

# 1. Пайплайн

Графика в современных играх

# Игровой цикл

- Обработка пользовательского ввода

# Игровой цикл

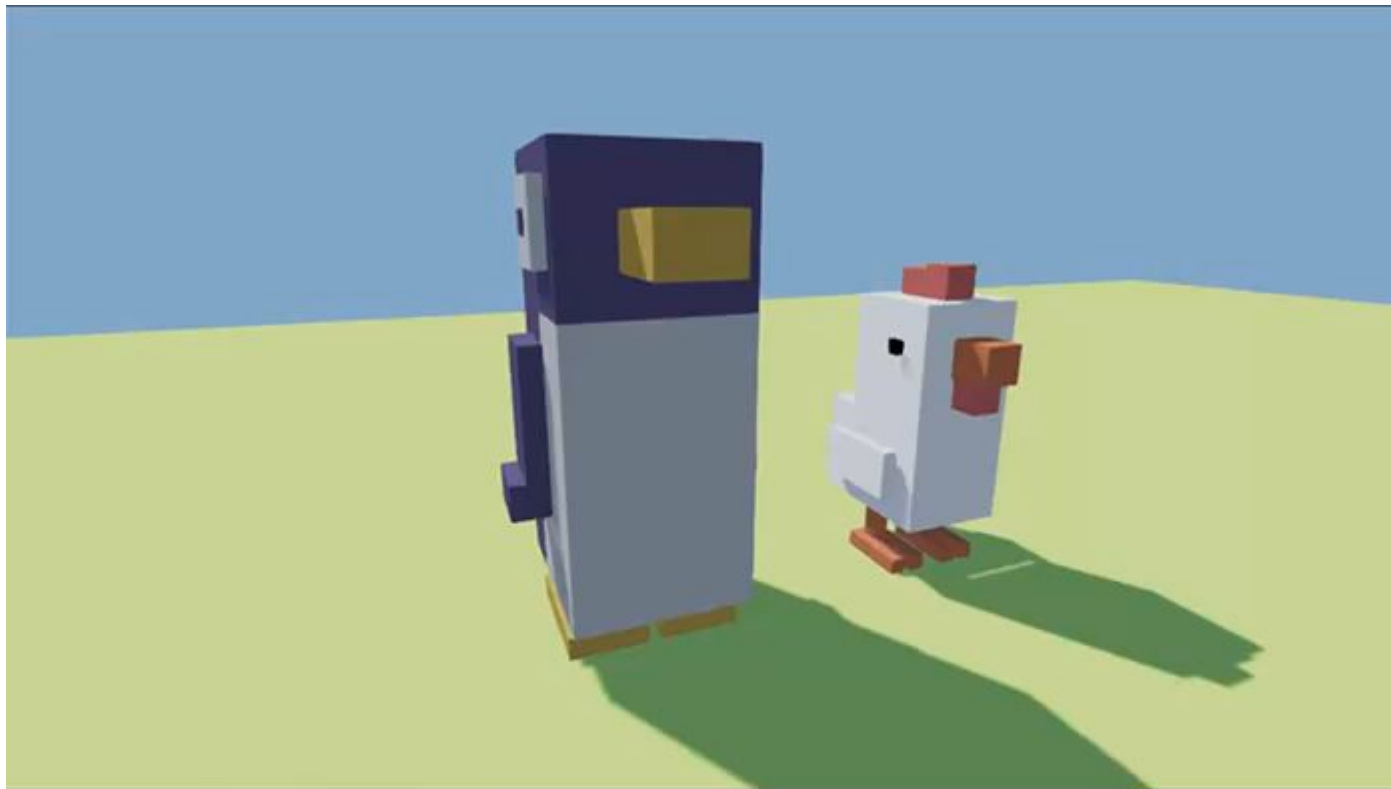
- Обработка пользовательского ввода
- Обновление игровых данных

