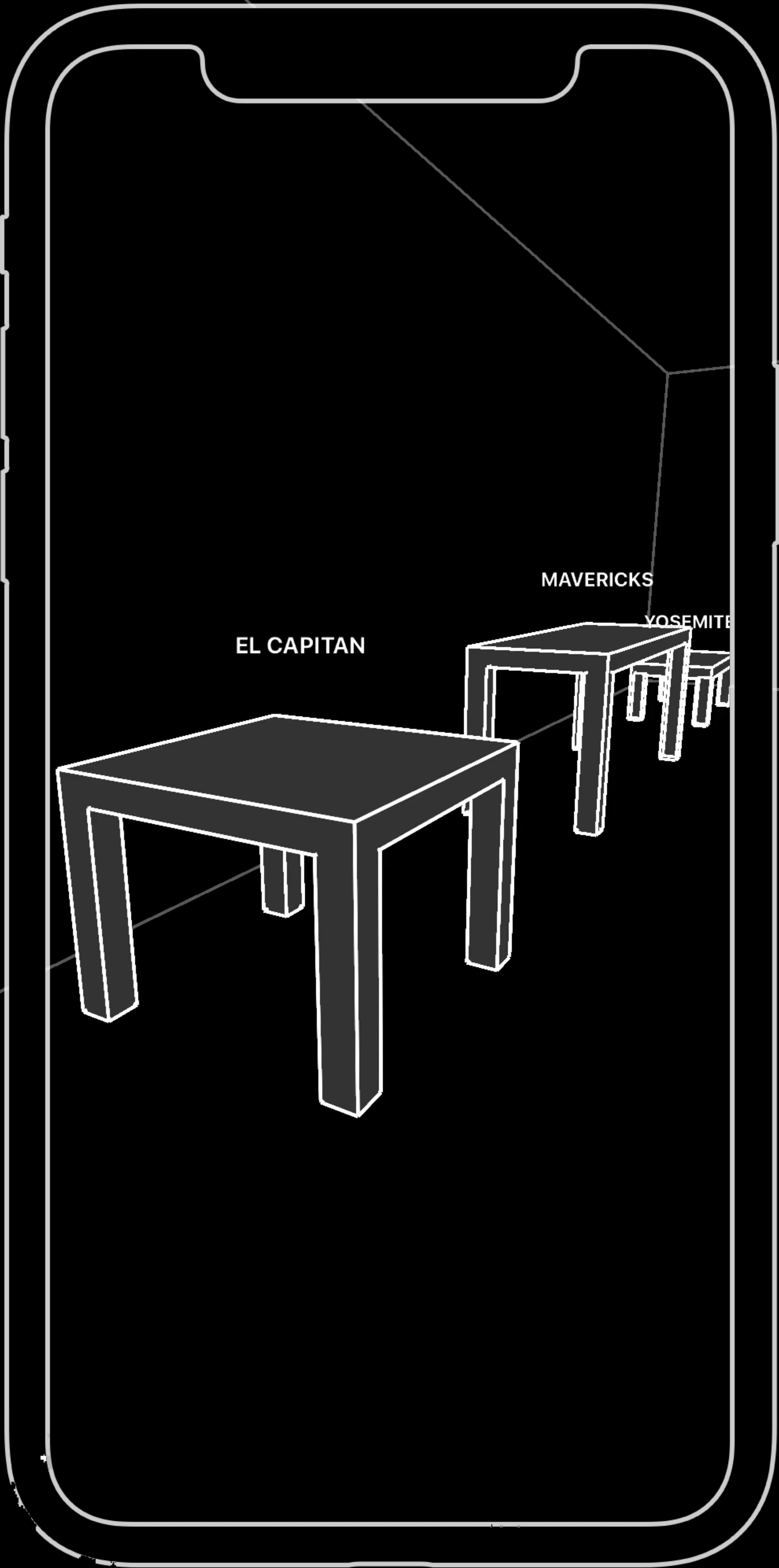
SIERRA



EL CAPITAN

MAVERICKS

YOSEMITE



EL CAPITAN

MAVERICKS

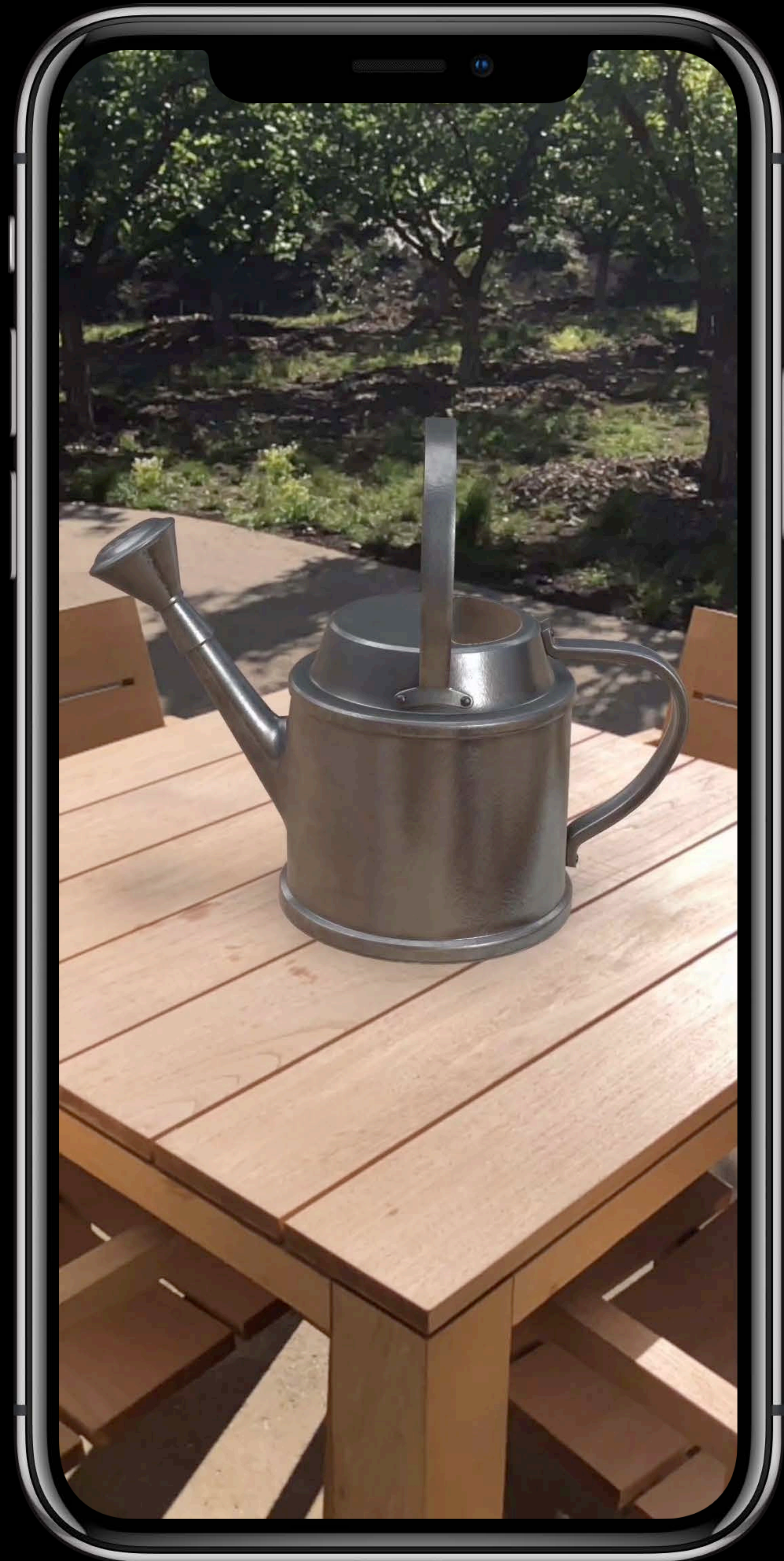
YOSEMITE

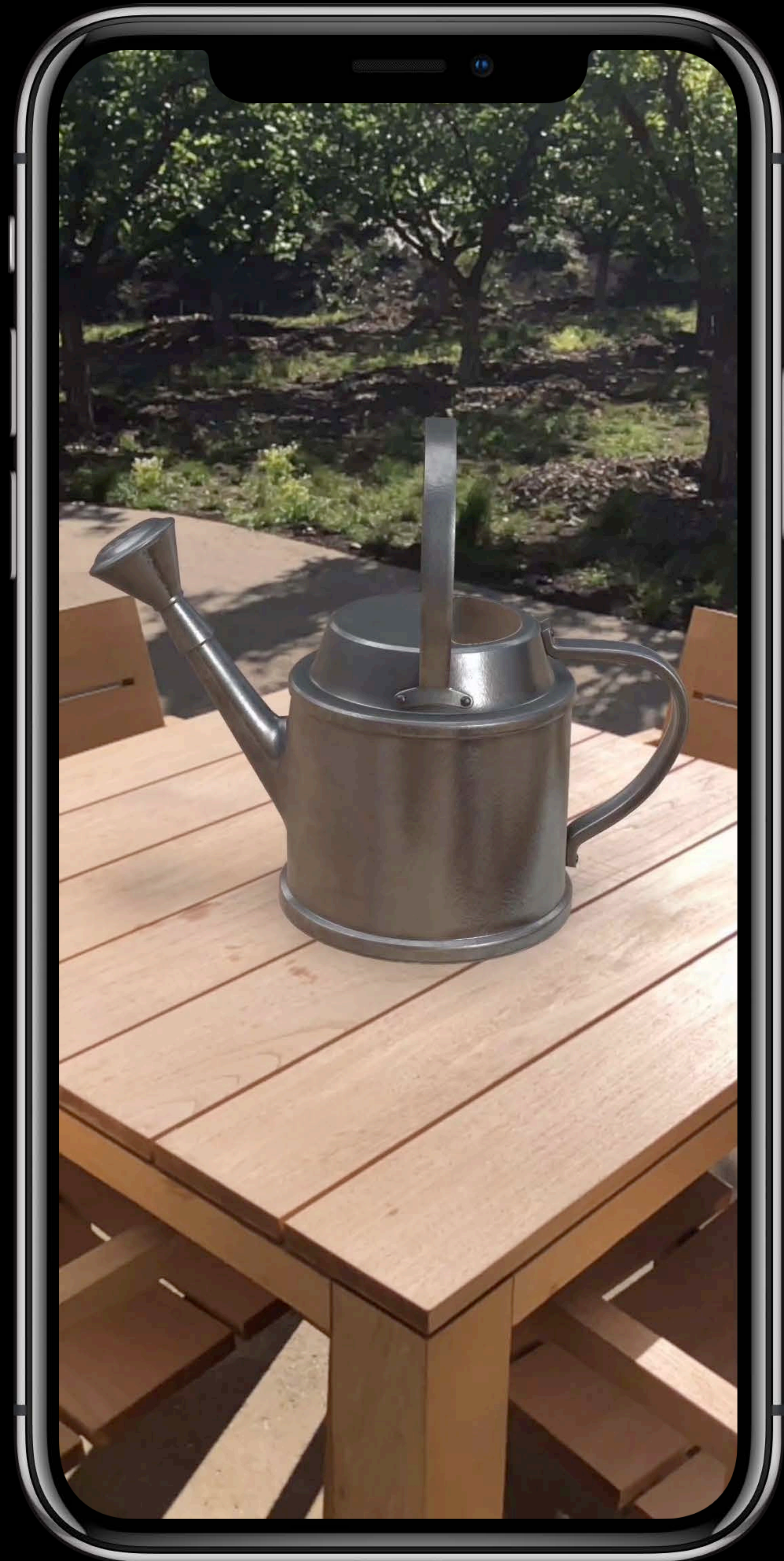
Custom movement interactions





Combine touch and movement





Indirect controls

Focus on content, not your finger

00:01

SCENARIO 1

◆ SURVIVE 15 WAVES

WAVES: 0 | KILLS: 0 | CRATES: 0



23 KM/H

76.25 ALT

224.57 M

N

AUTO

140.F

7.62MM MK I

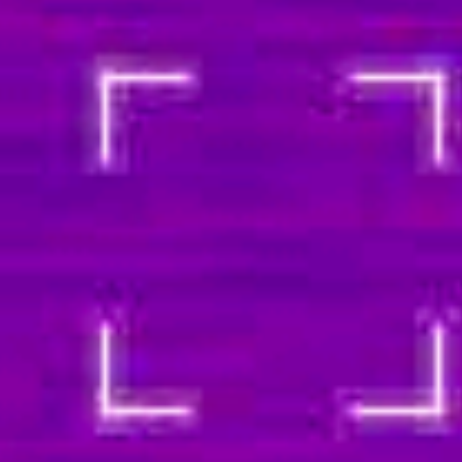


A technical line drawing of a 7.62mm MK I rifle, showing the receiver, barrel, and magazine. The drawing is presented in a white, semi-transparent box with a thin border.

23 KM/H

76.25 ALT

224.57 M



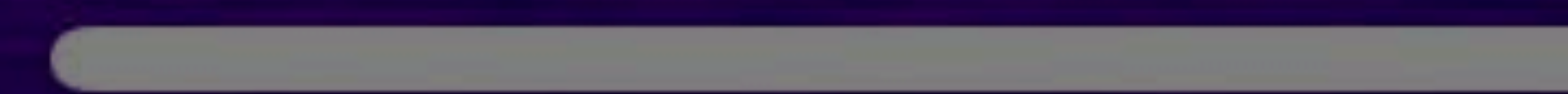


7.62MM MK I

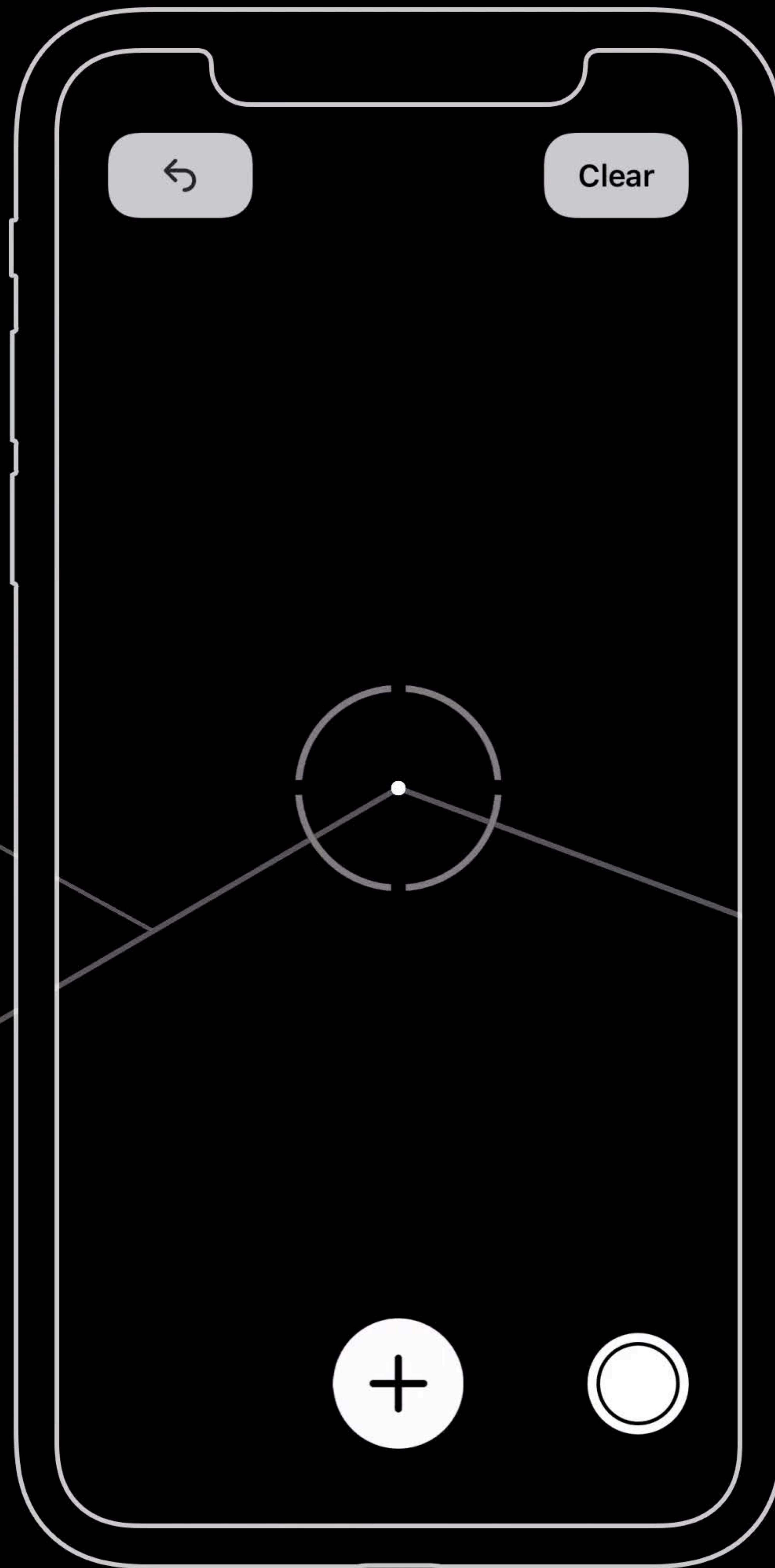
23 KM/H

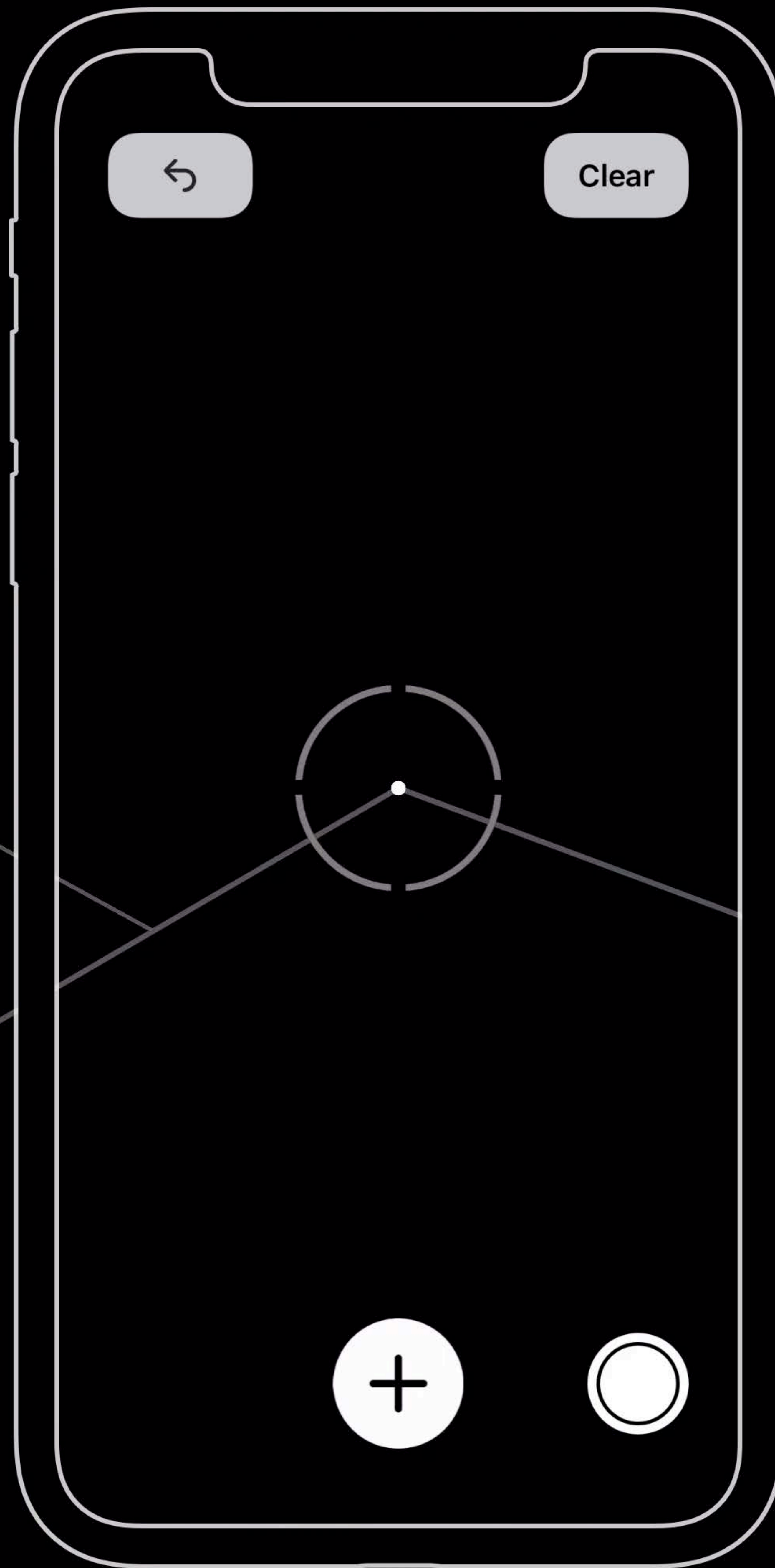
76.25 ALT

224.57 M



One-handed AR





Getting into AR

Presenting content

Interactions in the world

Getting into AR

Presenting content

Interactions in the world

Creating Great Looking AR Models

Omar Khan, Product Design

Essential concepts

People expect a lot out of AR

Fast and consistent
rendering performance

60

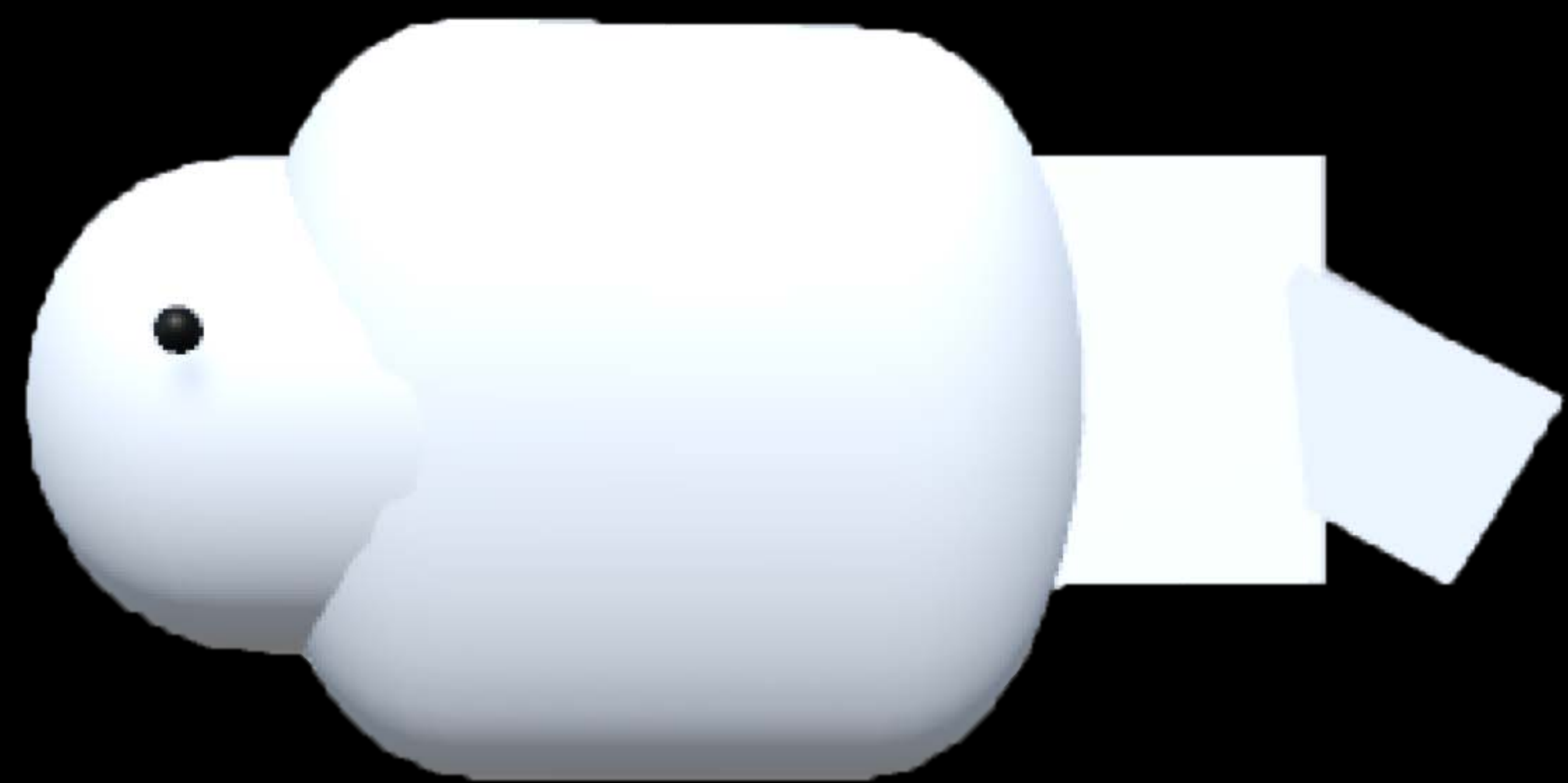
Frames Per Second

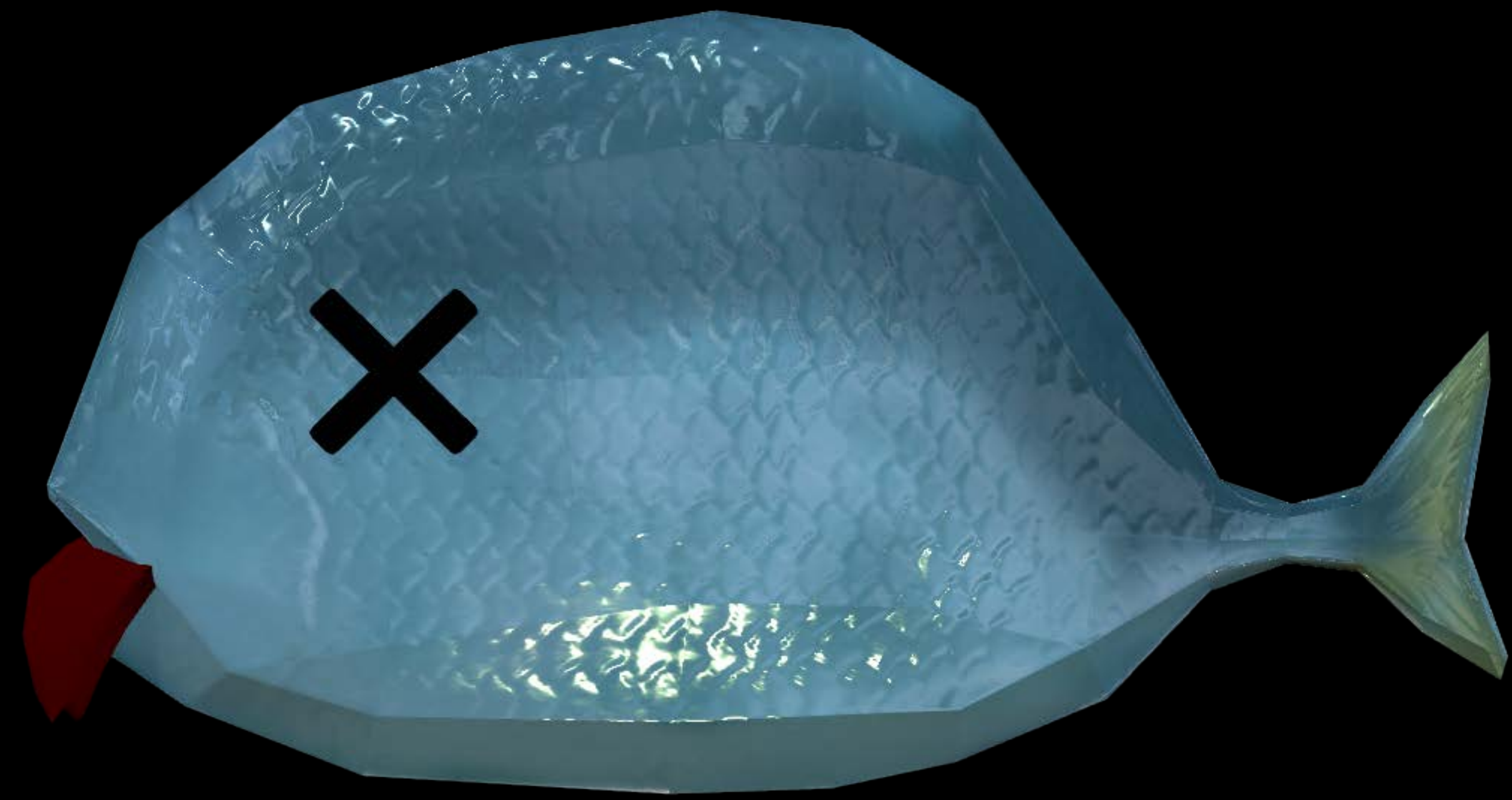
Minimal battery impact





High fidelity assets and cohesive style

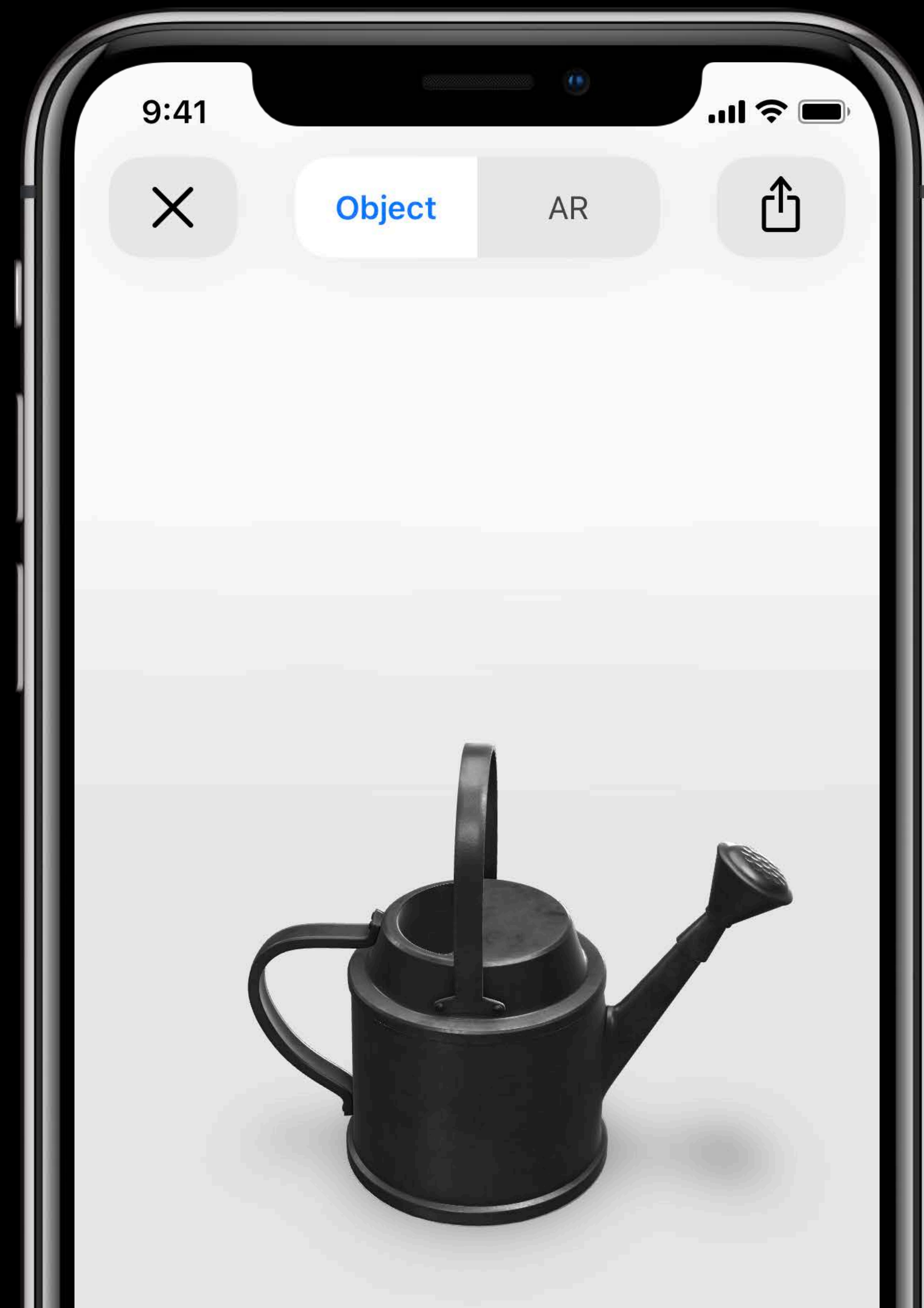




Seamless blend of AR and real world



Leverage AR Quicklook to Preview Assets



Planning the AR experience

Number of objects on screen?

Graphical style and details?

Level of interaction?