# Игровой цикл

- Обработка пользовательского ввода
- Обновление игровых данных
- Перерисовка

# Игровой цикл

- 60 раз в секунд
- 16.6ms на кадр



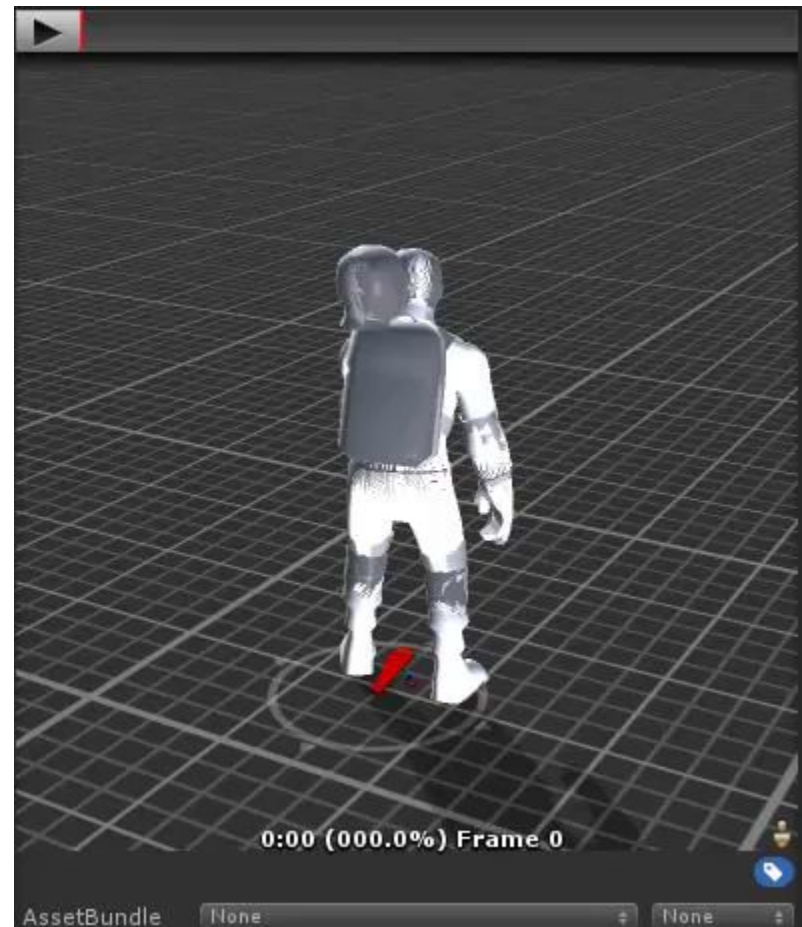
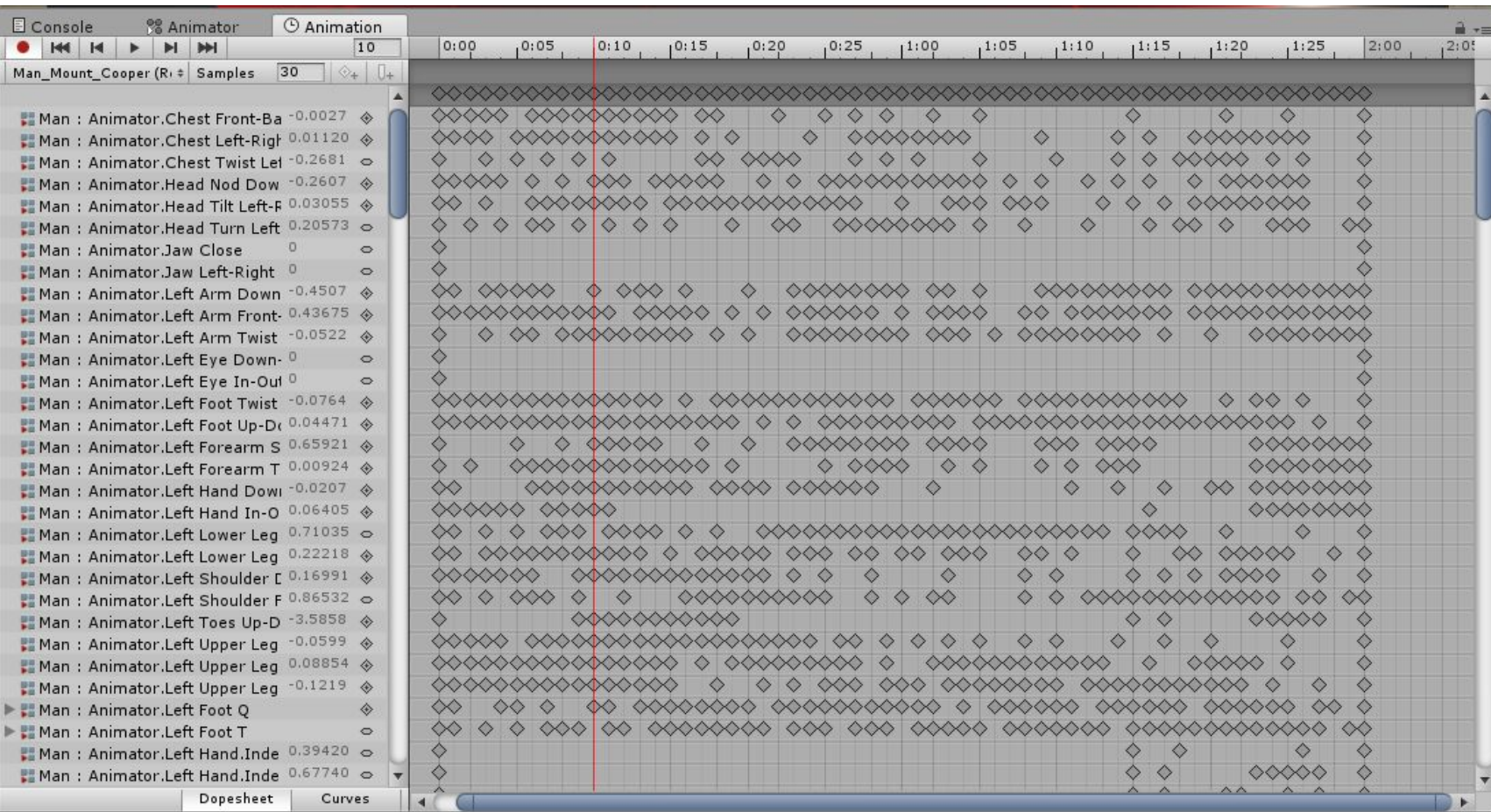
Animator interface showing a timeline and property list.