Setting up your AR canvas





60fps



+ Mt 0fps

1 2.73K

60fps

2.75K



+ 60fps

2.73K



Campfi

CampfiAR

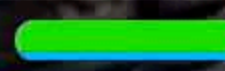
Stylized and playful

Unique details with
physically based materials

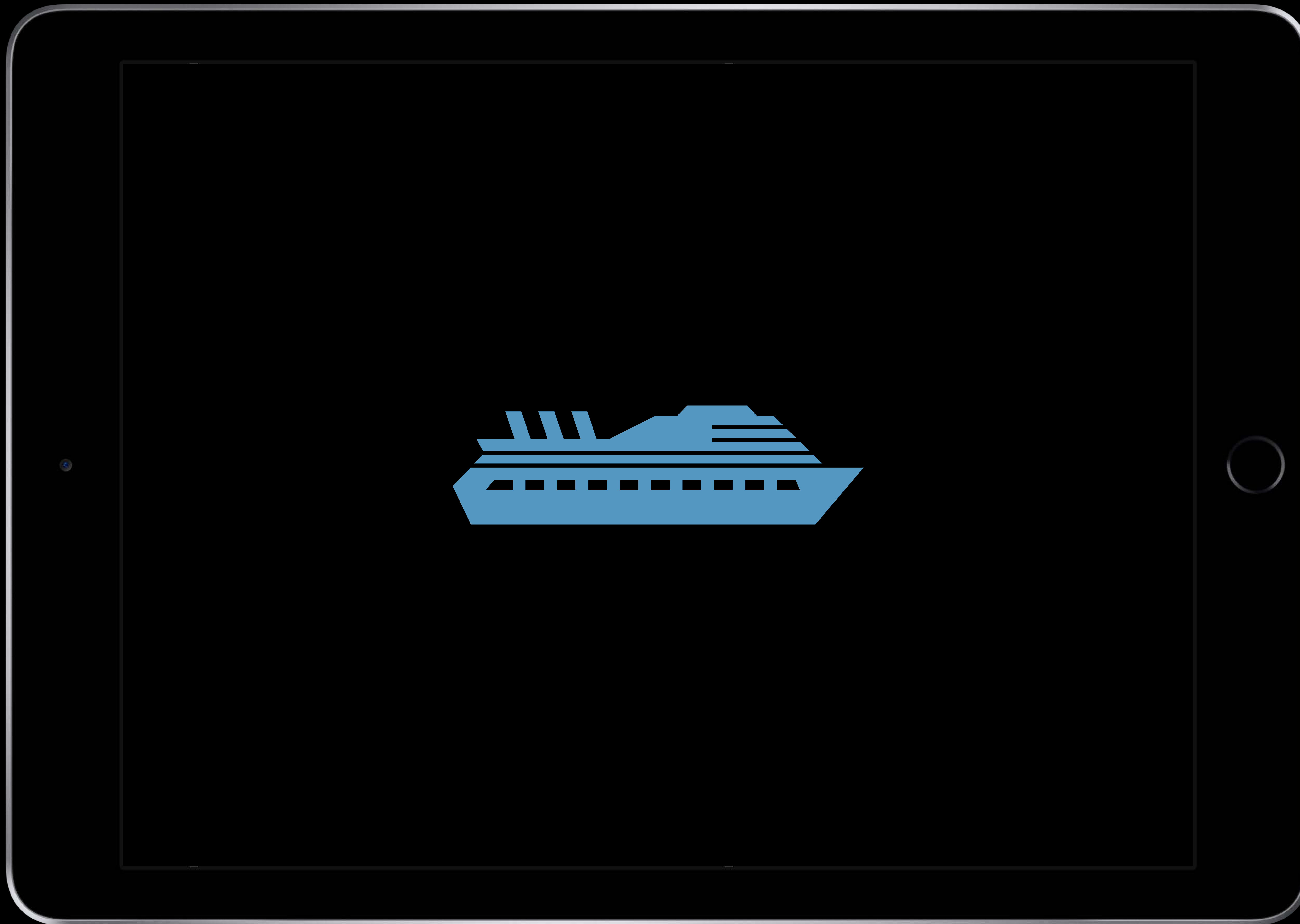
Working with meshes

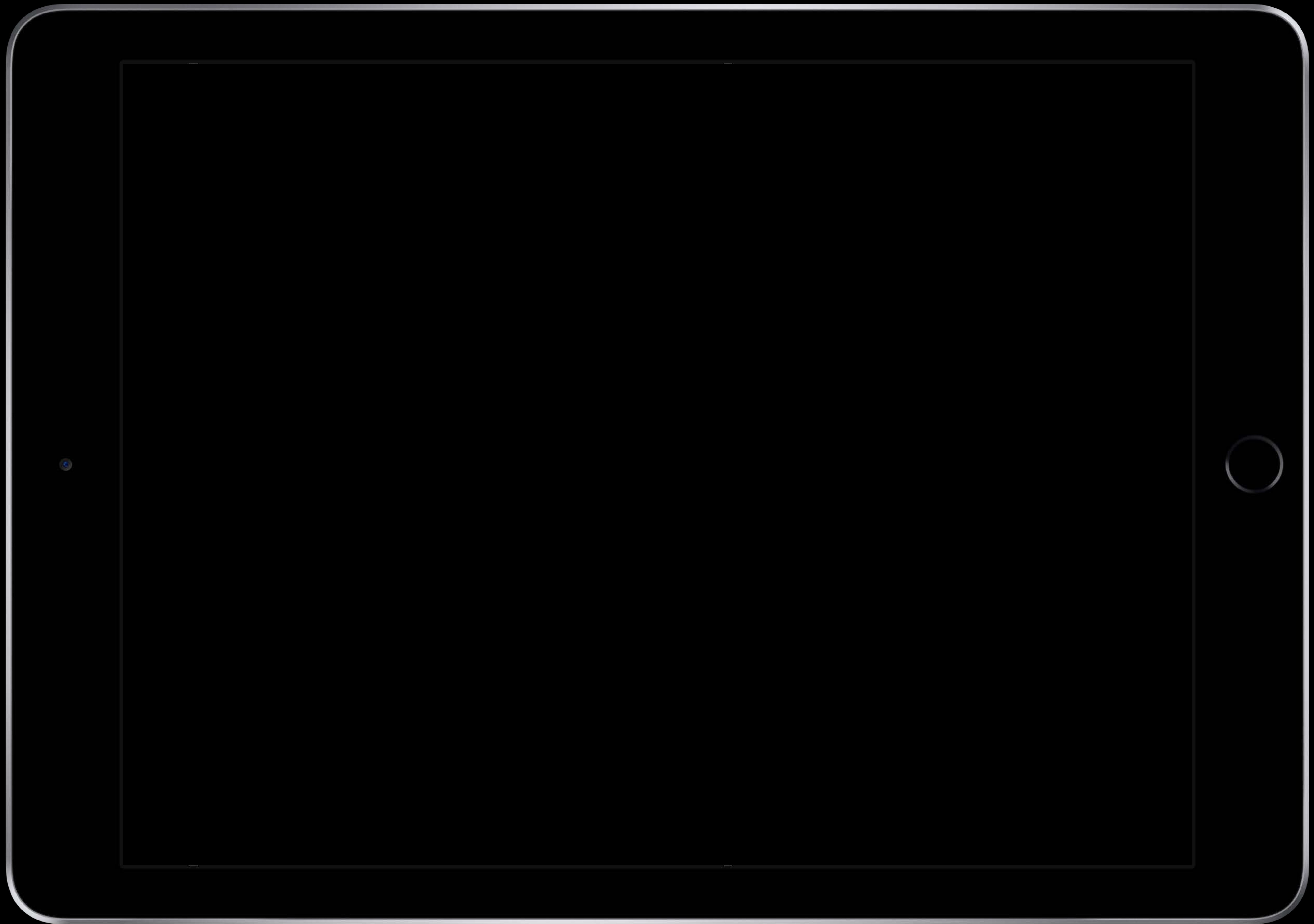




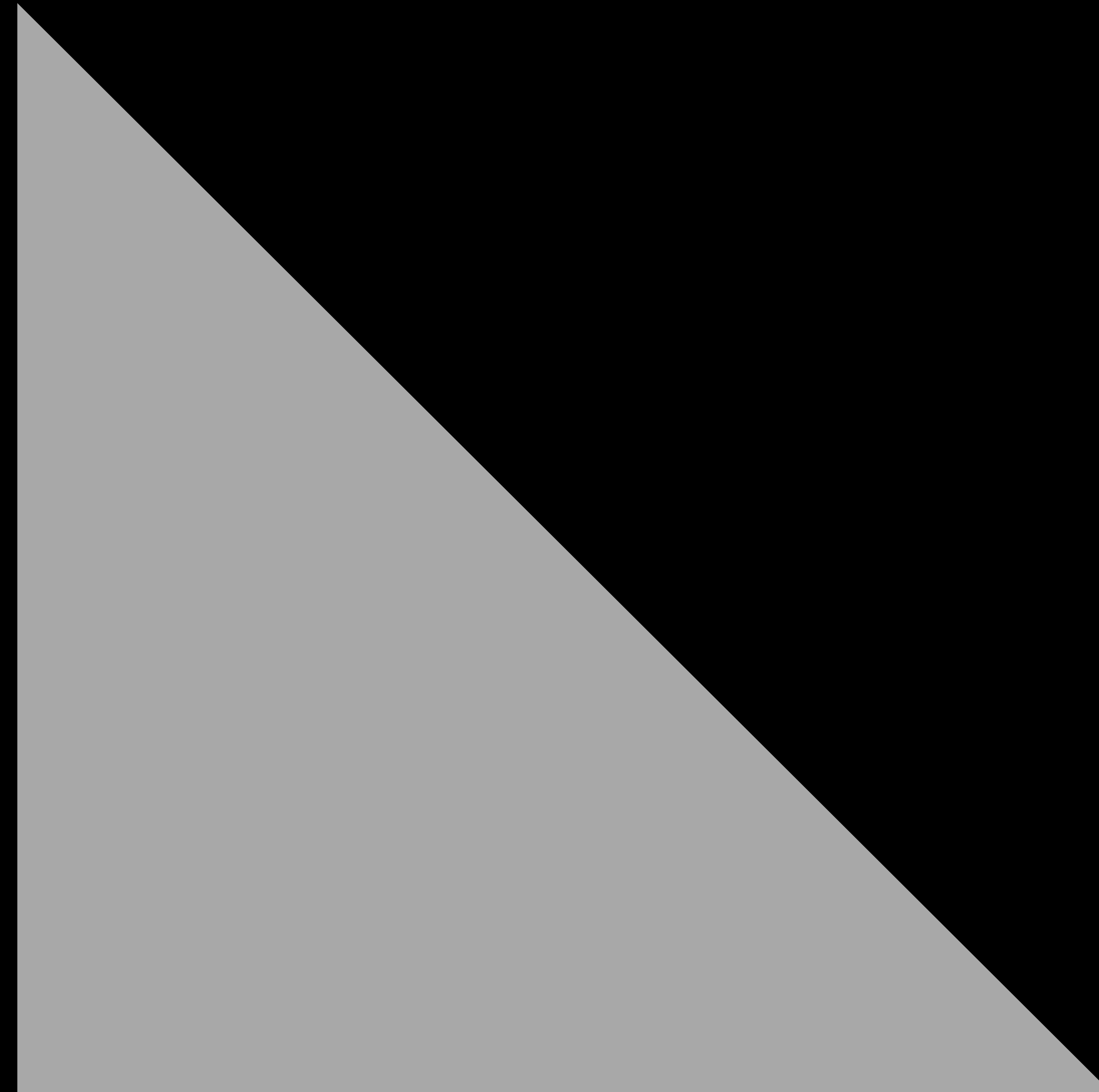
+  Mt 60fps

◀14 ▲3.12K

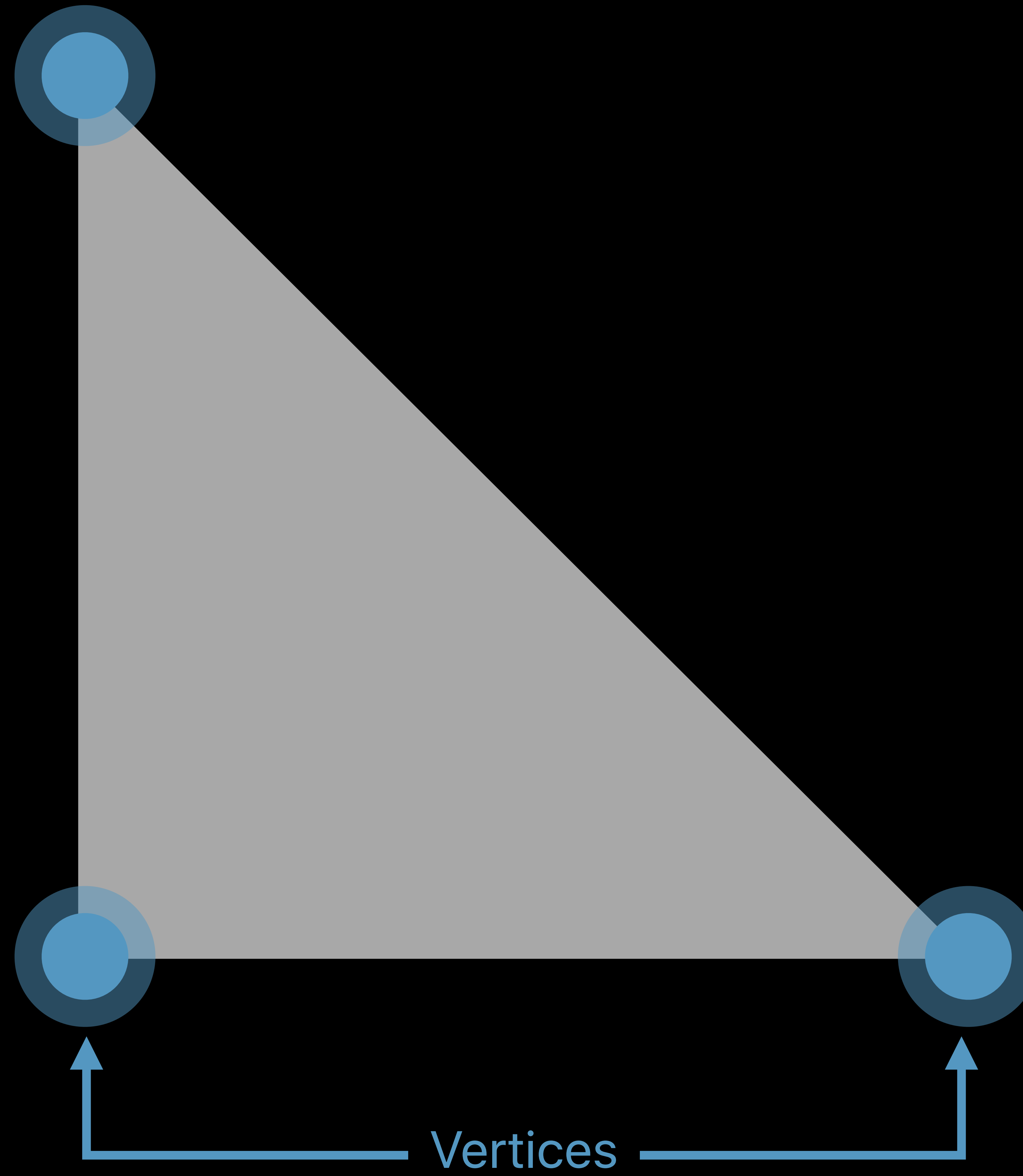




Mesh Basics



Mesh Basics

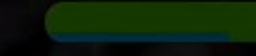






32fps



+  Mt 58fps

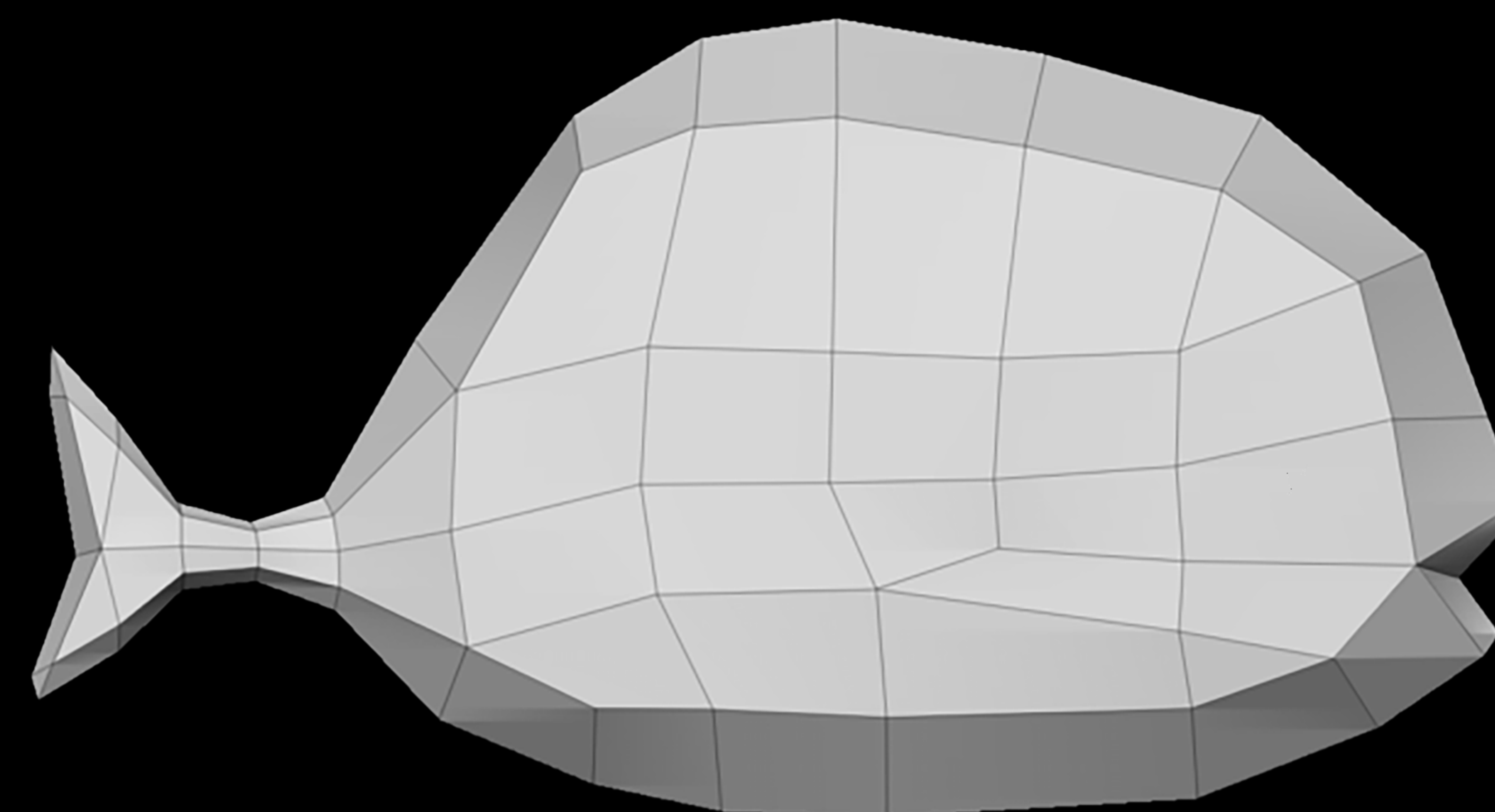
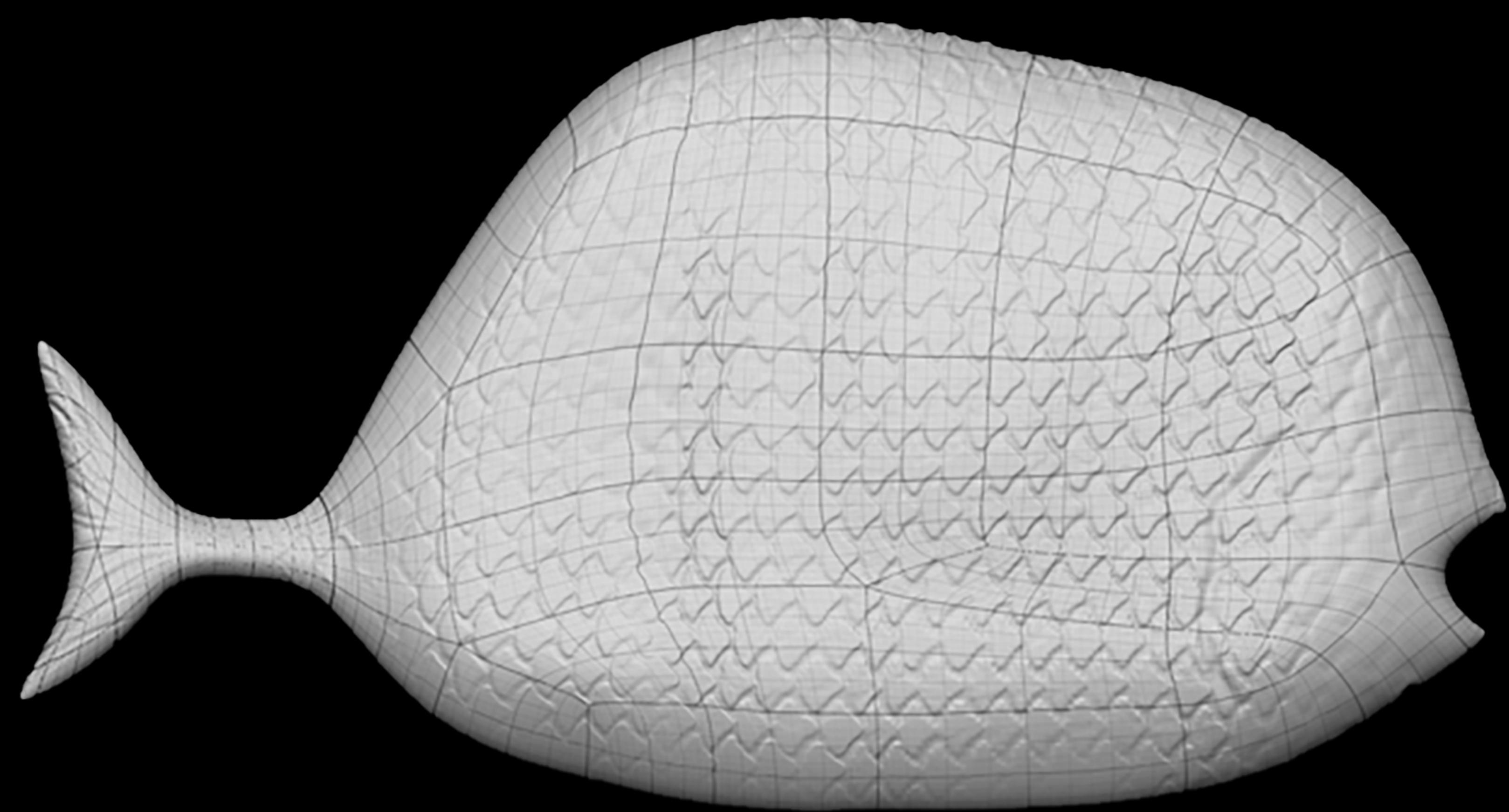
9 200K

32fps

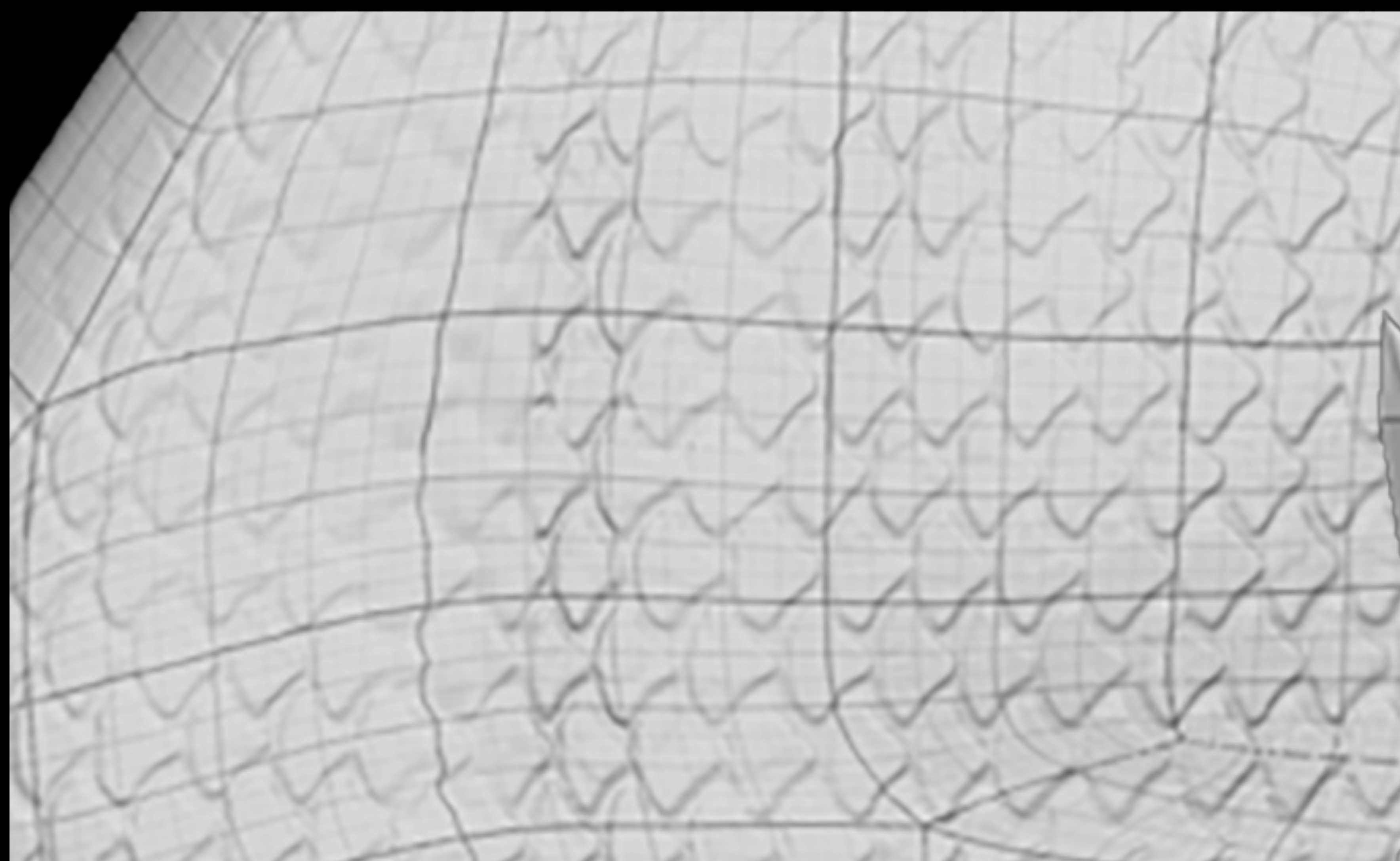
955K



High-Density to Low-Density Model



High-Density to Low-Density Model







60fps



+ Mt 35fps

4 4932K

60fps

9.22K

+ Mt 35fps

4 4932K

Producing great looking materials

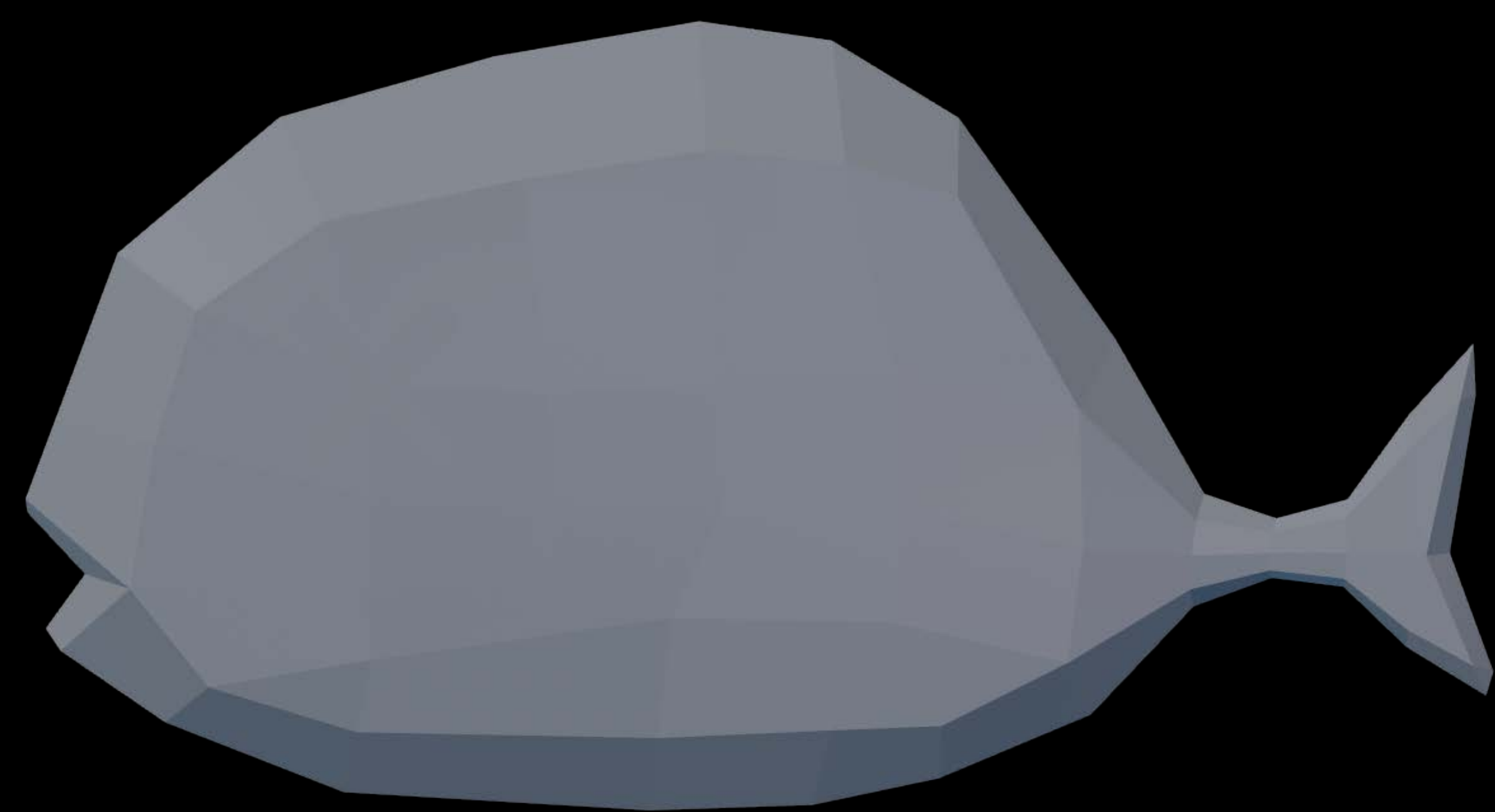
Physically Based Rendering (PBR)