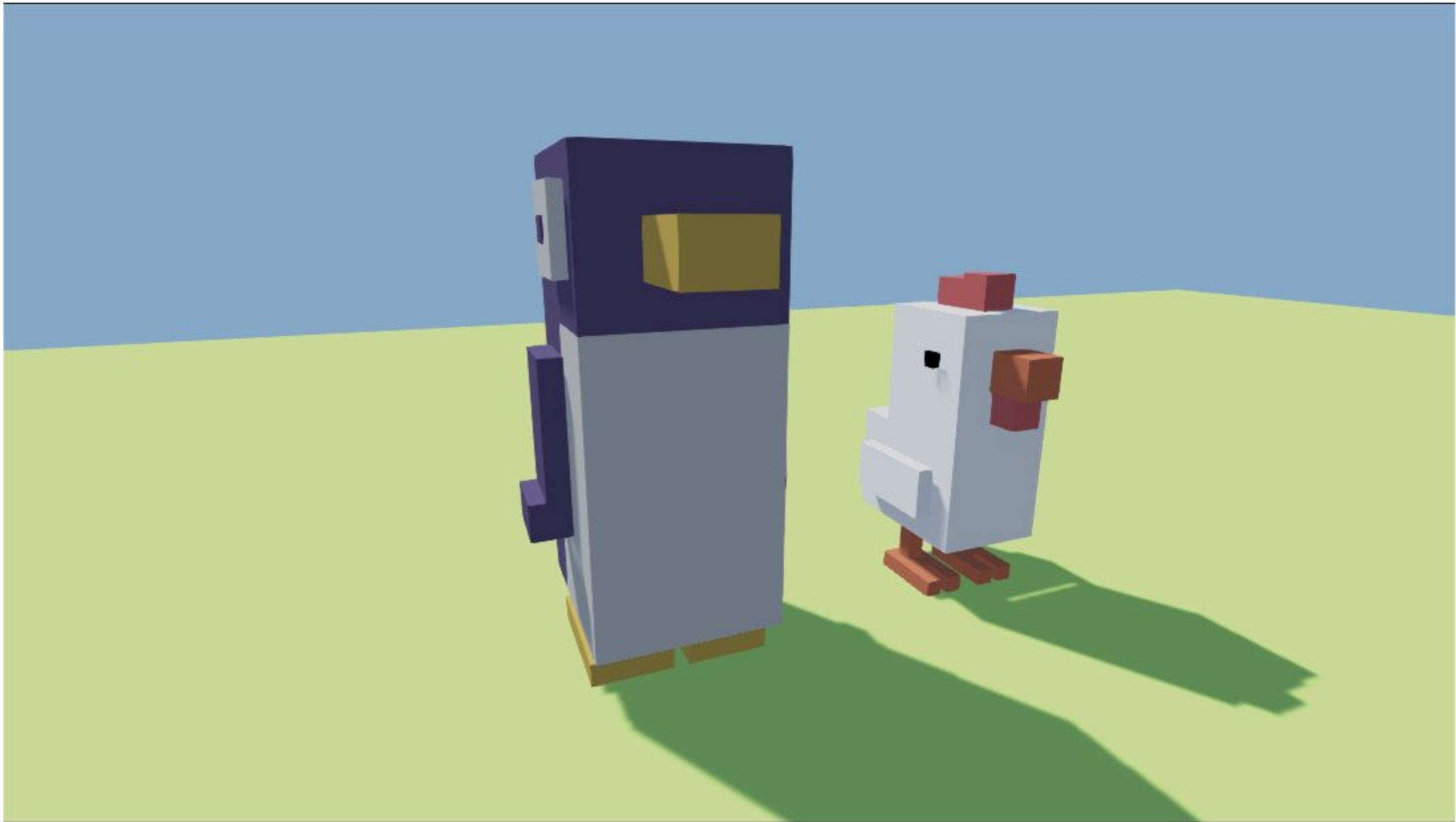
Timeline: 0:00, 0:10, 0:20, 0:30, 0:40, 0:50, 1:00, 1:10, 1:20, 1:30, 1:40

Property List:

- TurnAround (Samples: 60)
- Chicken : Position
- Chicken : Rotation

Buttons: Add Property, Dopesheet, Curves







# Вершины

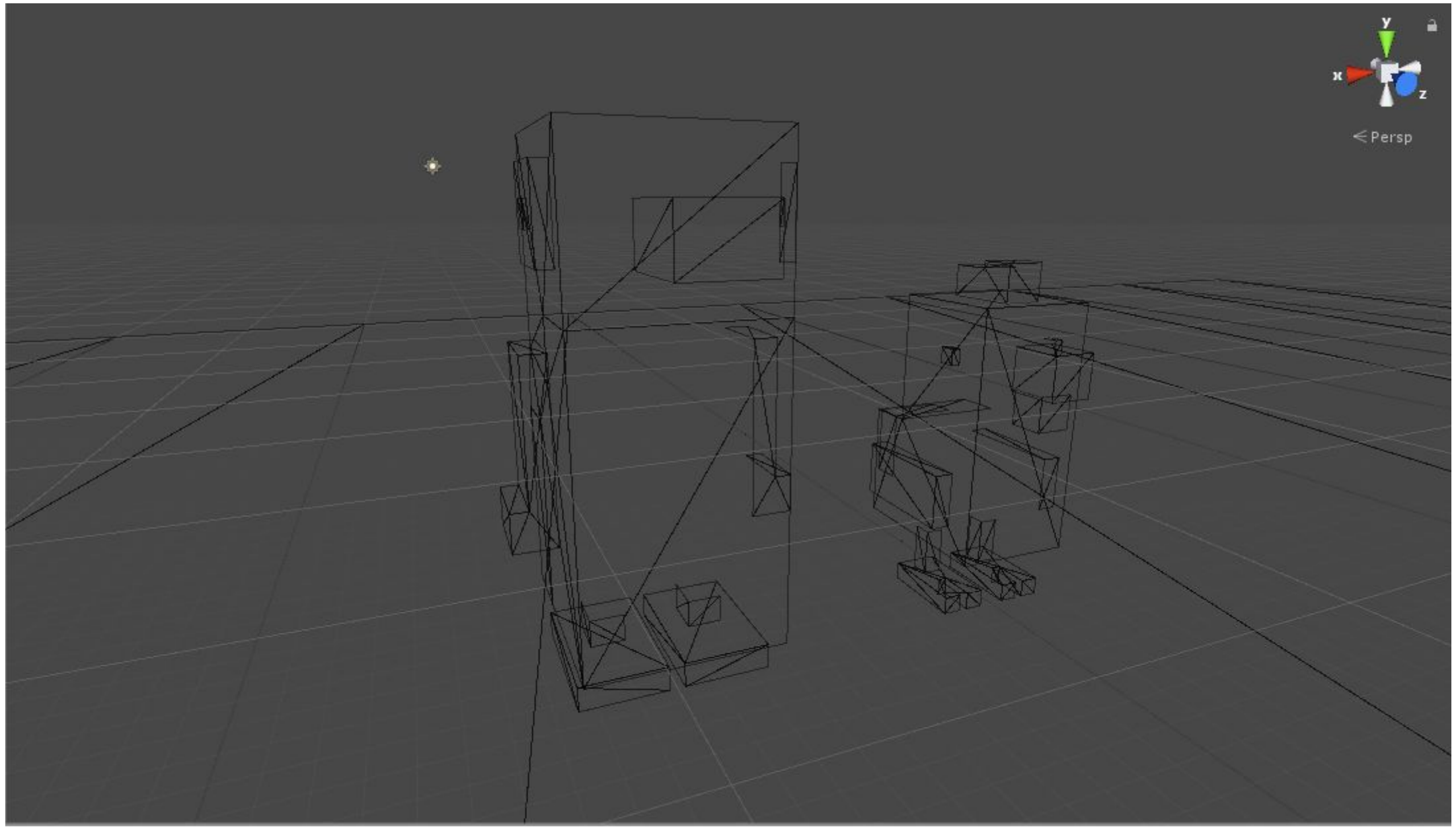
- Vector3: (x, y, z)

# Треугольники

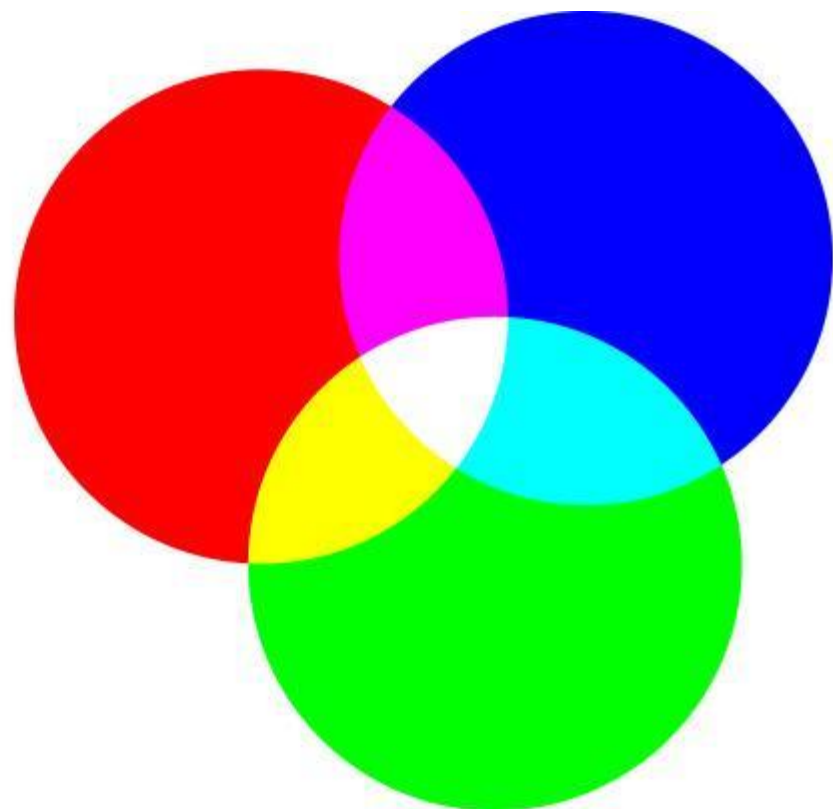
- Triangle: (index1, index2, index3)

# Модель

- Vector3[]
- Triangles[]



# RGB



Inspector

penguin Import Settings

Open

Texture Type: Default

Texture Shape: 2D

sRGB (Color Texture):

Alpha Source: Input Texture Alpha

Alpha Is Transparency:

Advanced

Non Power of 2: ToNearest

Read/Write Enabled:

Generate Mip Maps:

Border Mip Maps:

Mip Map Filtering: Box

Fadeout Mip Maps:

Wrap Mode: Repeat

Filter Mode: Bilinear

Aniso Level: 1

Default

Override for PC, Mac & Linux Standalone

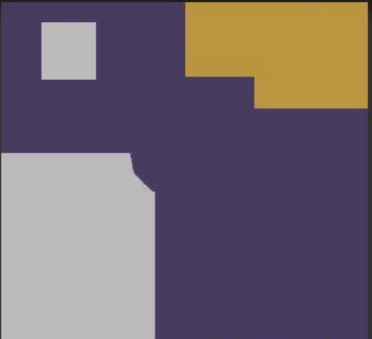
Max Size: 2048

Compression: Normal Quality

Format: RGB Compressed DXT1

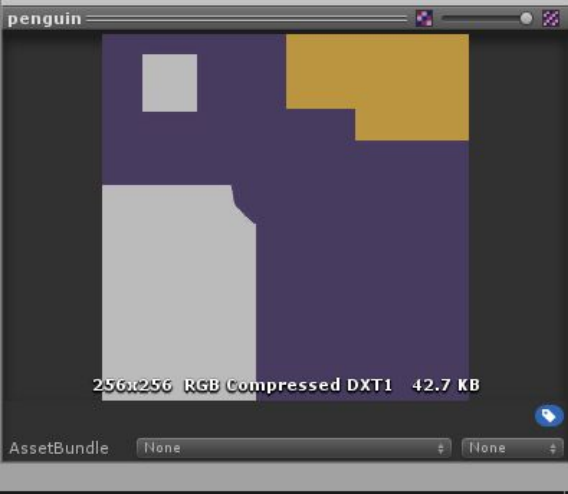
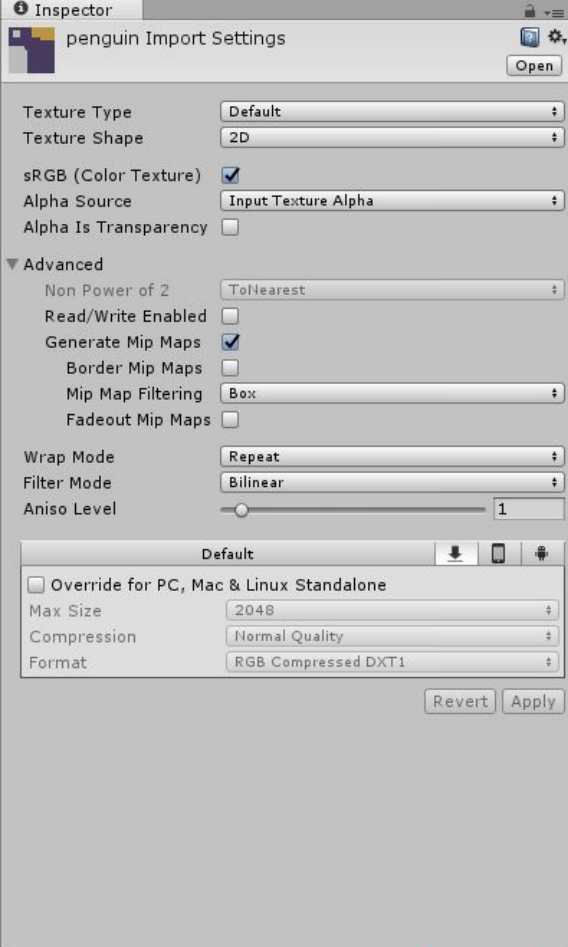
Revert Apply

penguin



256x256 RGB Compressed DXT1 42.7 KB

AssetBundle: None



```
DiffuseTexture.shader + X
1 Shader "Studdy Road/Diffuse Texture" {
2
3   Properties {
4     _MainTex("Texture", 2D) = "white" {}
5   }
6
7   SubShader {
8
9     Tags {
10      "Render-Type" = "Opaque"
11    }
12
13    CGPROGRAM
14
15    #pragma surface surf Lambert
16
17    struct Input {
18      float2 uv_MainTex;
19    };
20    sampler2D _MainTex;
21
22    void surf (Input IN, inout SurfaceOutput o) {
23      o.Albedo = tex2D(_MainTex, IN.uv_MainTex).rgb;
24    }
25
26    ENDCG
27  }
28
29  Fallback "Diffuse"
30 }
```

Inspector

penguin Import Settings

Texture Type: Default

Texture Shape: 2D

sRGB (Color Texture):

Alpha Source: Input Texture Alpha

Alpha Is Transparency:

Advanced

Non Power of 2: ToNearest

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Mip Map Filtering: Box

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Filter Mode: Bilinear

Aniso Level: 1

Default

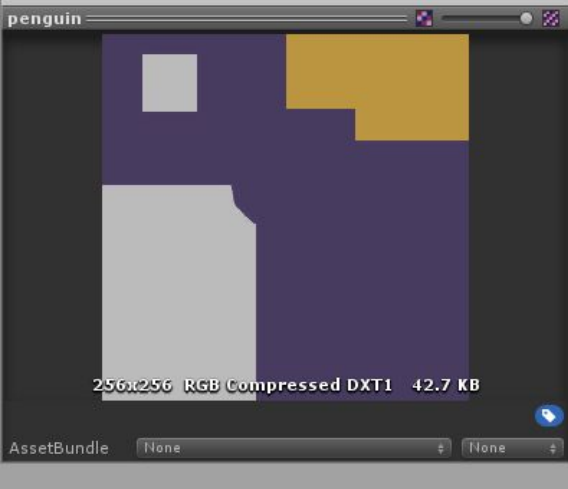
Override for PC, Mac & Linux Standalone

Max Size: 2048

Compression: Normal Quality

Format: RGB Compressed DXT1

Revert Apply



```
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```

Inspector

Penguin

Shader: Studdy Road/Diffuse Texture

Texture

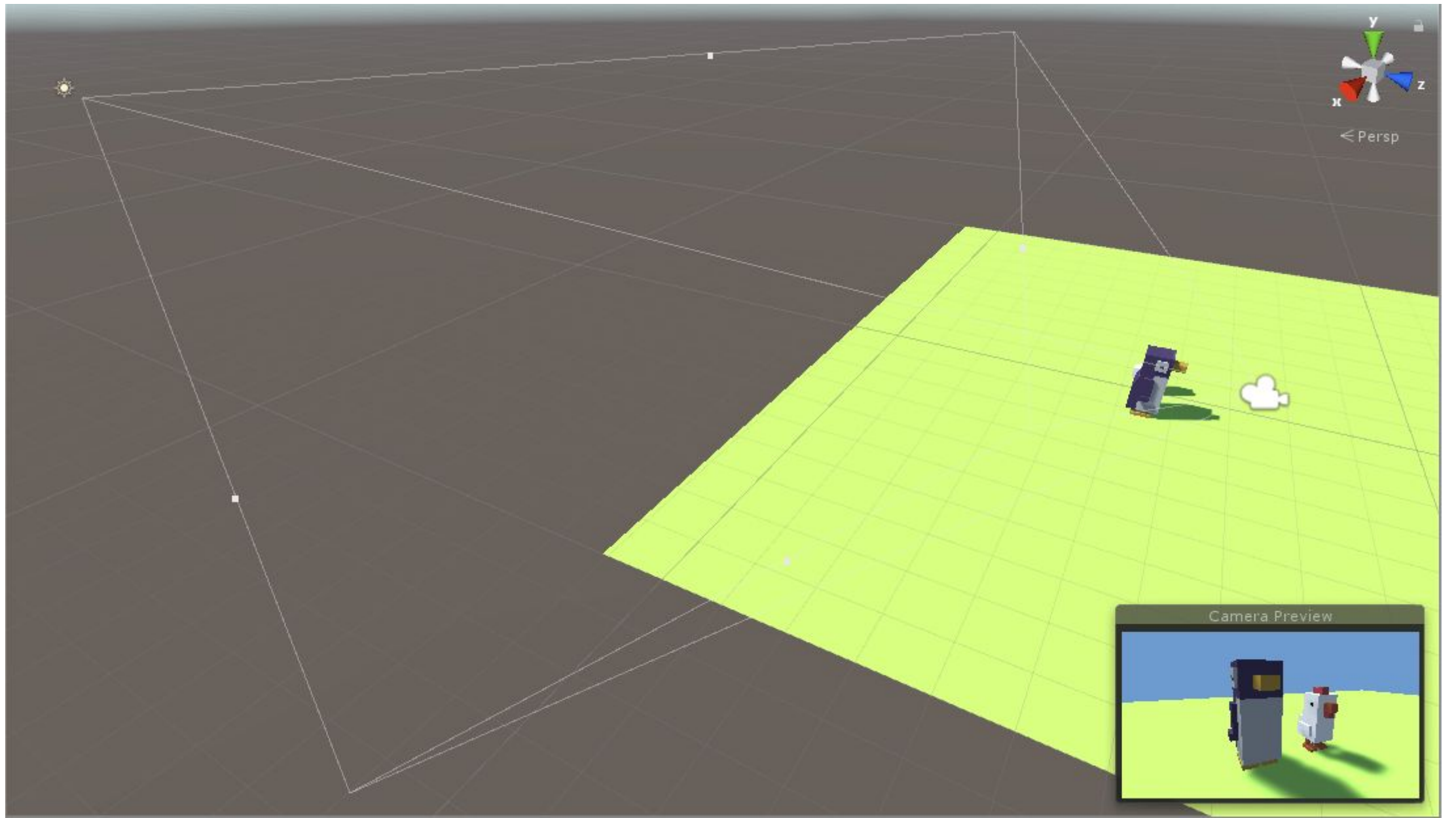
Tiling X: 1 Y: 1

Offset X: 0 Y: 0