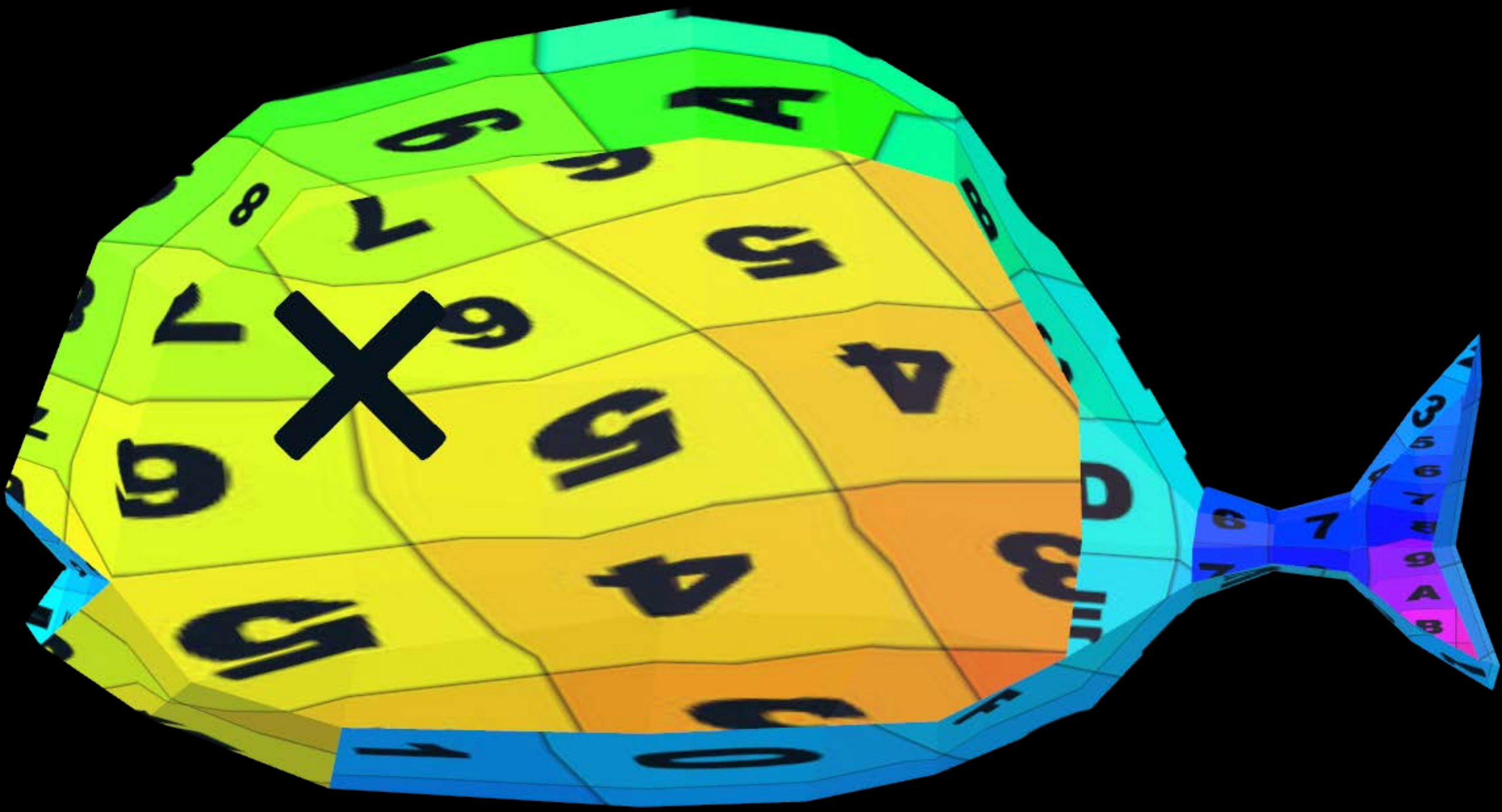


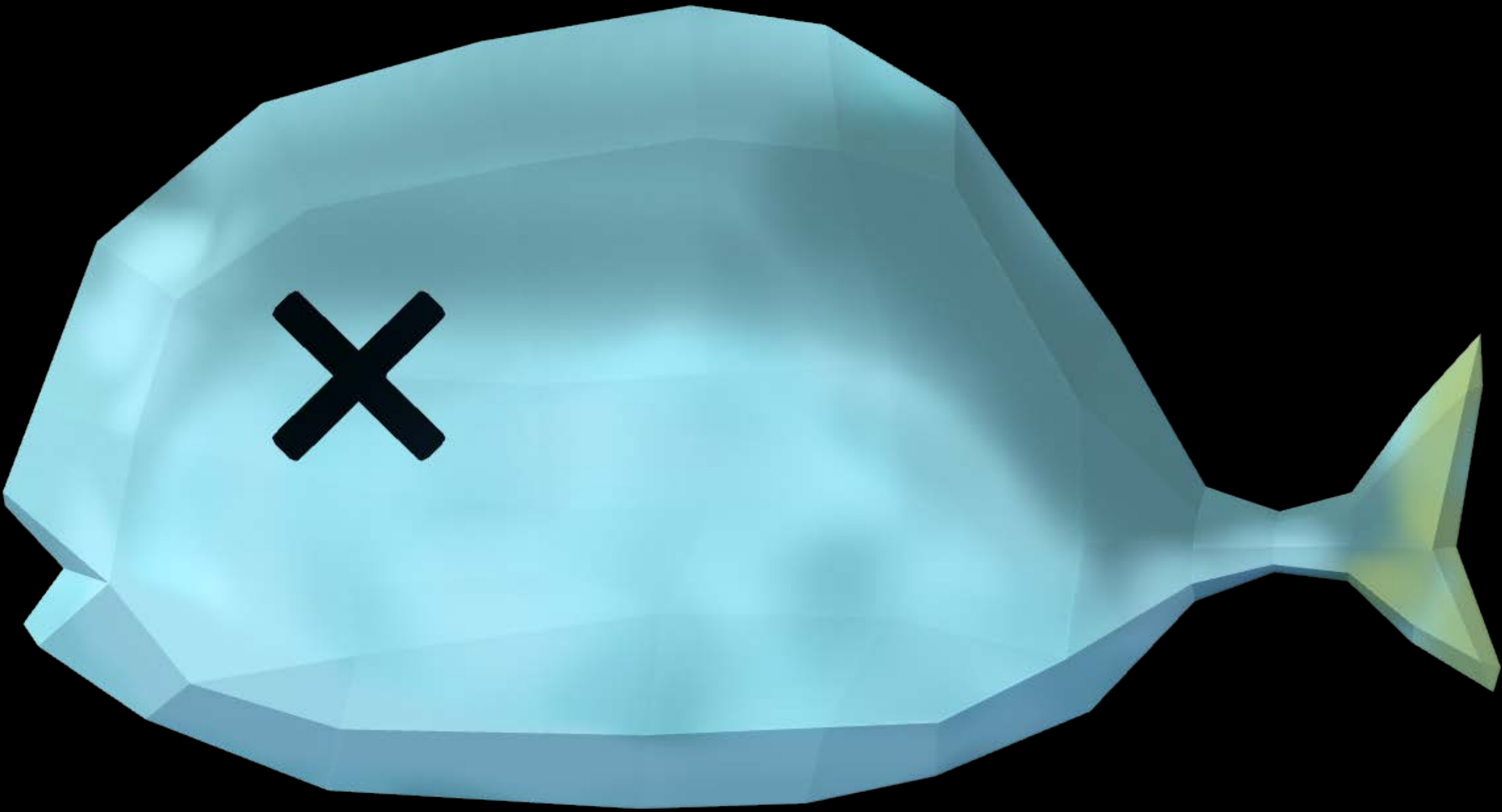
Albedo

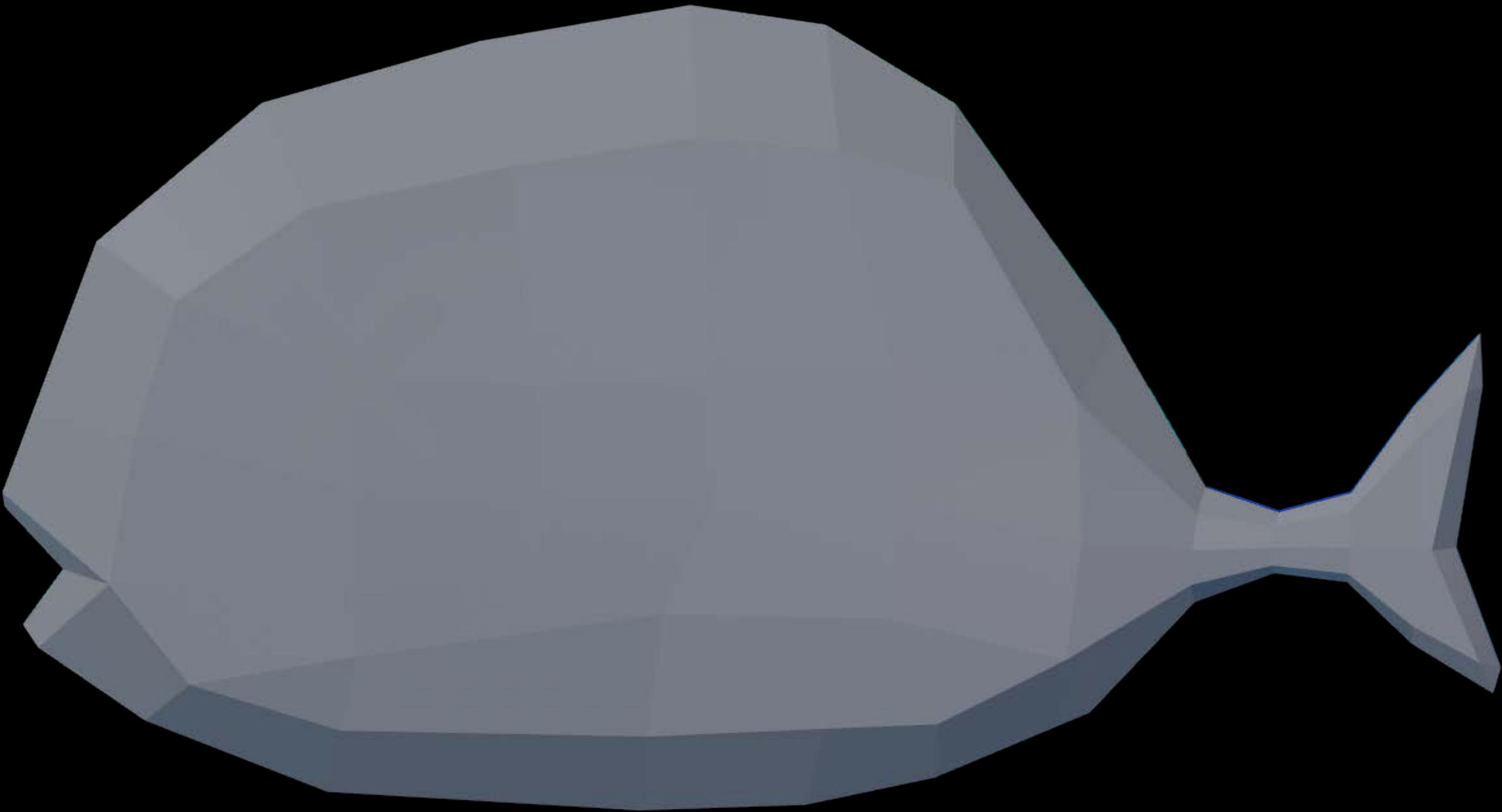


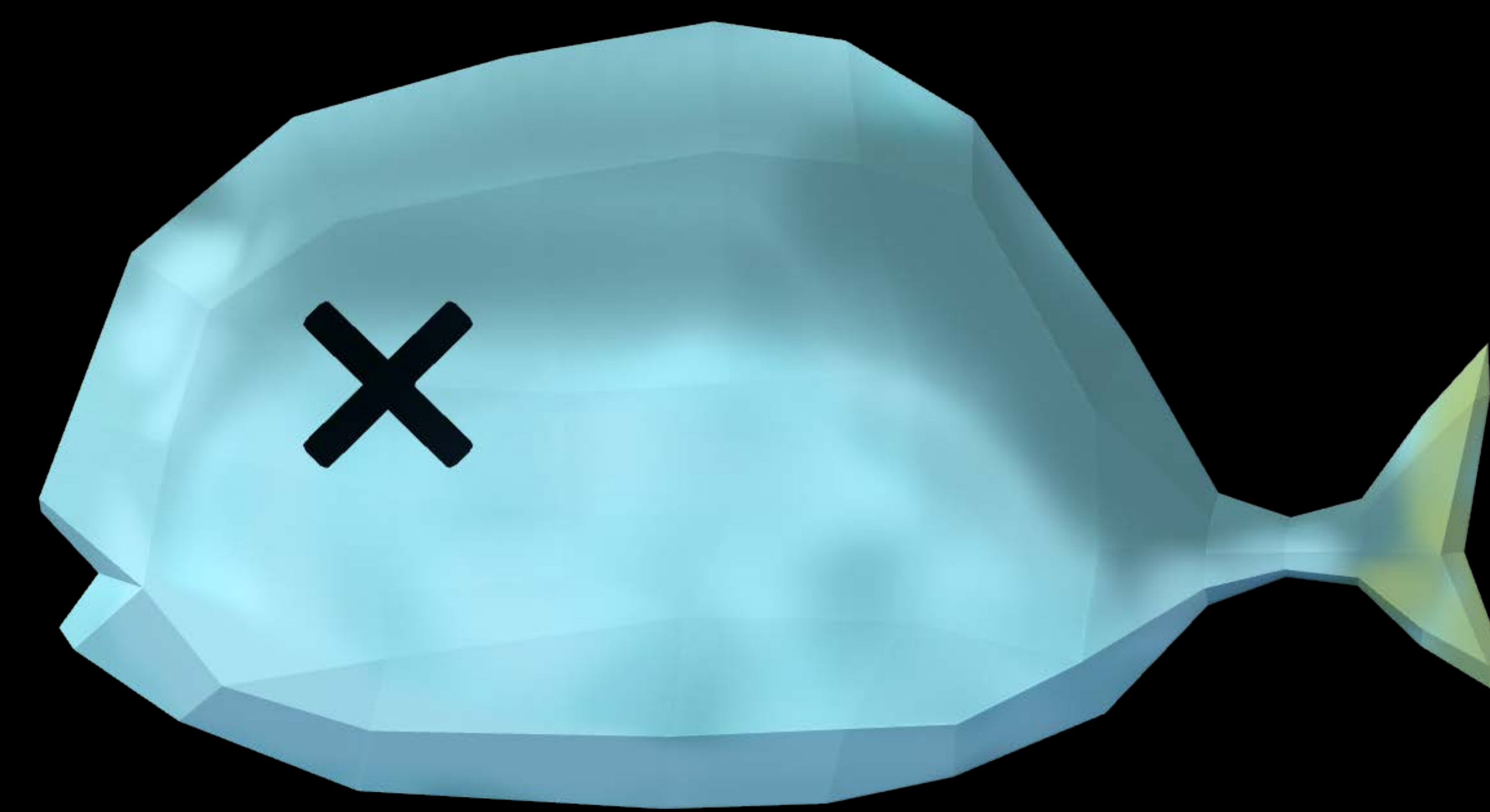
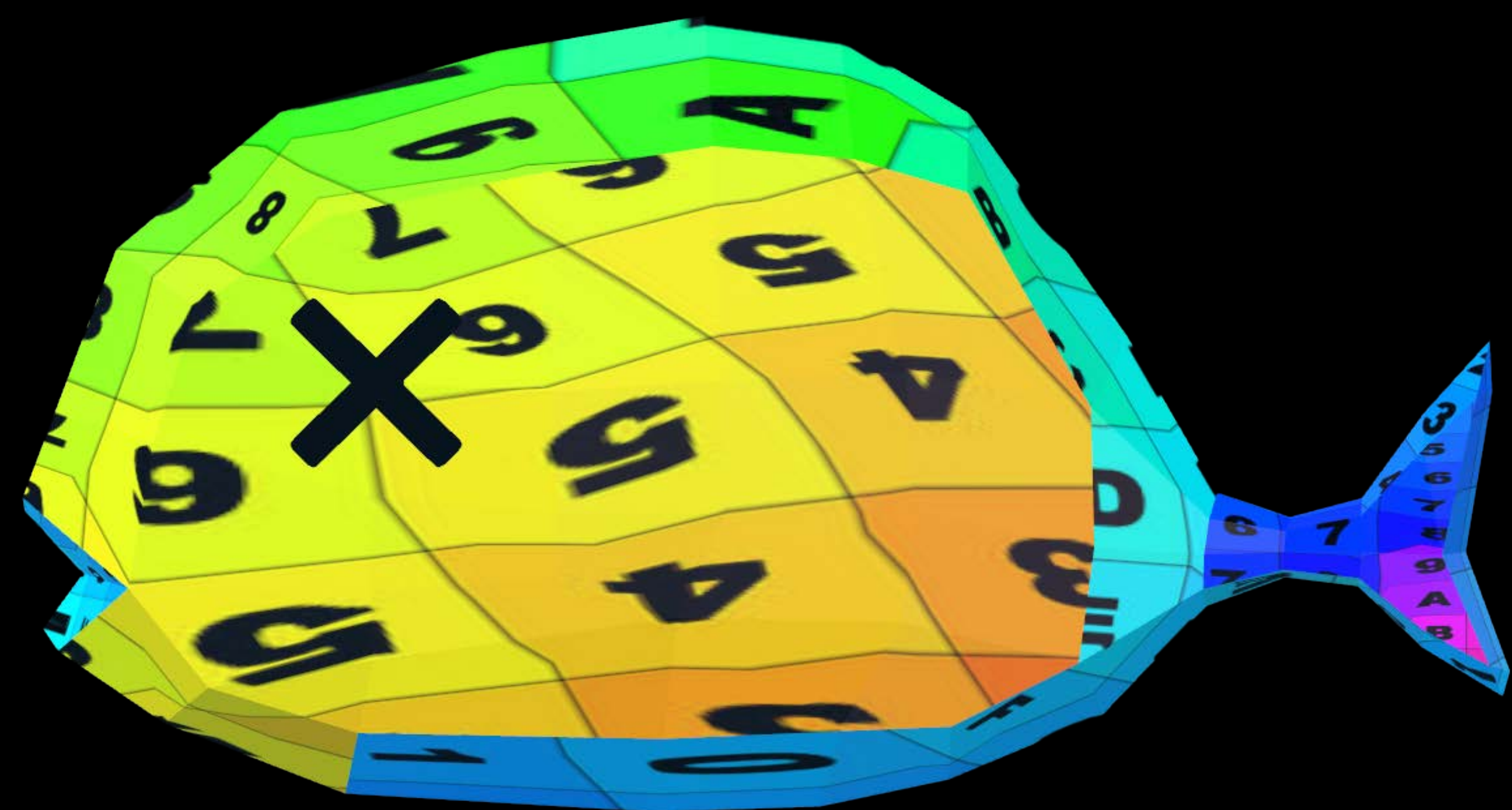
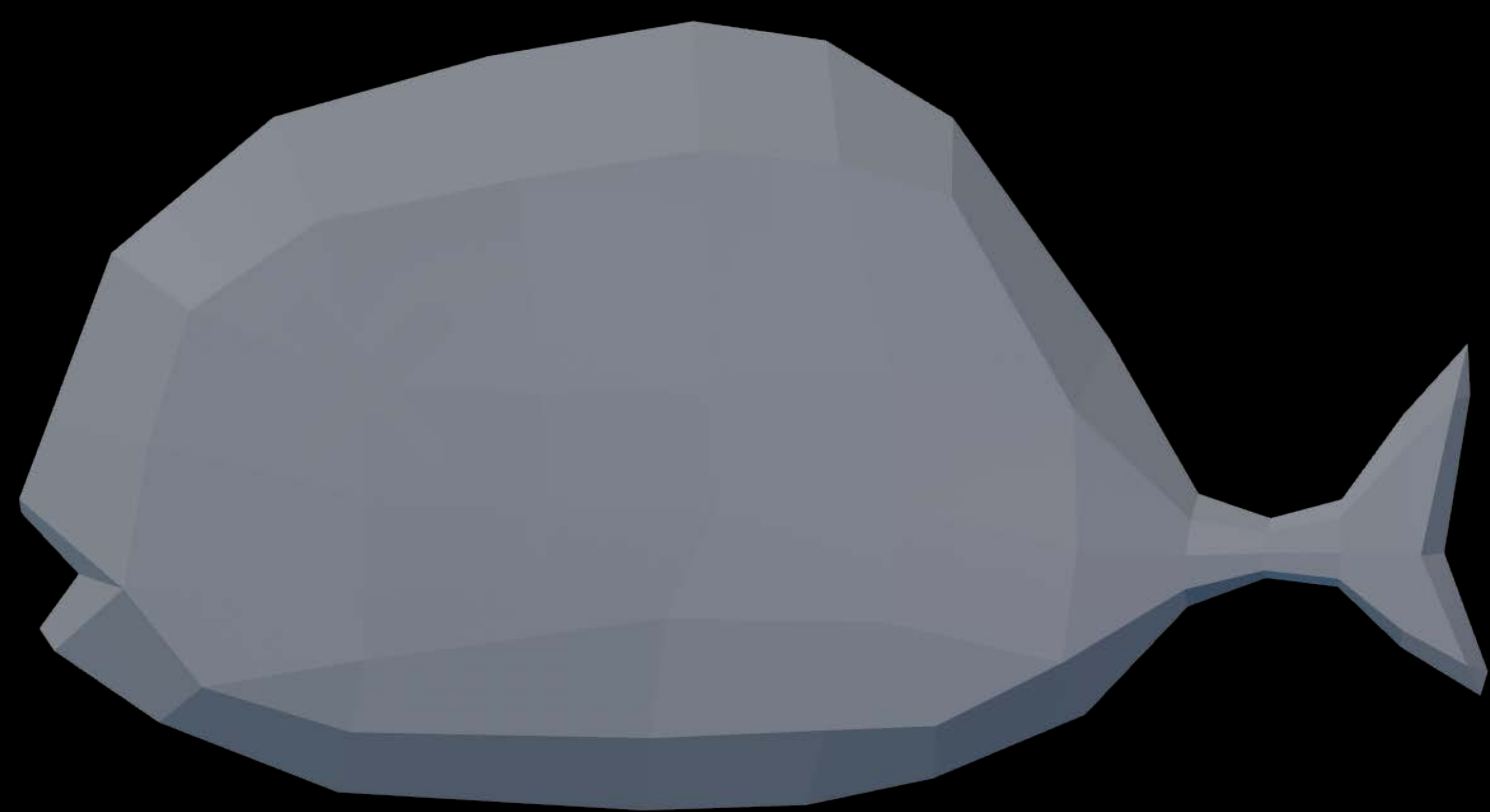