Render Queue: From Shader 2000







# Матрицы

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Identity Matrix

$$\begin{pmatrix} 1 & 0 & 0 & tx \\ 0 & 1 & 0 & ty \\ 0 & 0 & 1 & tz \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

glTranslatef(tx,ty,tz)

$$\begin{pmatrix} sx & 0 & 0 & 0 \\ 0 & sy & 0 & 0 \\ 0 & 0 & sz & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

glScalef(sx,sy,sz)

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos(d) & -\sin(d) & 0 \\ 0 & \sin(d) & \cos(d) & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

glRotatef(d,1,0,0)

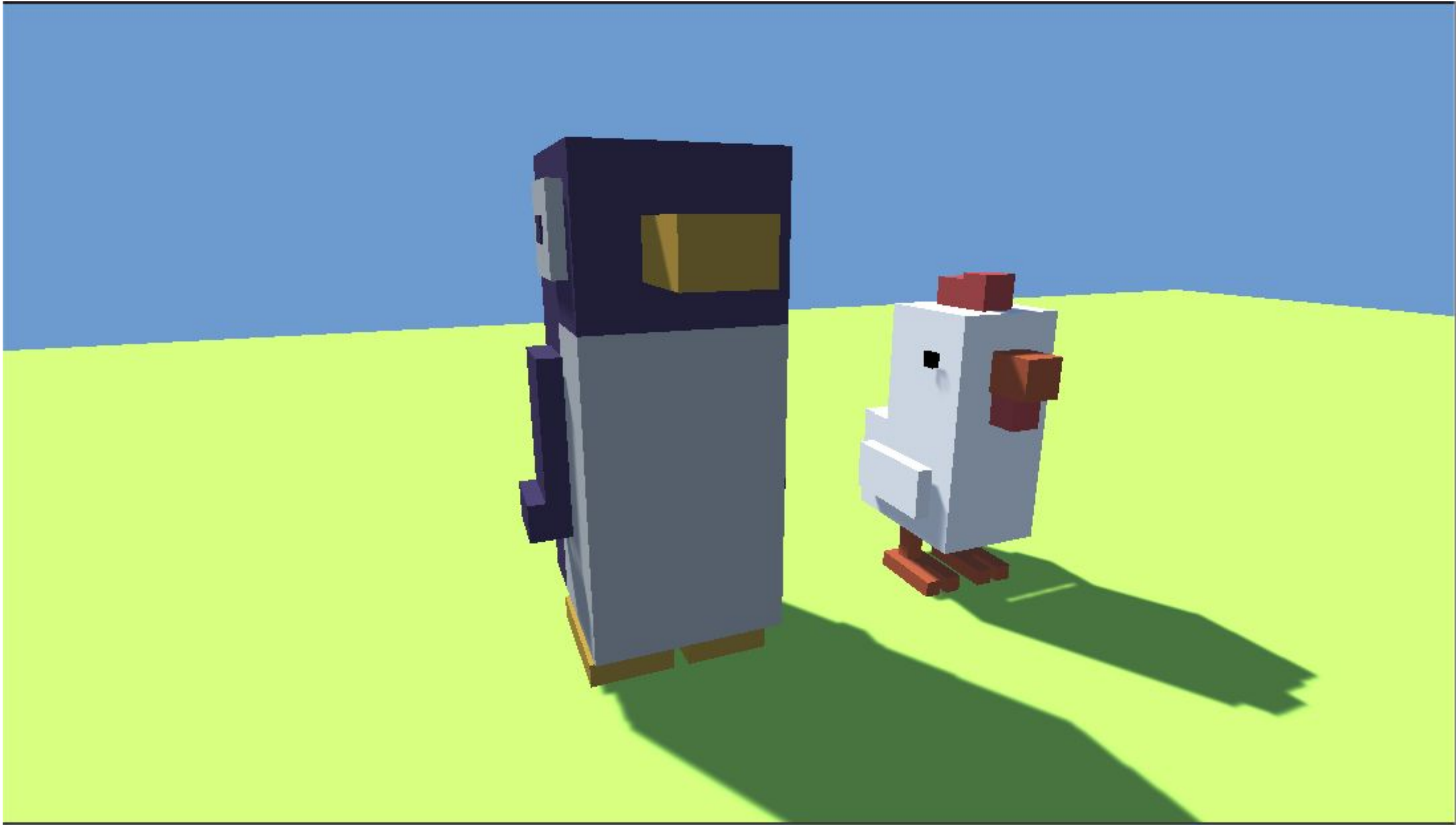
$$\begin{pmatrix} \cos(d) & 0 & \sin(d) & 0 \\ 0 & 1 & 0 & 0 \\ -\sin(d) & 0 & \cos(d) & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

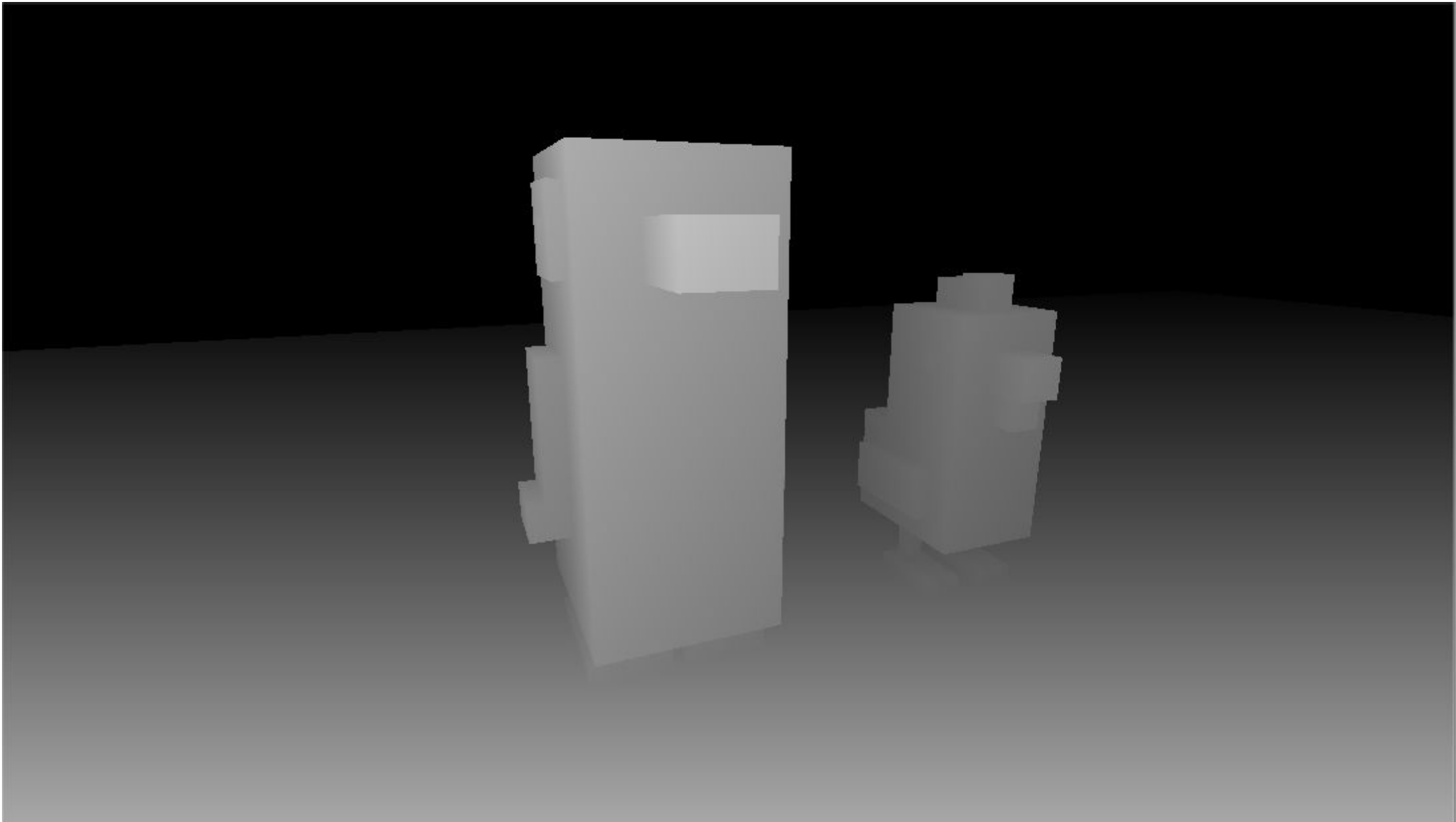
glRotatef(d,0,1,0)

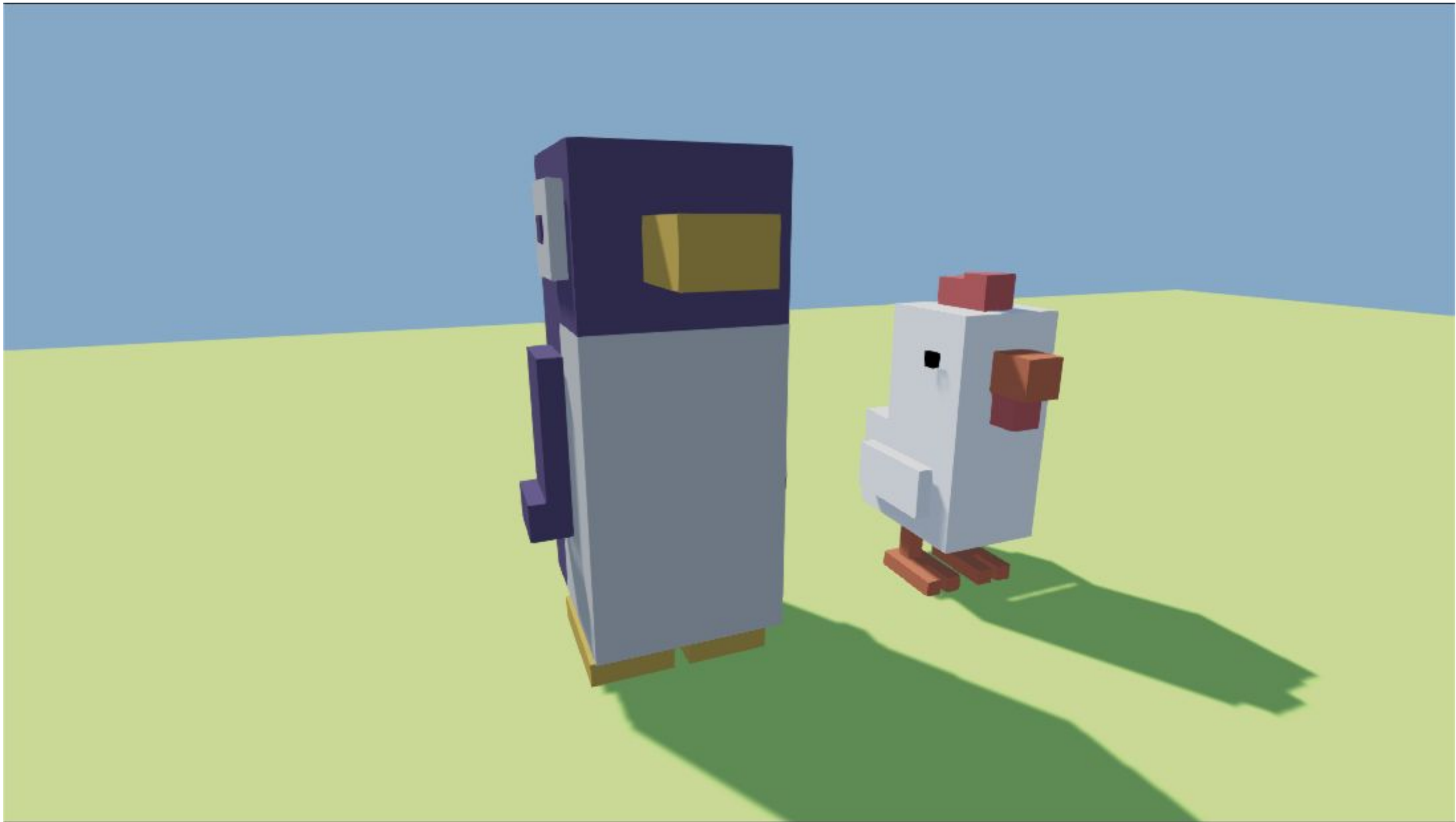
$$\begin{pmatrix} \cos(d) & -\sin(d) & 0 & 0 \\ \sin(d) & \cos(d) & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

glRotatef(d,0,0,1)









# Вопросы

# ССЫЛКИ

- <https://www.gamedev.net/articles/programming/graphics/introduction-to-the-graphics-pipeline-r3344/>
- <https://simonschreibt.de/gat/renderhell-book2/>