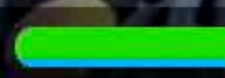






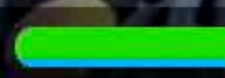
Normals



+  Mt 60fps

↔23 ▲8.66K



+  Mt 60fps

↔23 ▲8.66K

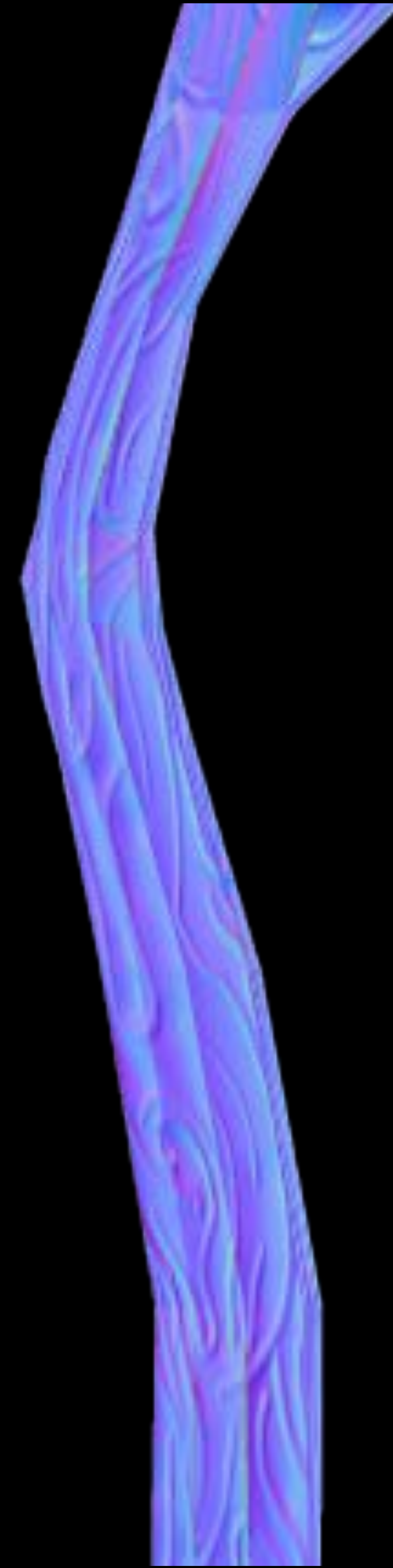


9.22K

+ Mt 60fps

23 48.66K











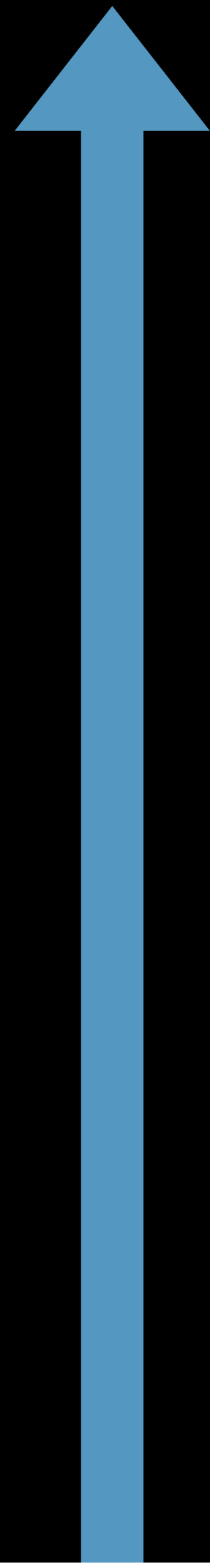
Surface



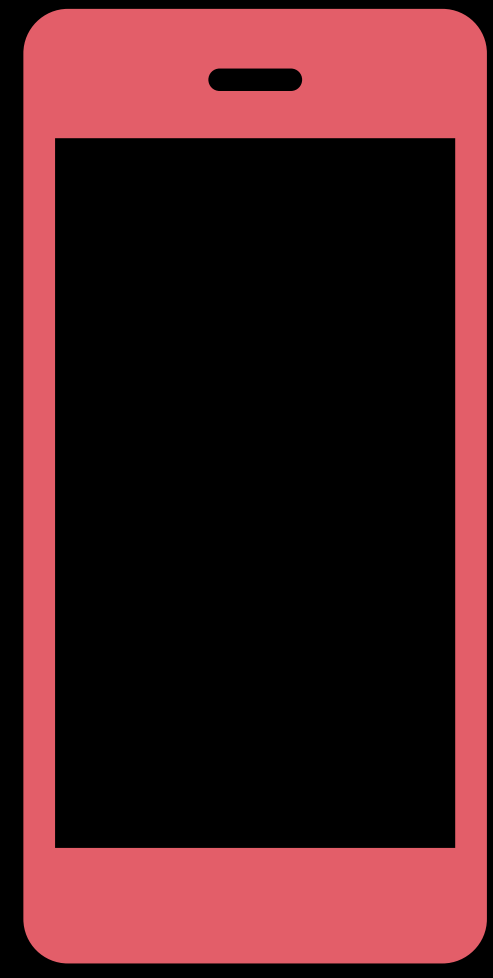
Surface



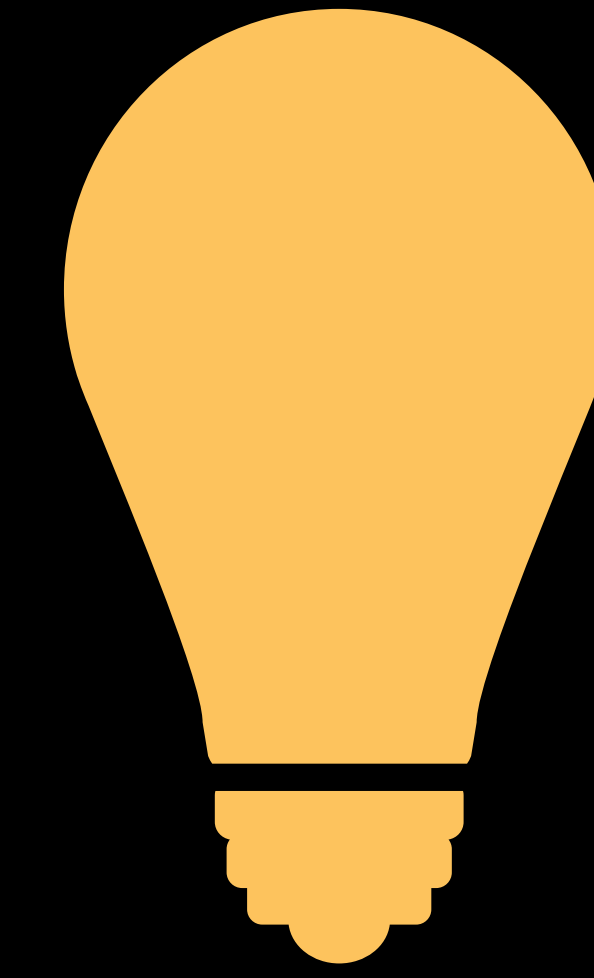
Normal



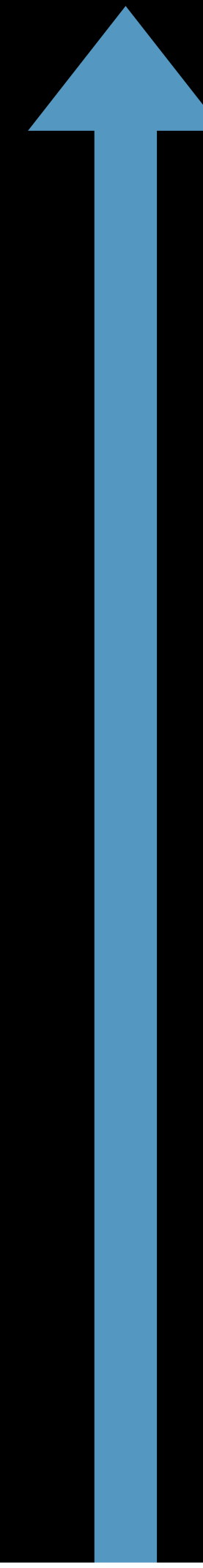
Screen



Light



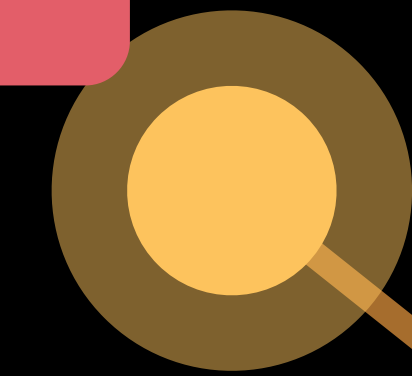
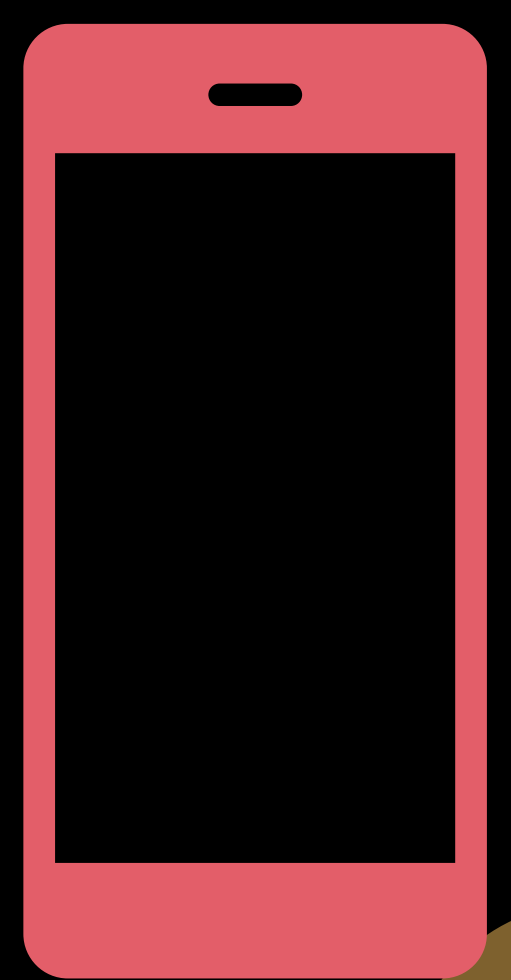
Normal



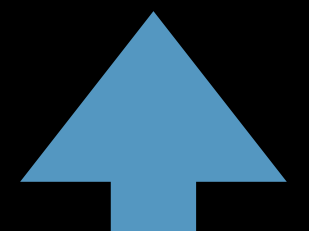
Surface



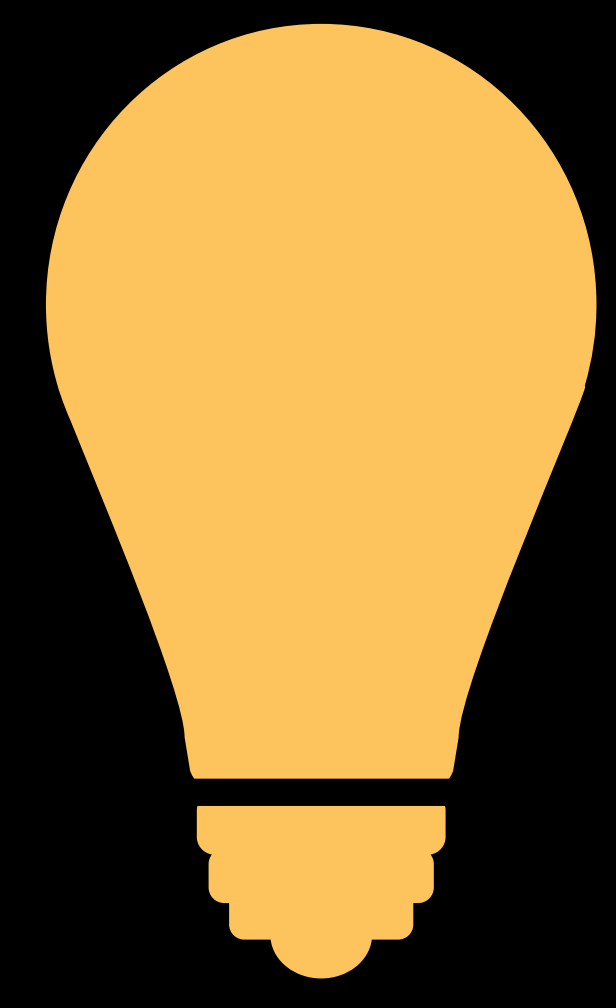
Screen



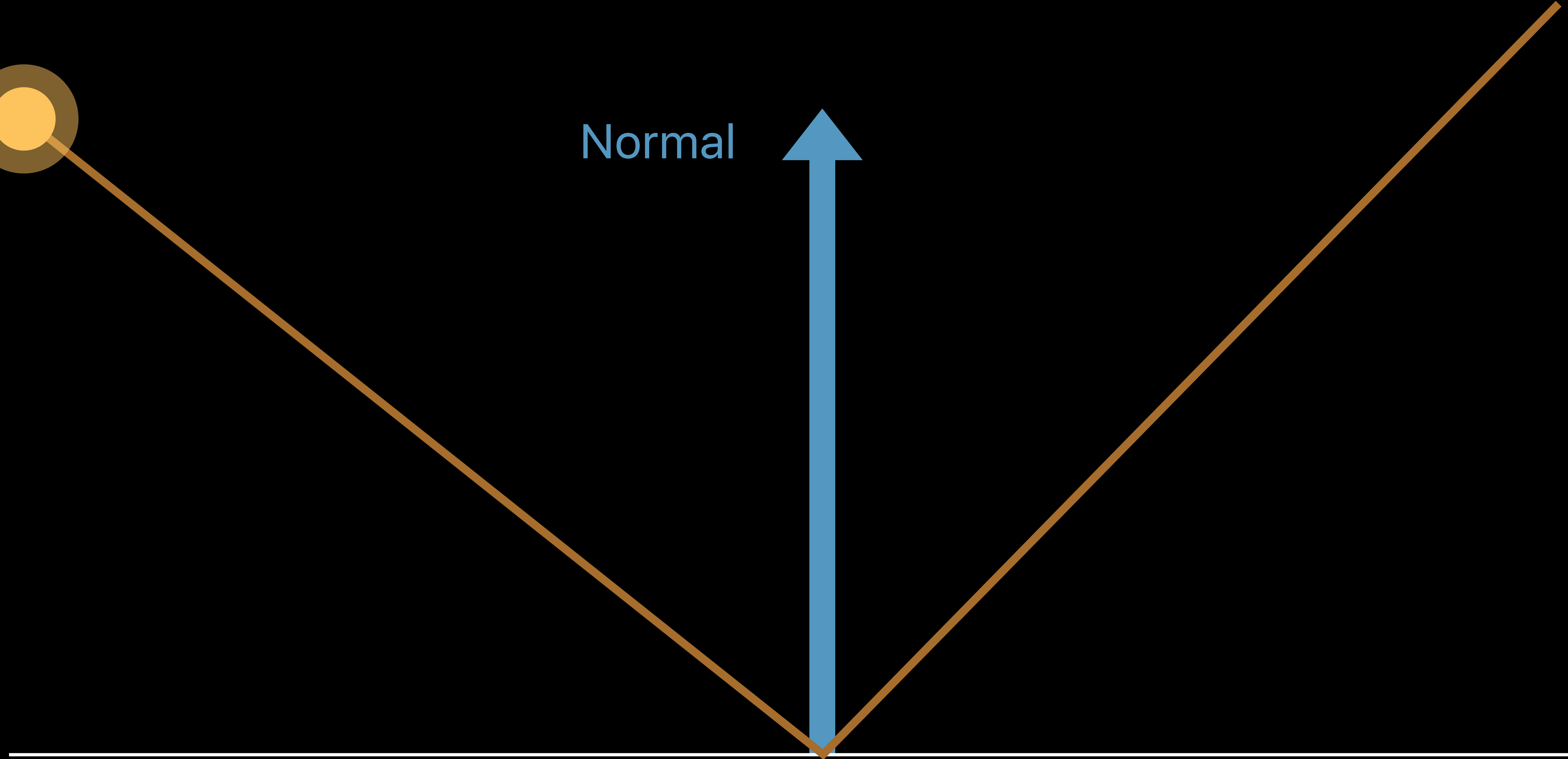
Normal

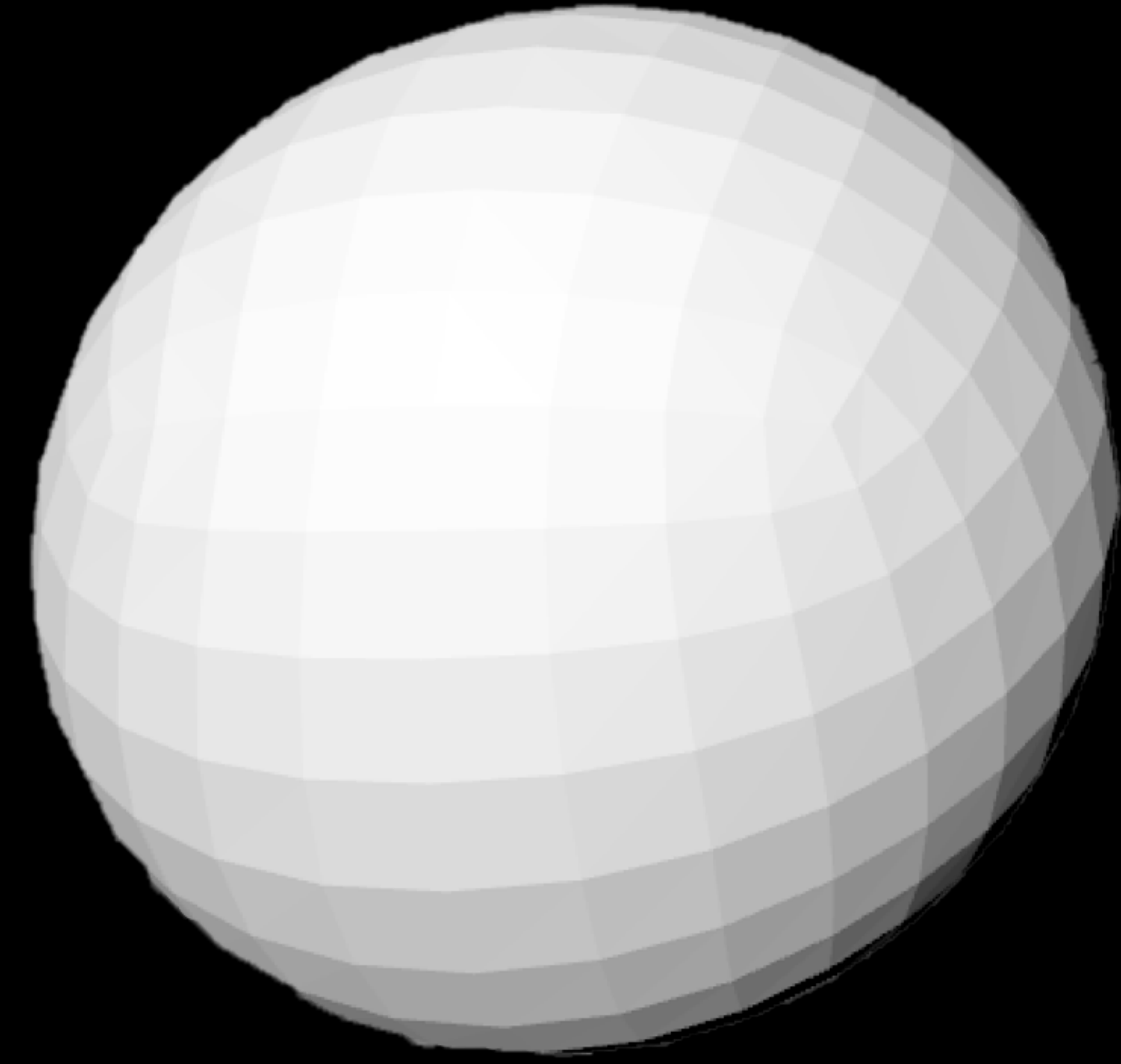


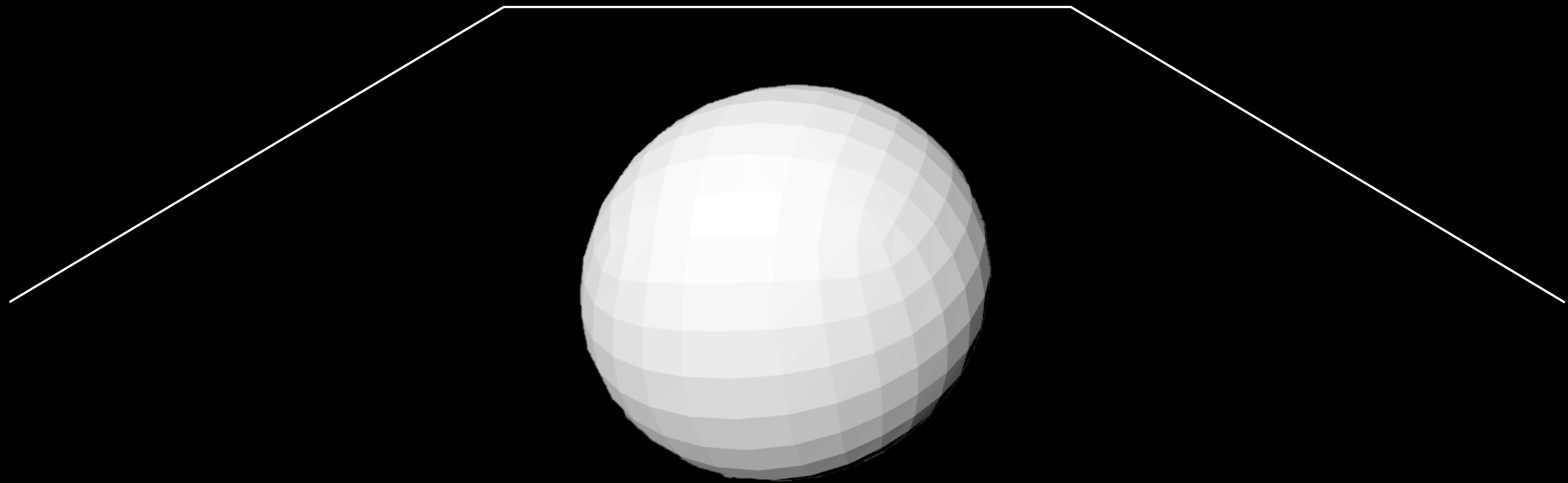
Light

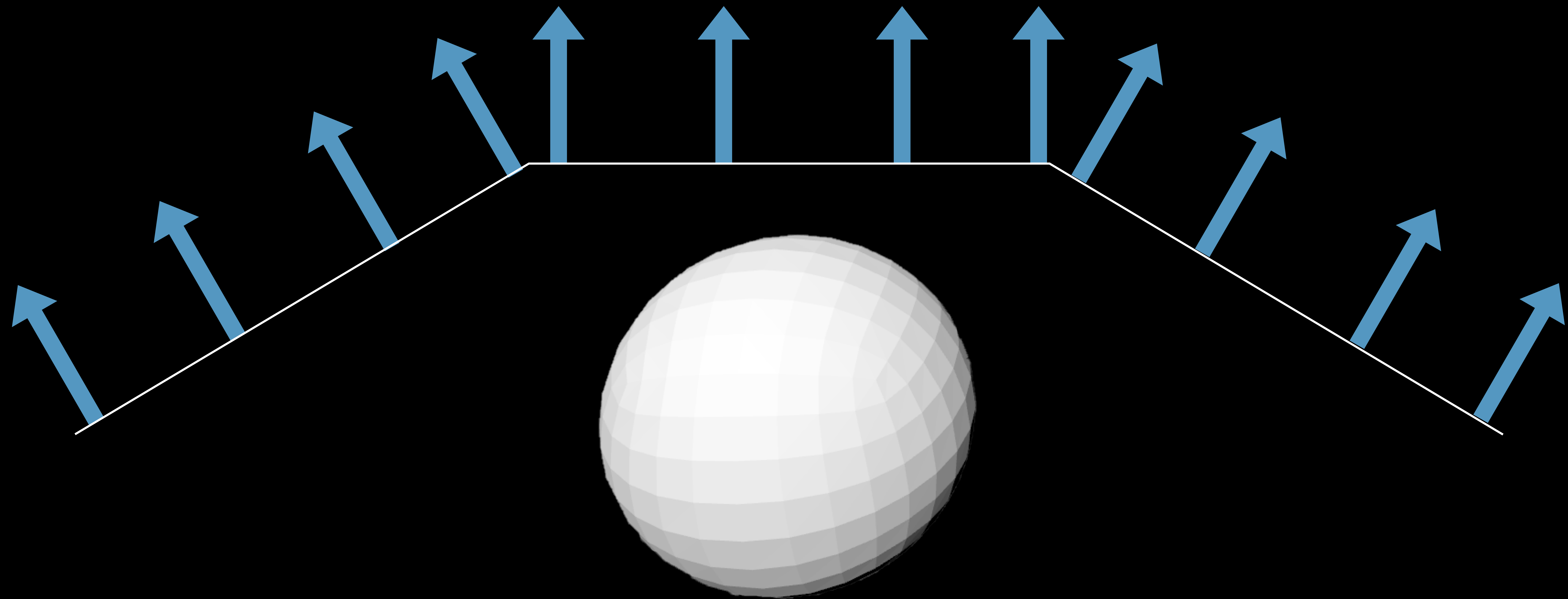


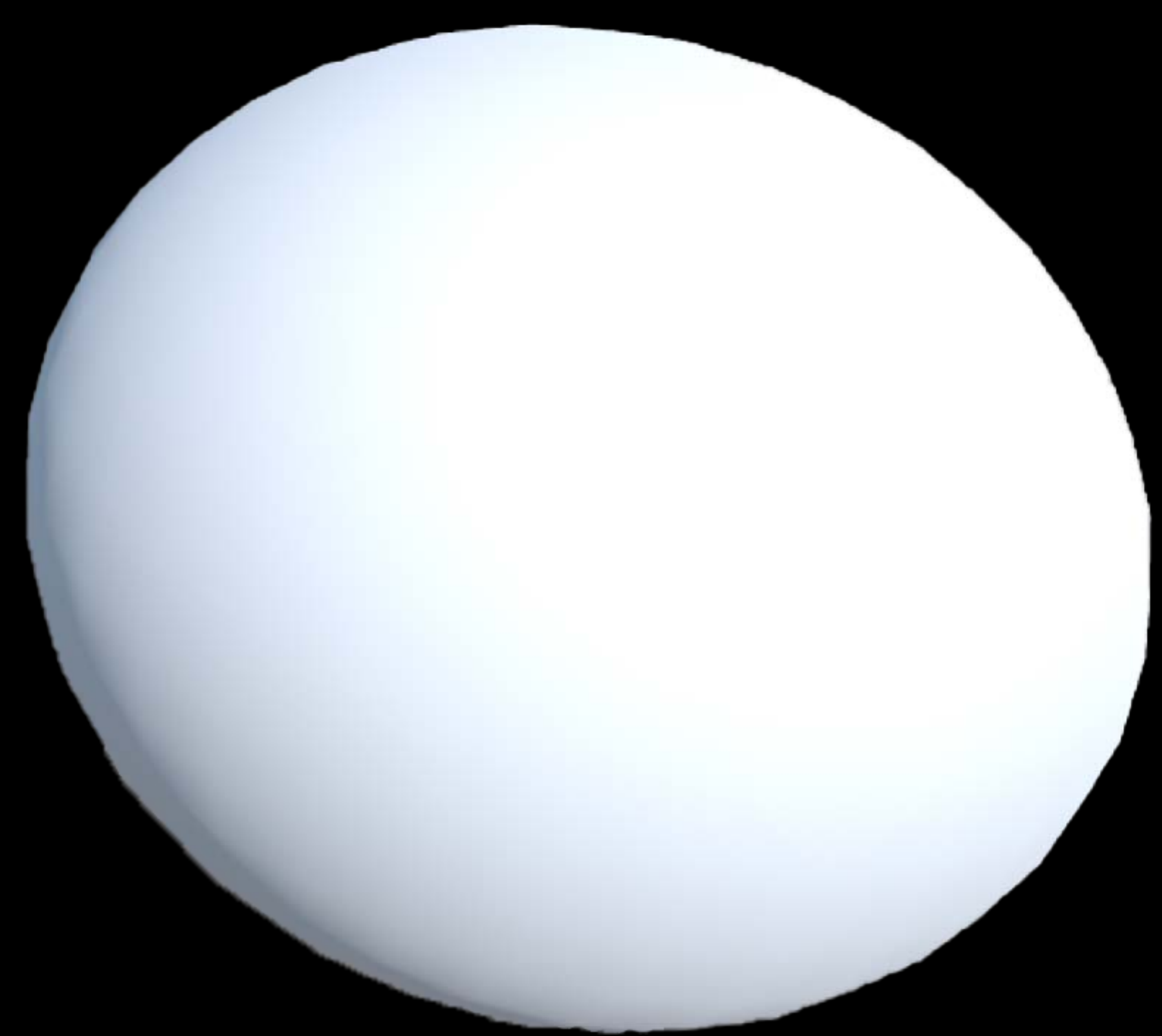
Surface

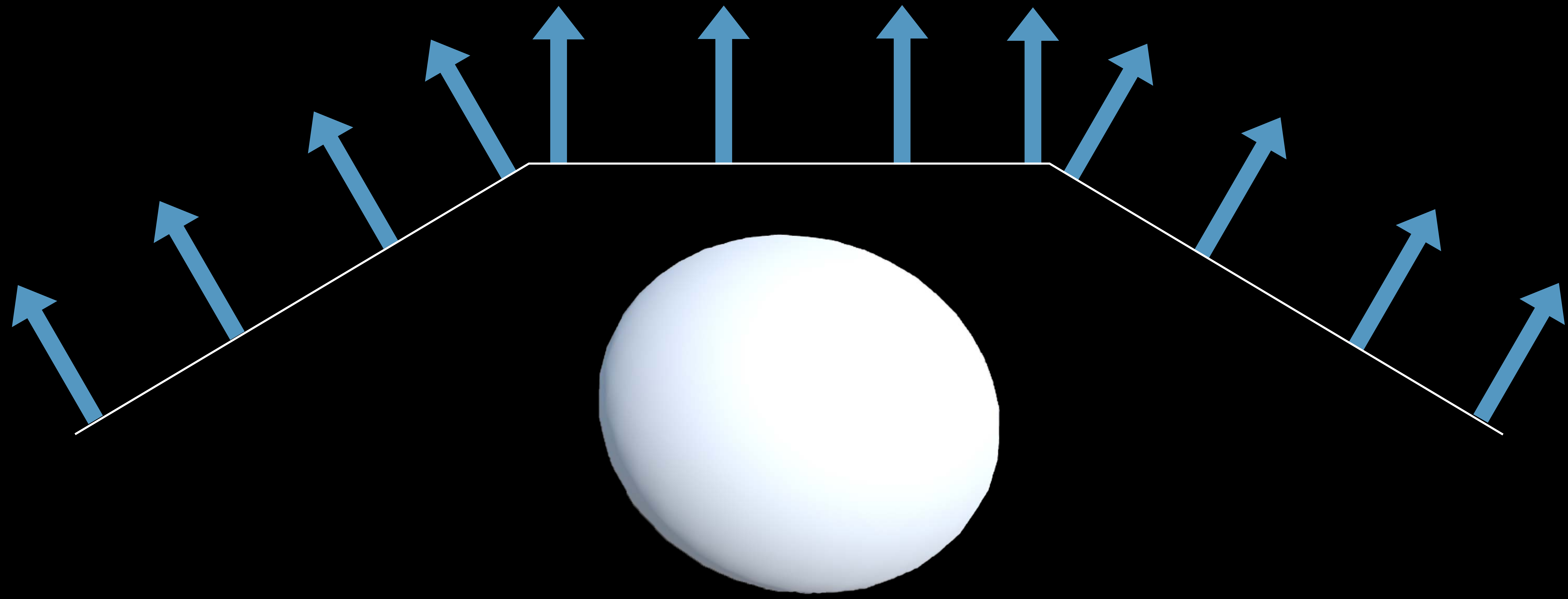


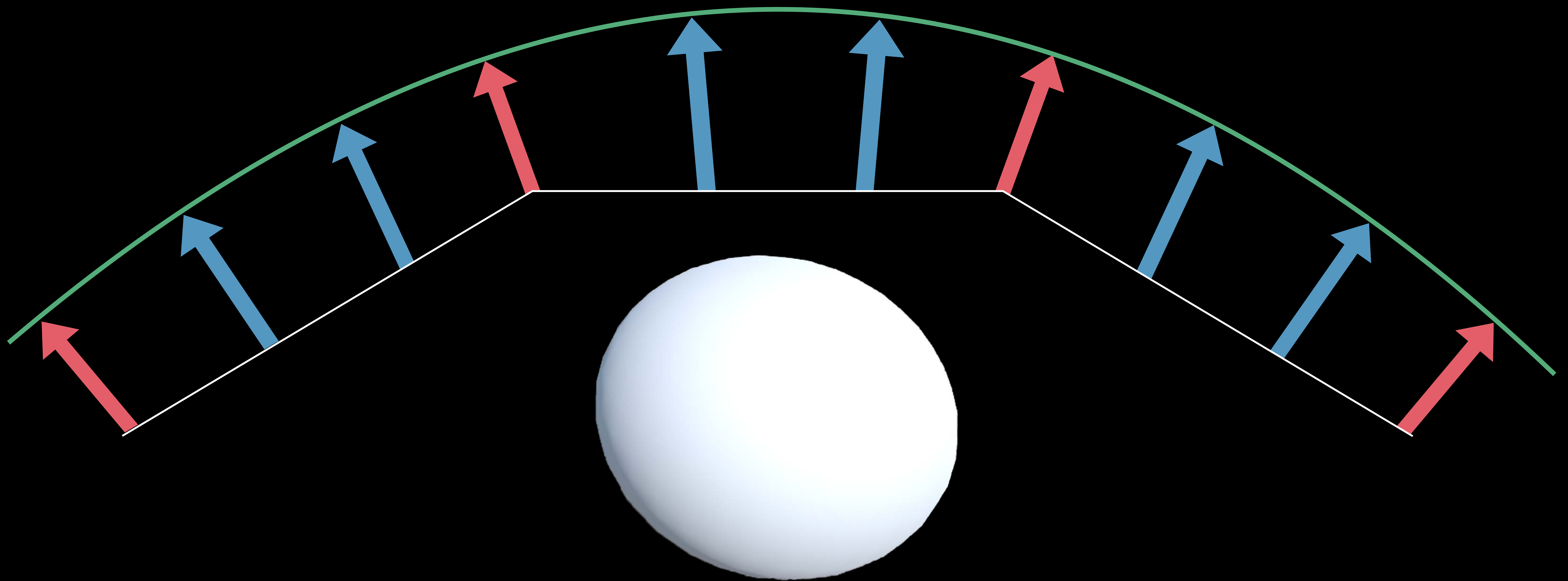


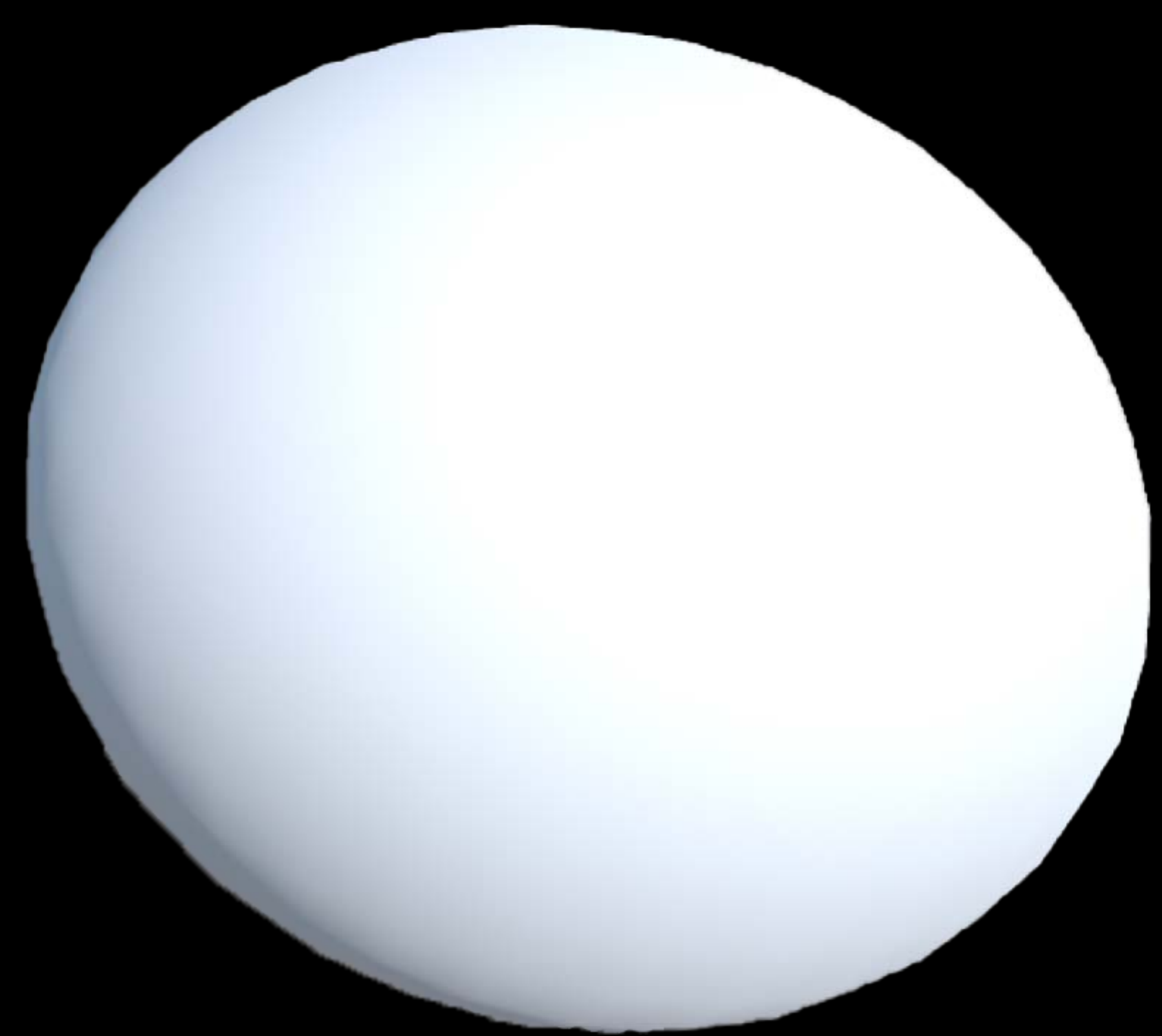


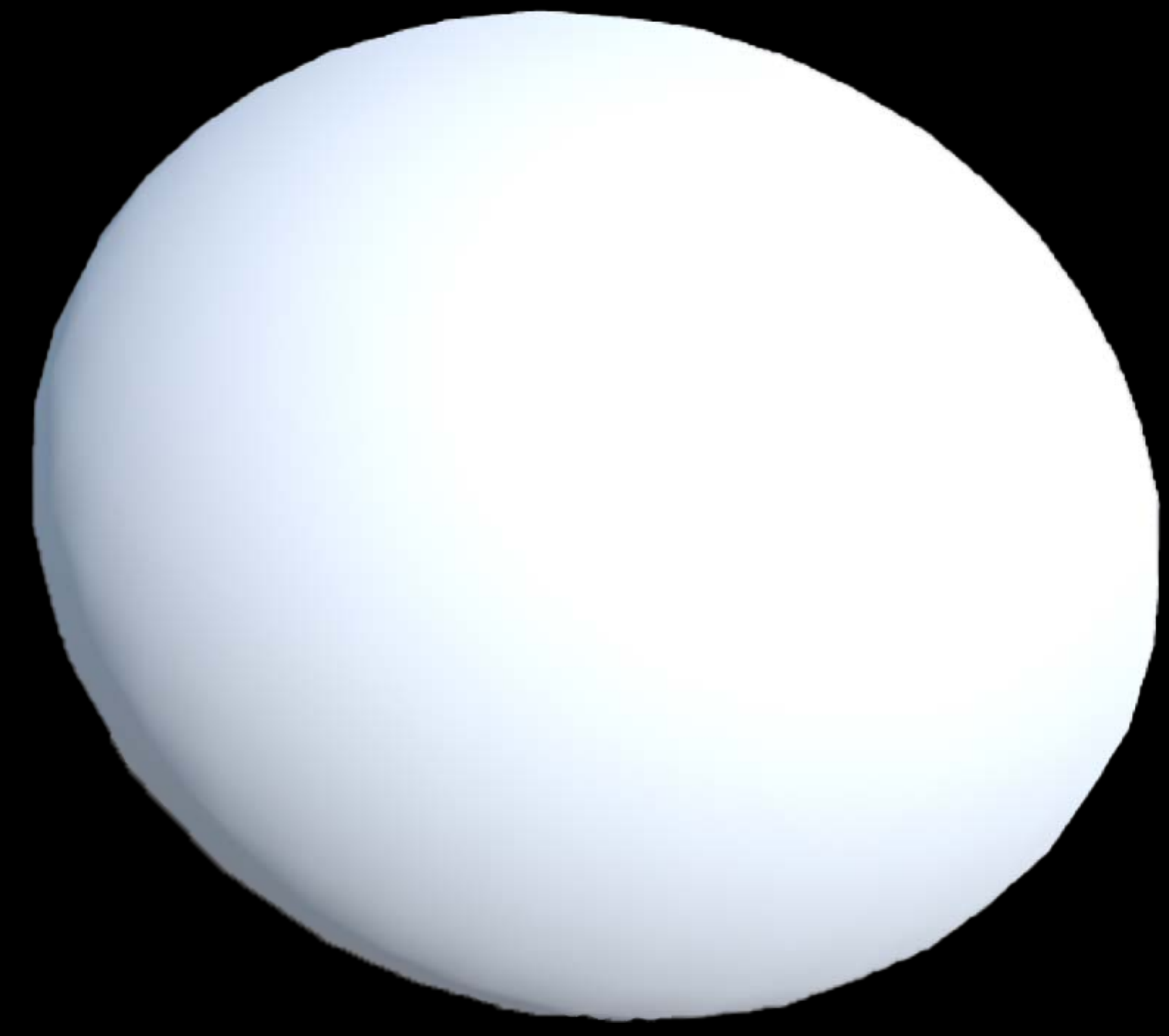
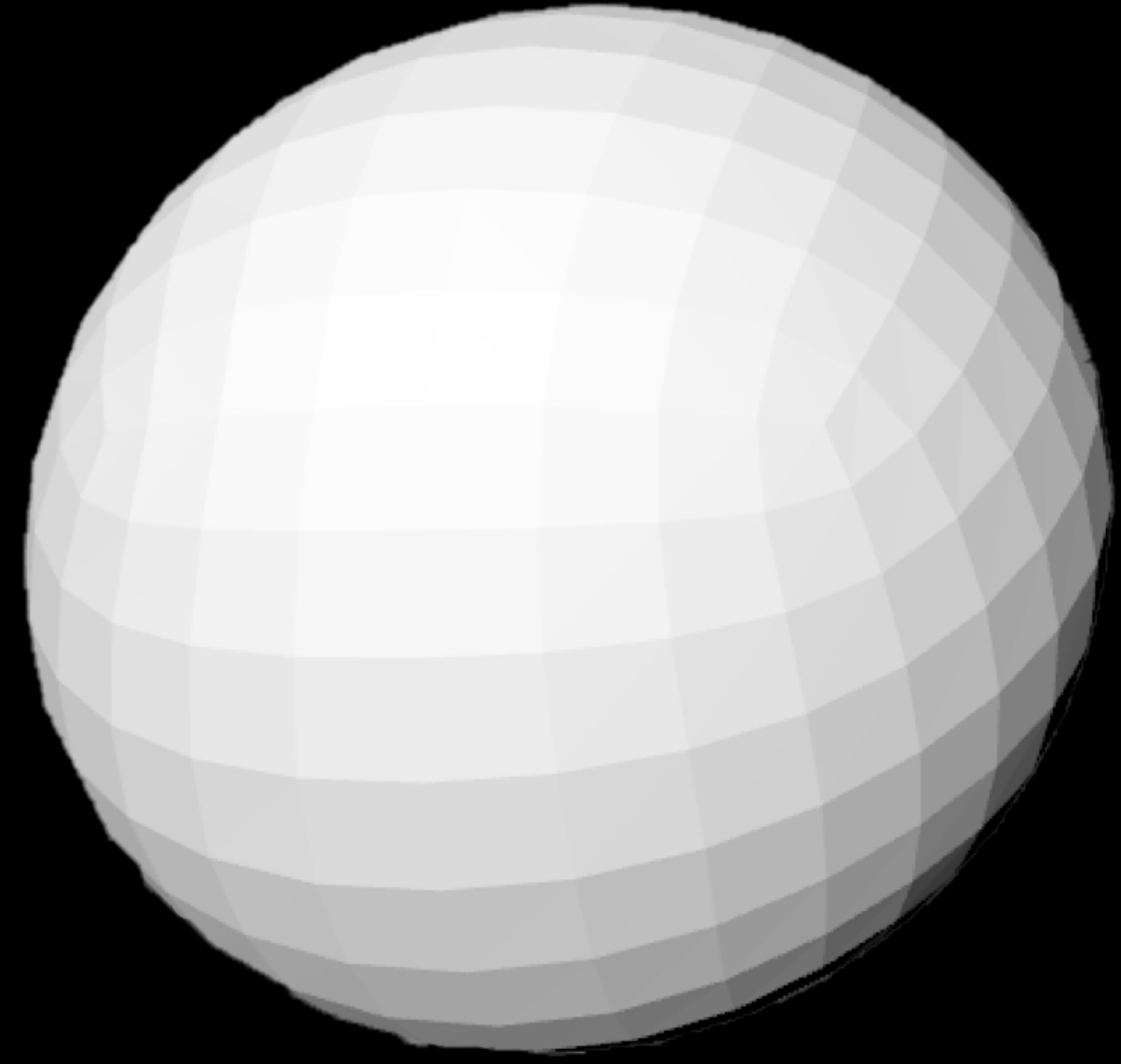












Metalness



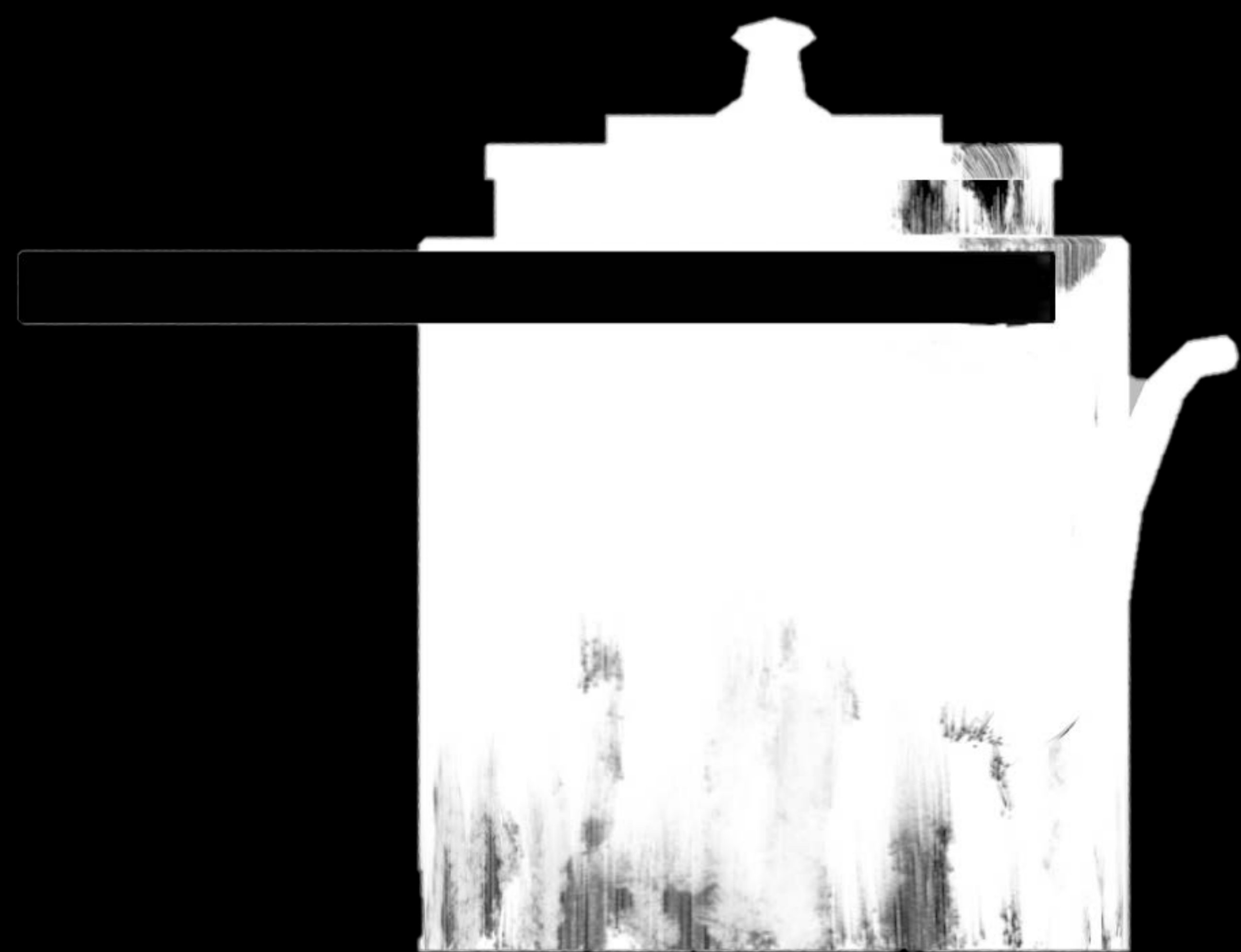












Roughness





Roughness



Roughness







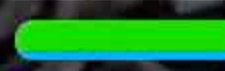






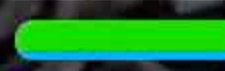
Ambient occlusion



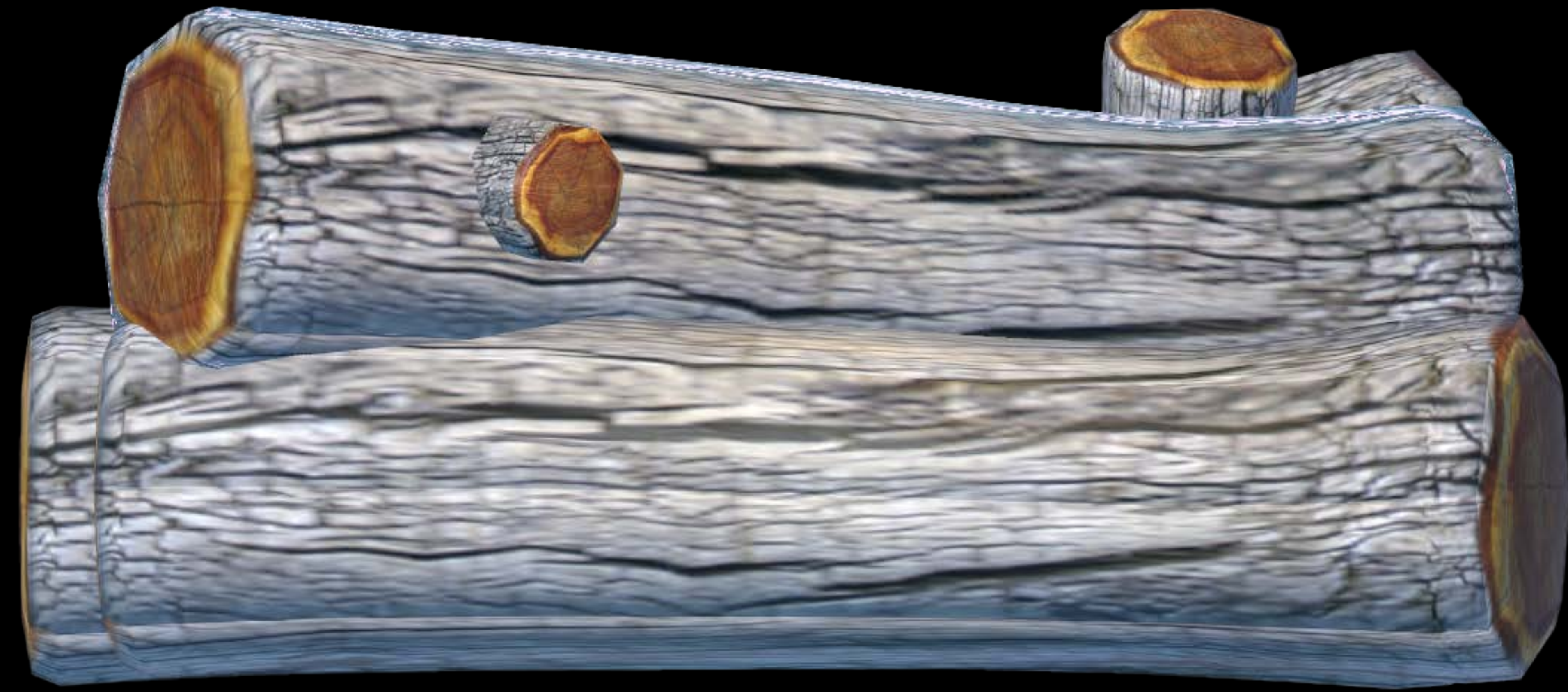
+  Mt 60fps

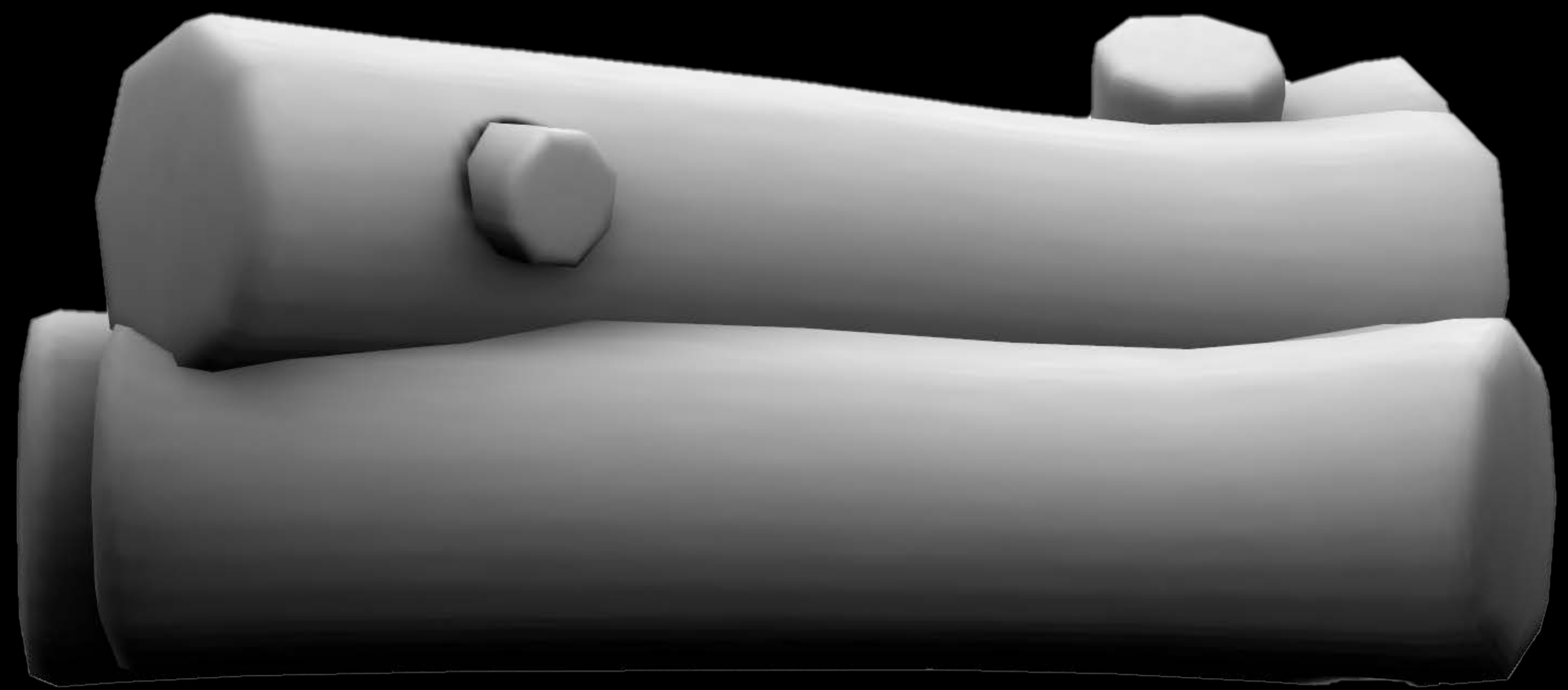
↕24 ▲9.13K



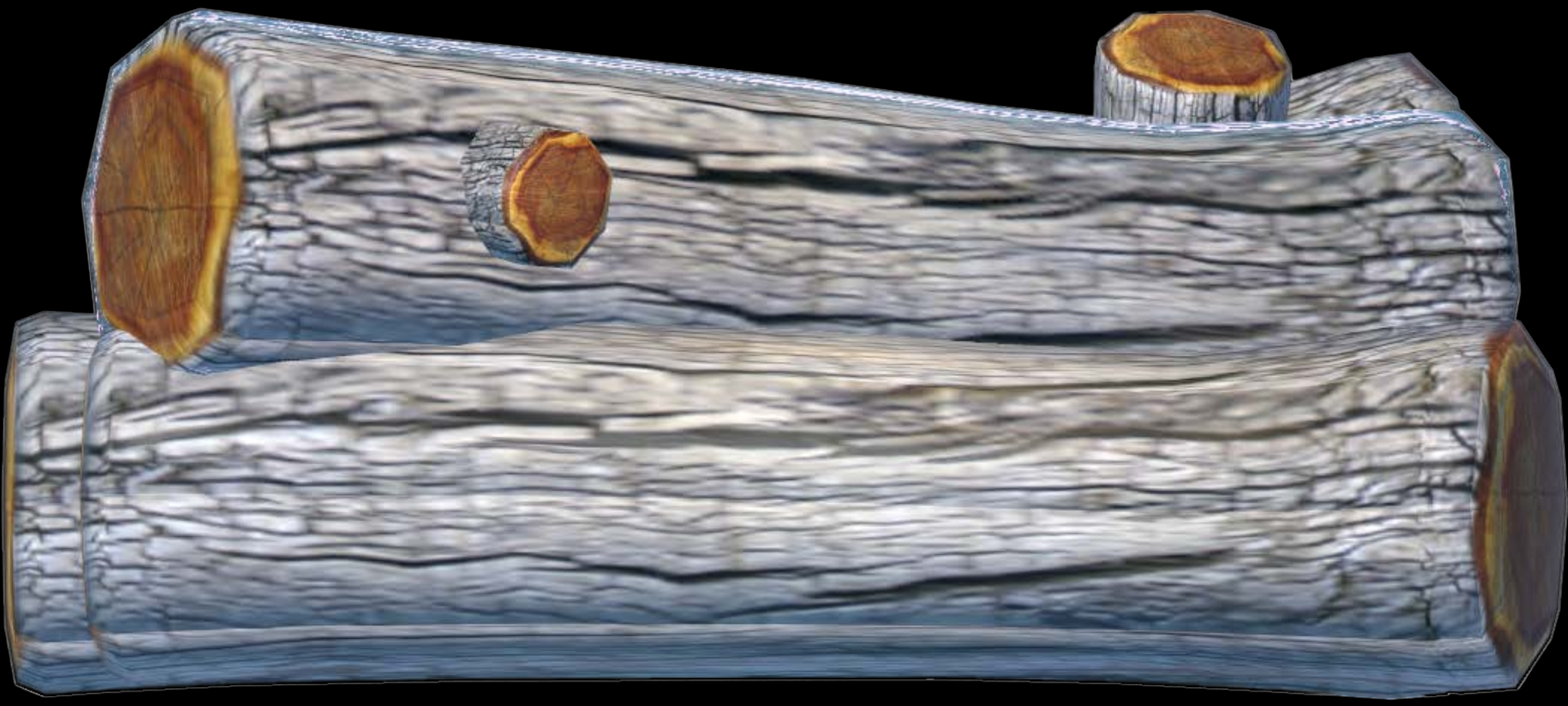
+  Mt 60fps

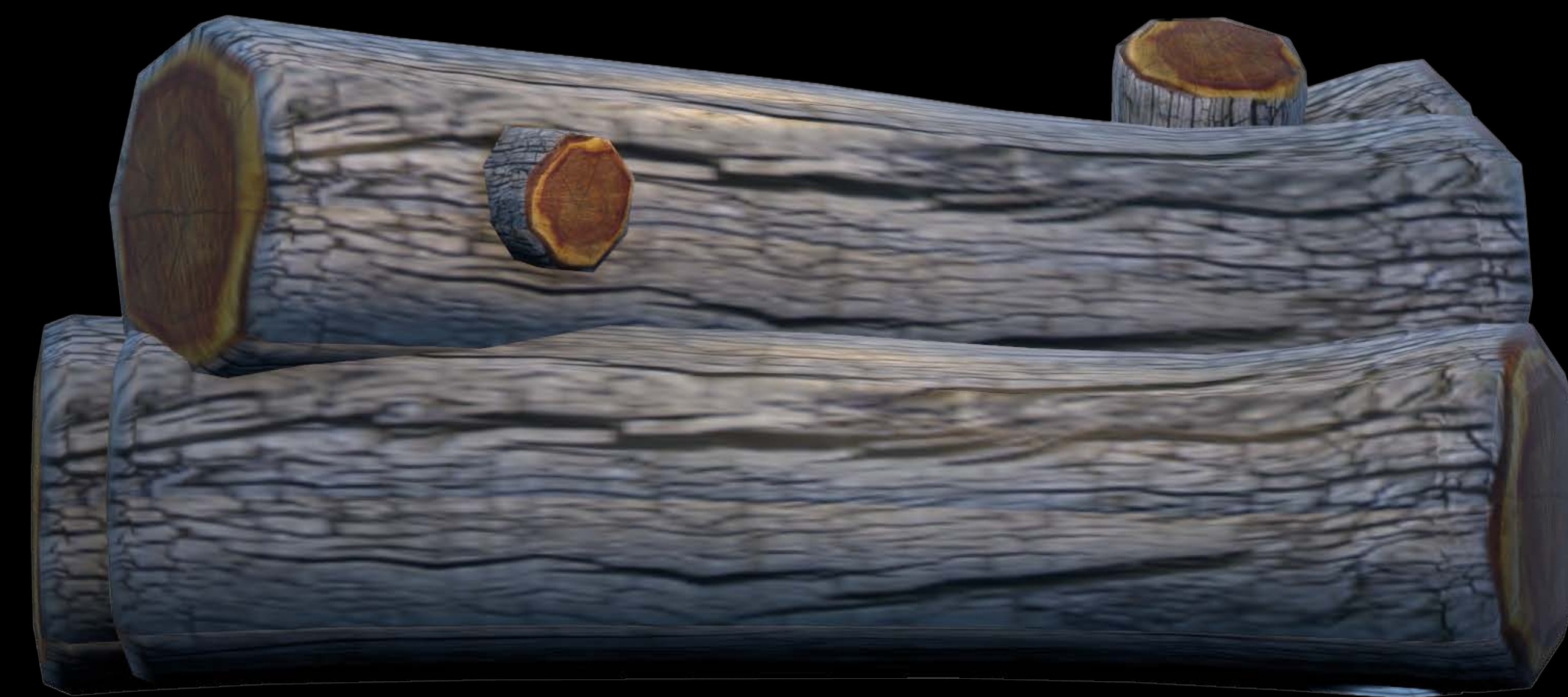
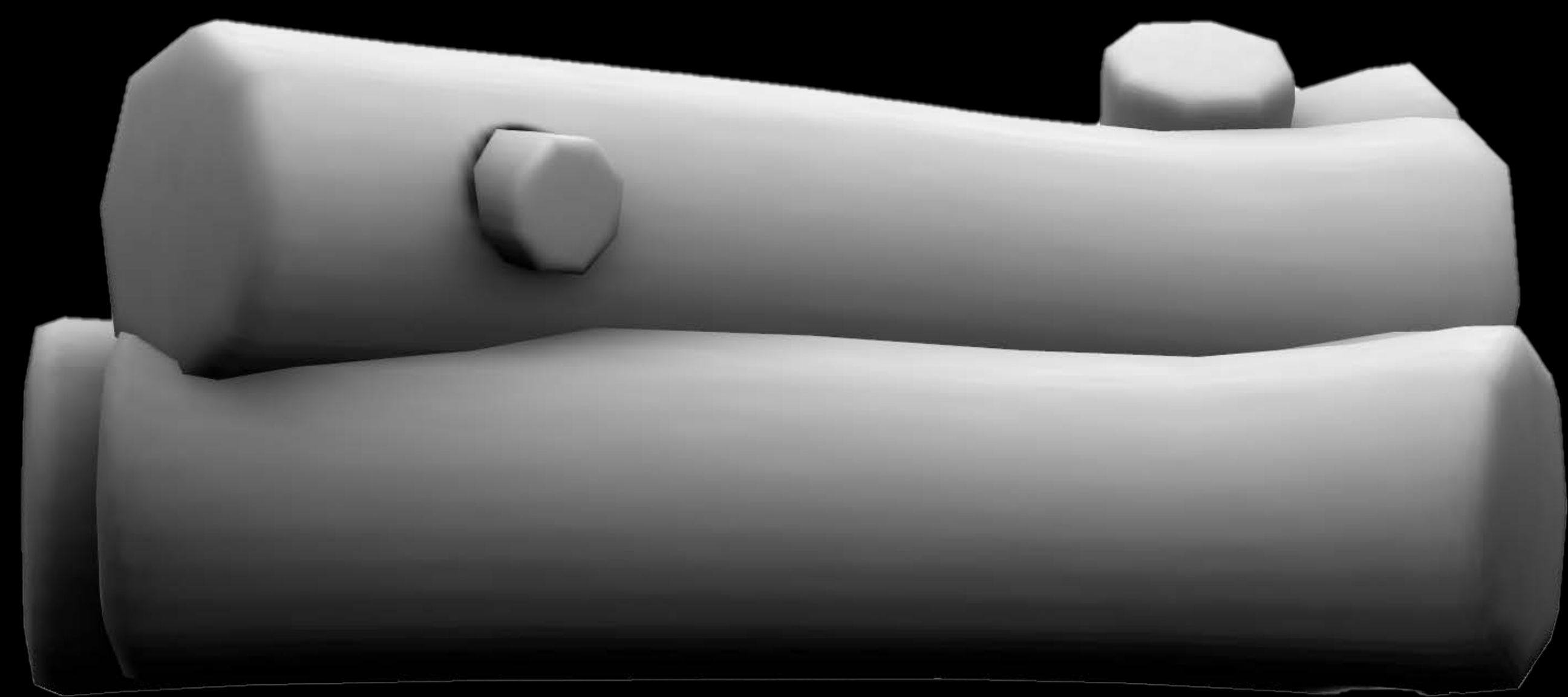
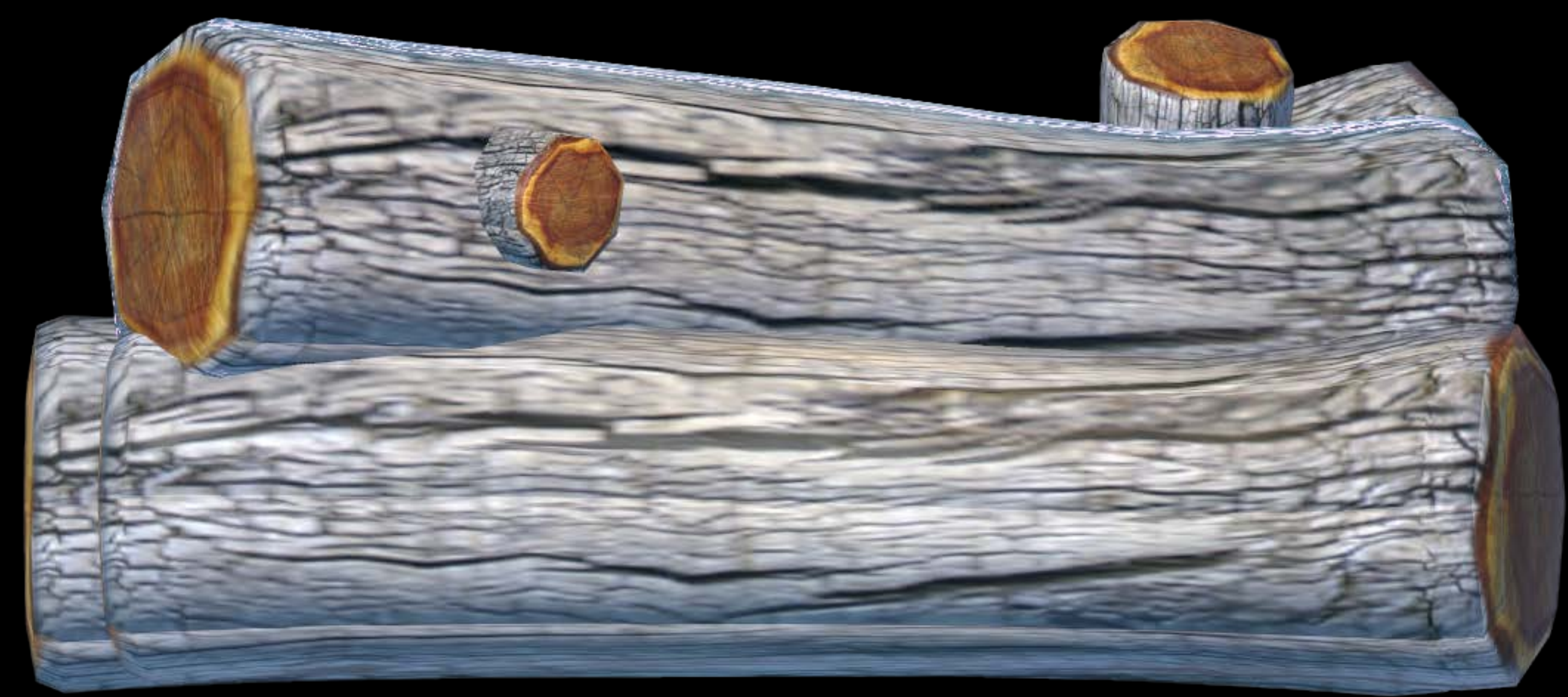
↕24 ▲9.13K











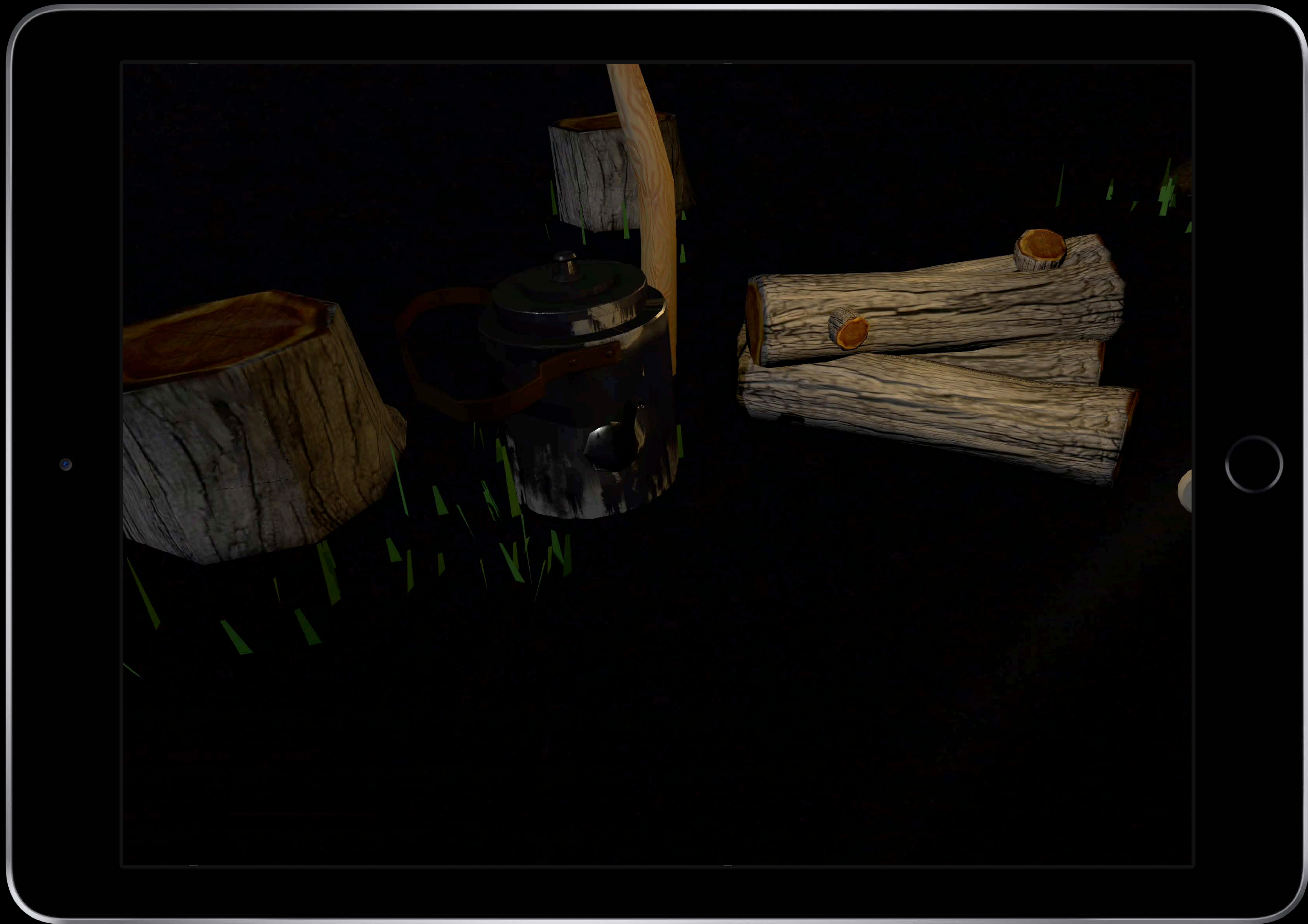
Transparency



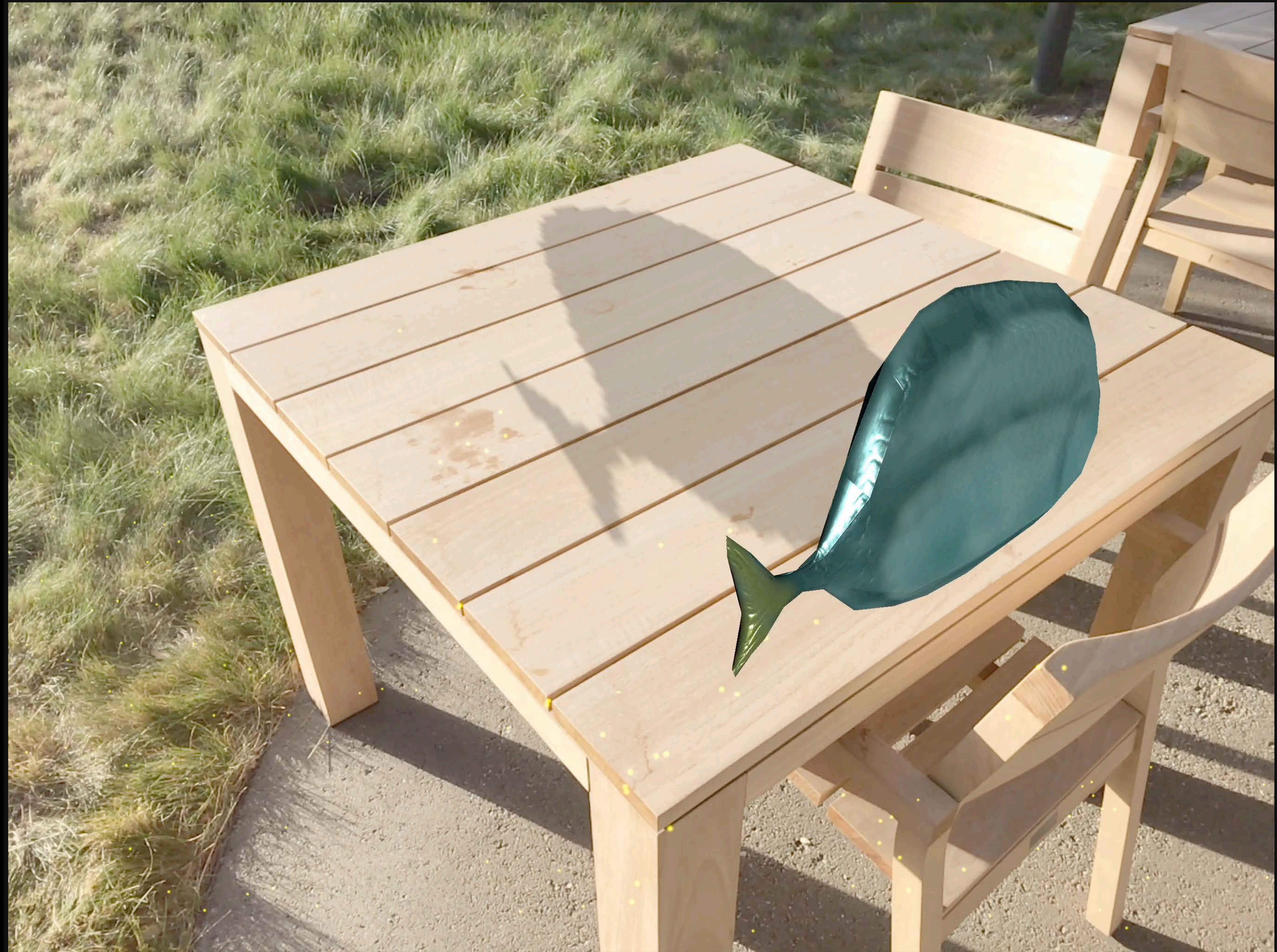
Grounding AR content to the real world

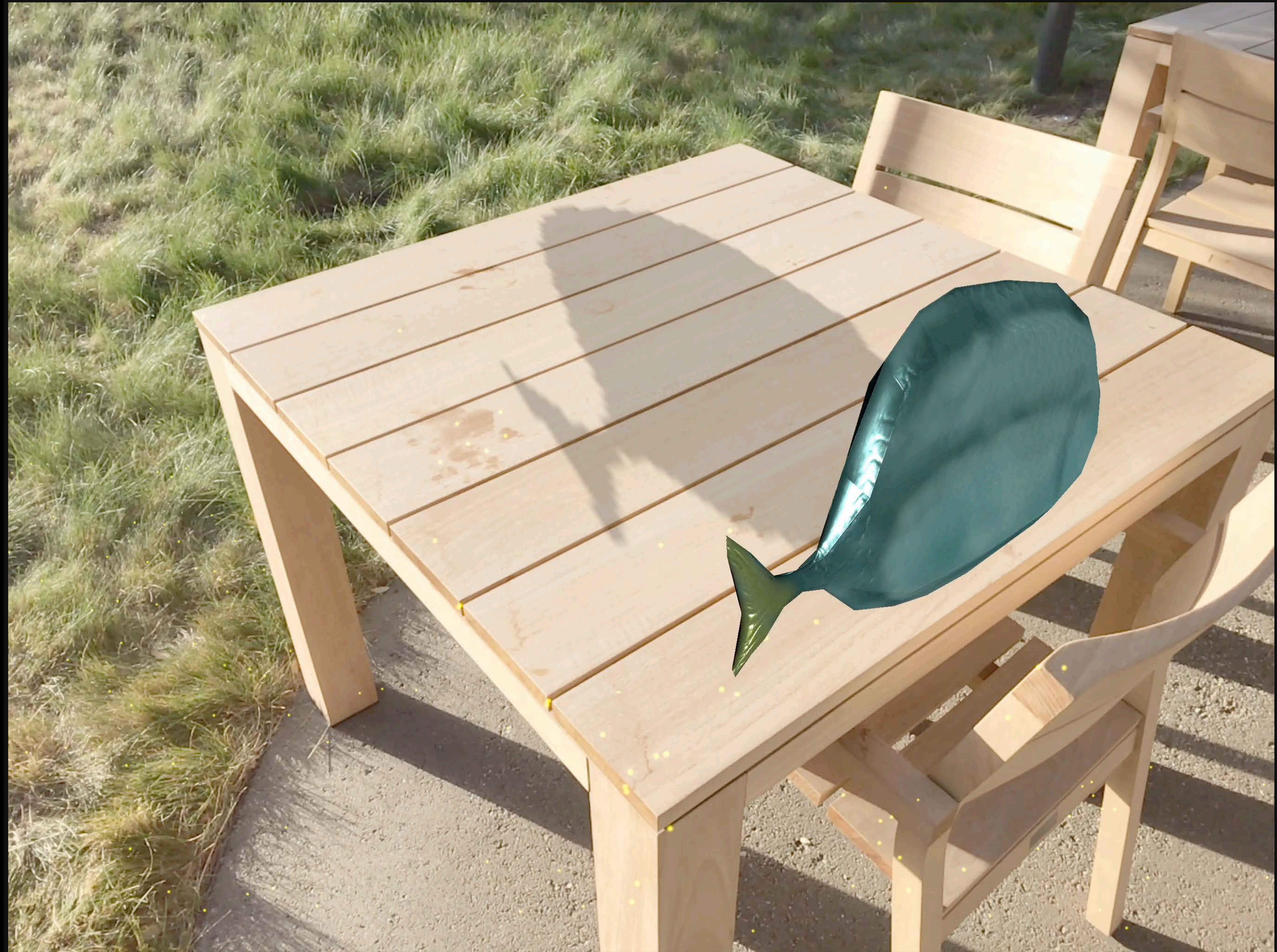
Light estimation

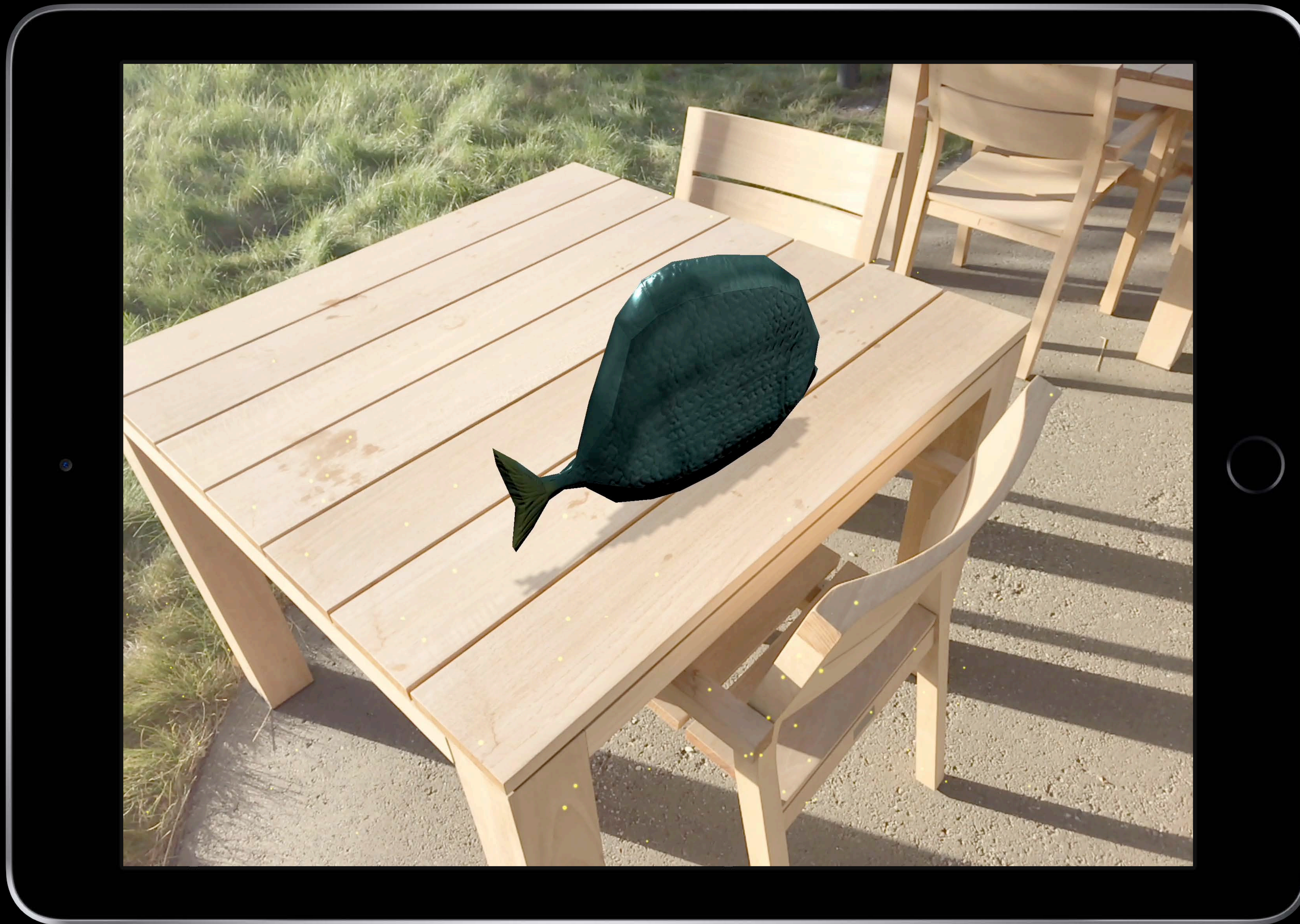


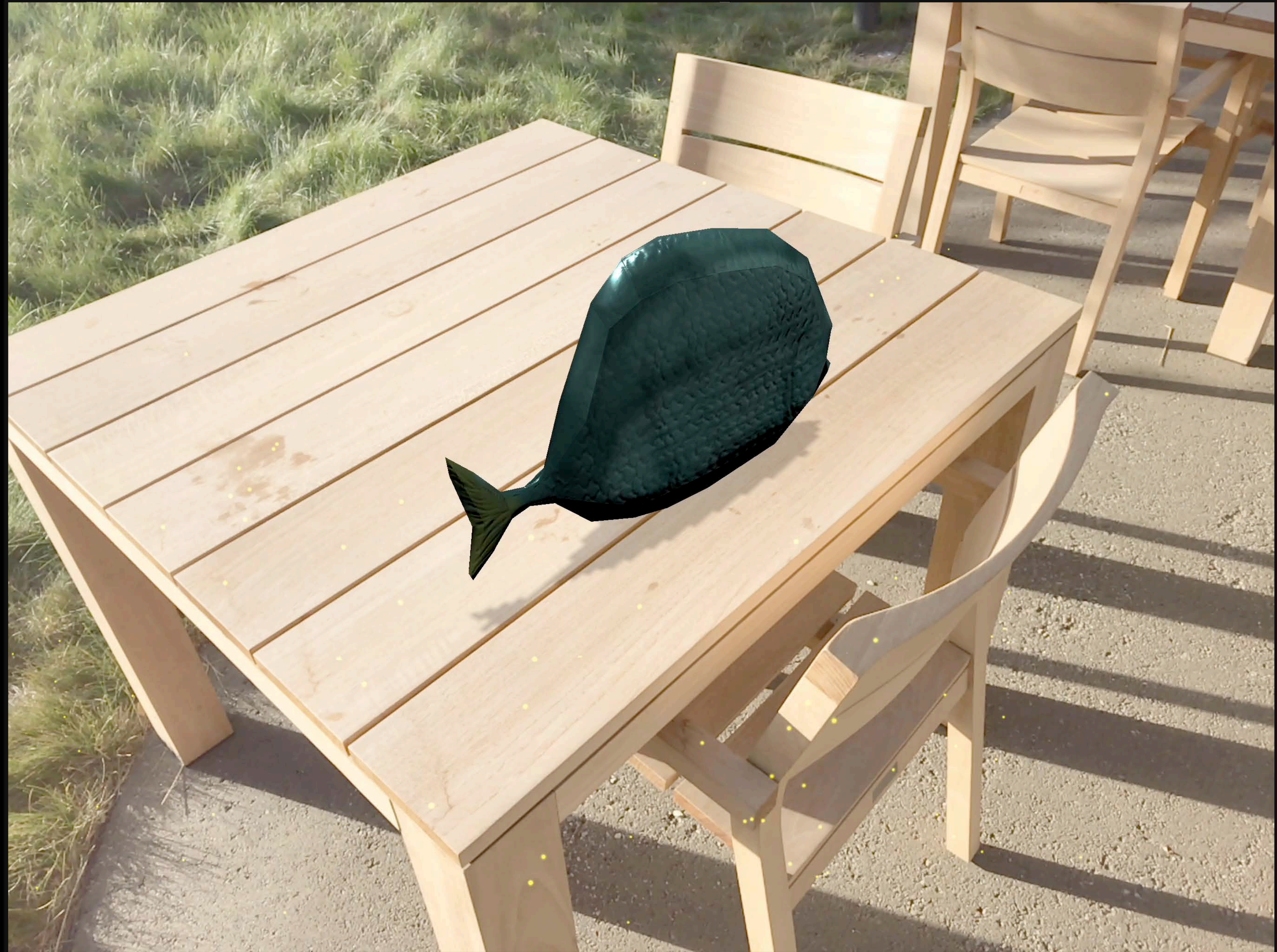


Shadows are hard





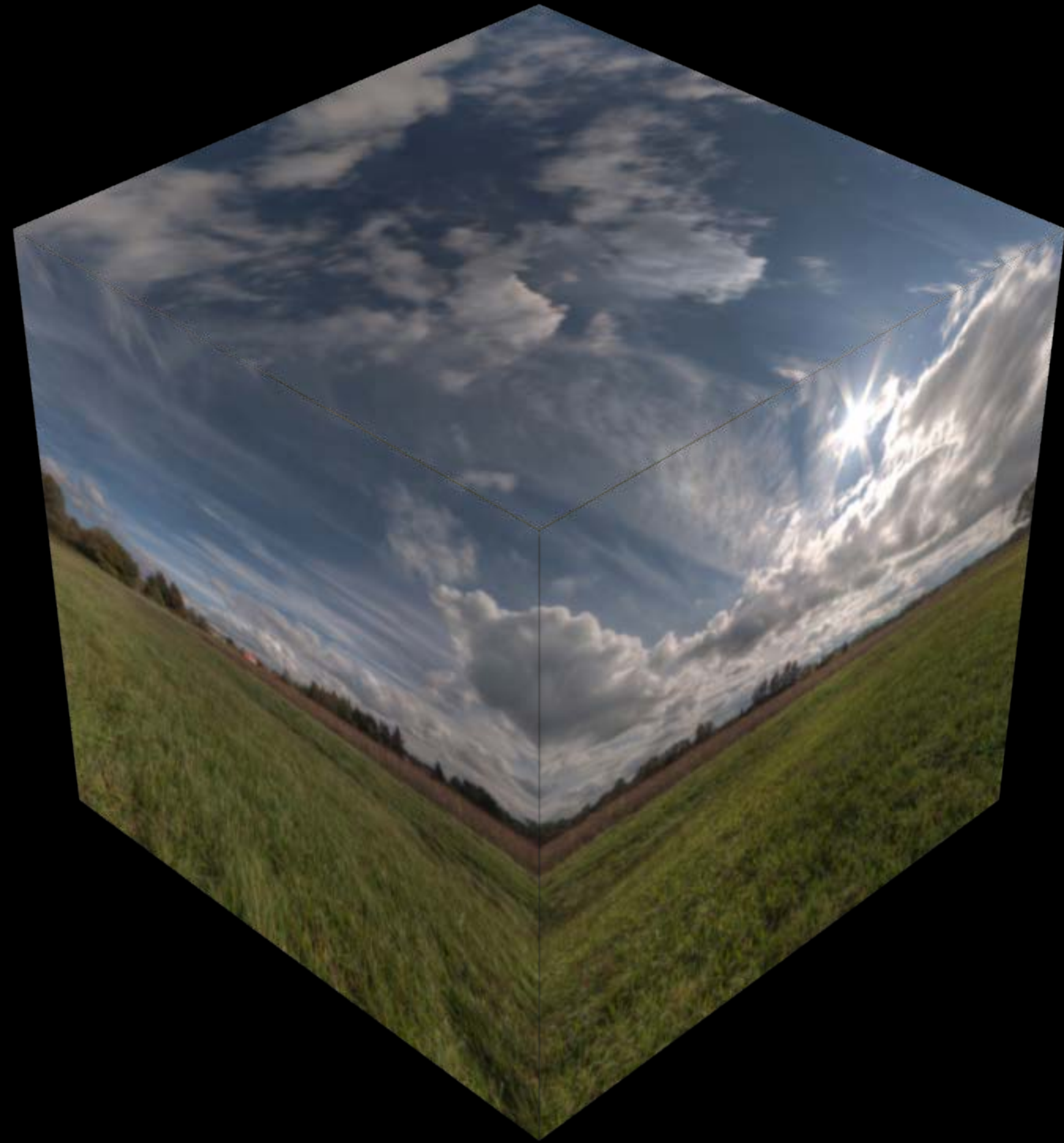


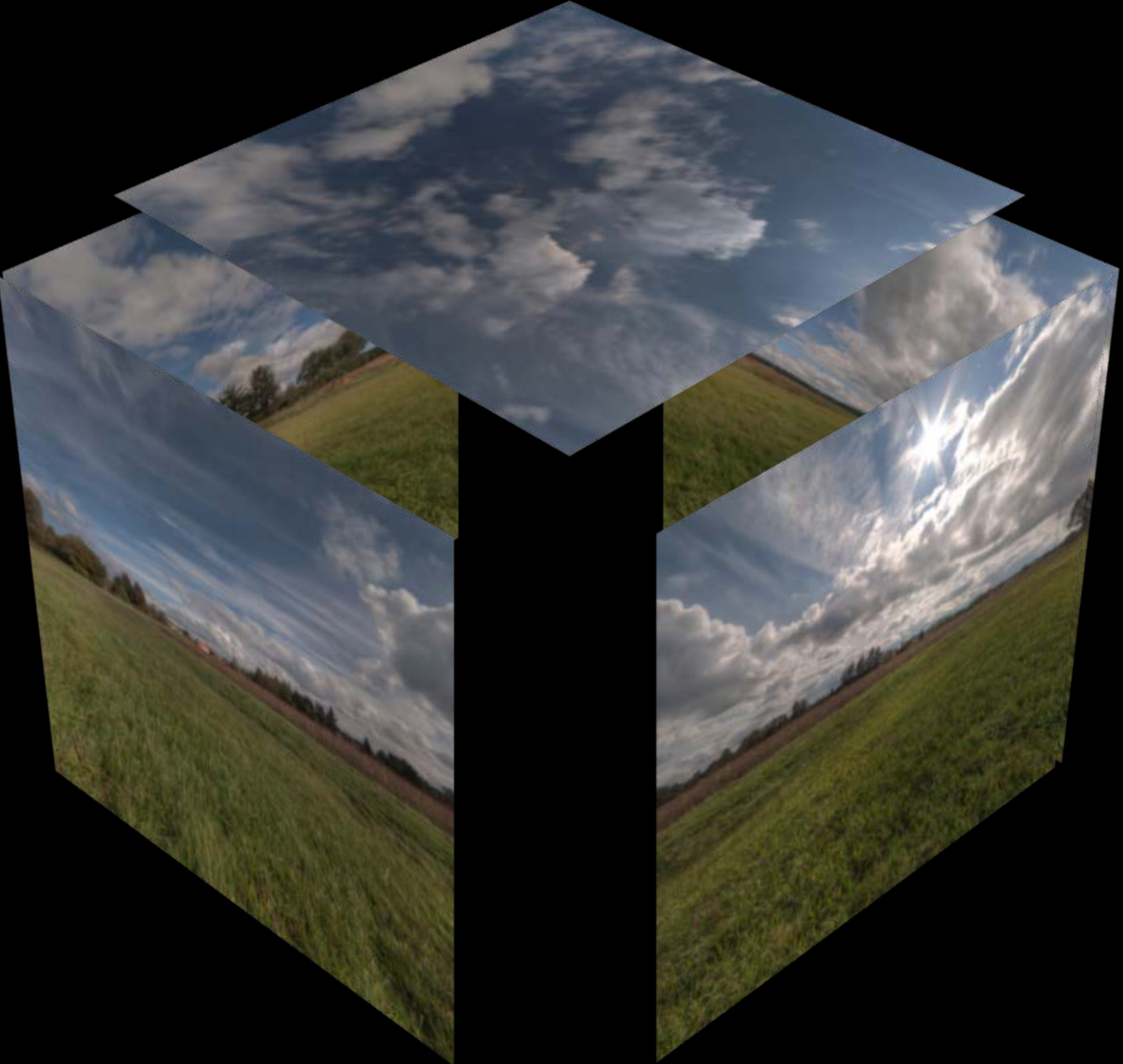


Environment maps











The final touches





Things to Keep in Mind

Real world environment considerations

Things to Keep in Mind

Real world environment considerations

Maintaining your rendering budget

Things to Keep in Mind

Real world environment considerations

Maintaining your rendering budget

Leverage the benefits of physically based materials

Material Property Table

Albedo	Base or diffuse color of the object
Normals	Adding additional details without modifying base geometry
Metalness	Determining whether an object is metallic or not
Roughness	How much light dispersal a surface provides
Ambient Occlusion	Self shadowing and enhancing surface details
Transparency	Limit use of transparency and utilize with separate material

More Information

<https://developer.apple.com/wwdc18/805>

 **WWDC18**