Computer Graphics: Rendering (Image)

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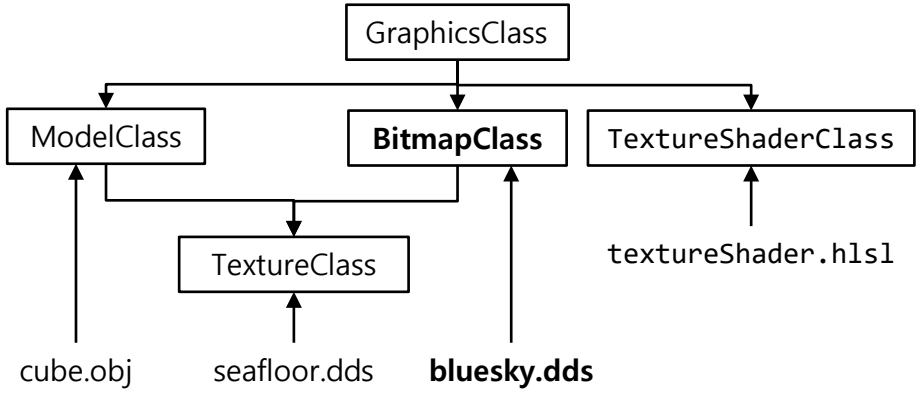
Tutorials

- 2D Image
- Text with Font Image
- Text with DirectWrite
- Billboarding

4-1 Image

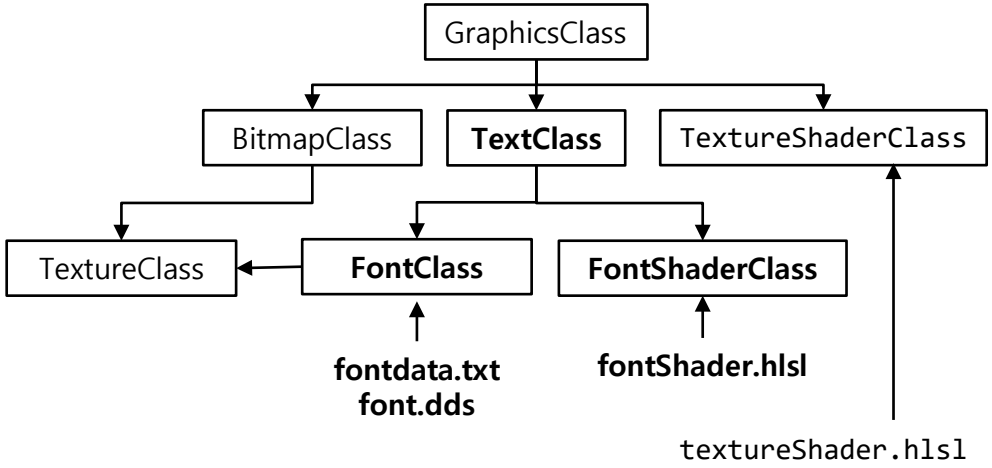
- Draw a 2D image from an external file
  - **BitmapClass**: draw a 2D image on a quad polygon
  - Use a orthogonal (parallel) matrix for projecting an image
  - Turn on/off a Z (depth) buffer for rendering an image



4-2 Text with Font Image

- Draw texts using a font image file
  - TextClass: handles the 2D text drawing process
  - FontClass: handles the texture for the font data
  - FontShaderClass: renders fonts using HLSL

- Uses two different shaders



4-2 Text with Font Image

- Font image: font.dds (1024x16)

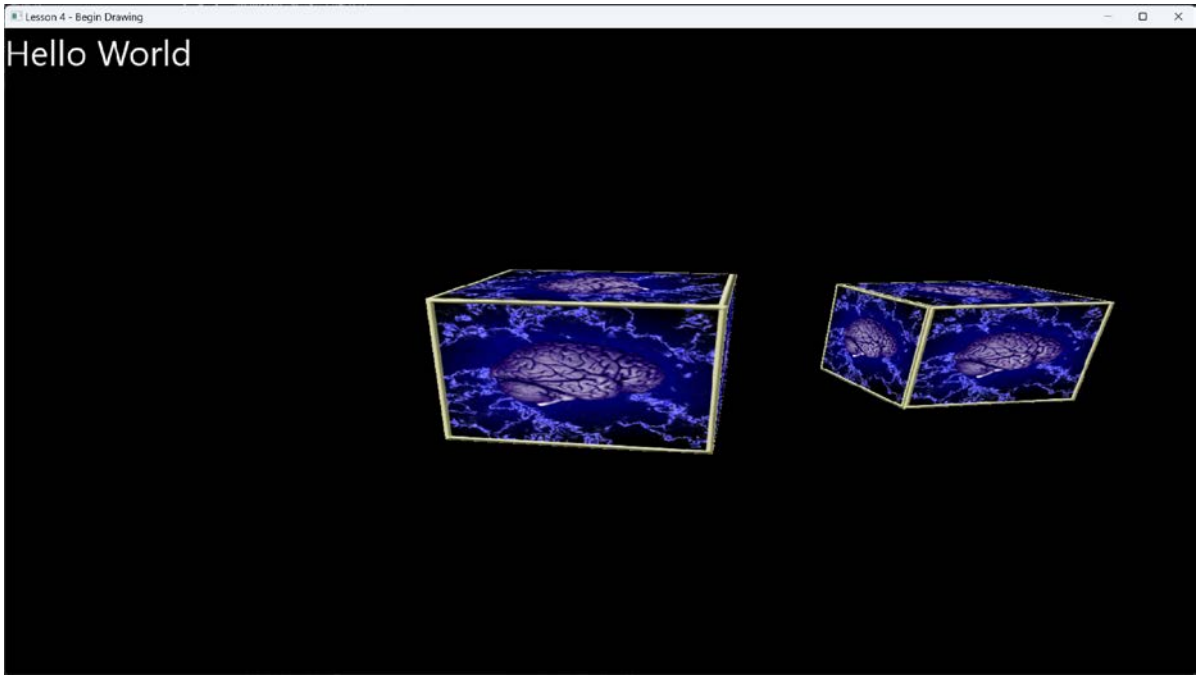
- Font data: fontdata.TXT
  - Location & size (pixels) of each character
  - Format: [Ascii value of character] [The character] [Left Texture U coordinate] [Right Texture U Coordinate] [Pixel Width of Character]

- Rendering notes
  - Turn on/off a depth buffer
  - Turn on/off alpha blending for transparency

```
32   0.0        0.0         0
33 ! 0.0        0.000976563 1
34 " 0.00195313 0.00488281  3
35 # 0.00585938 0.0136719   8
…

48 0 0.0761719  0.0820313   6
49 1 0.0830078  0.0859375   3
50 2 0.0869141  0.0927734   6
…

65 A 0.185547   0.194336    9
66 B 0.195313   0.202148    7
67 C 0.203125   0.209961    7
…

97 a 0.421875   0.426758    5
98 b 0.427734   0.432617    5
99 c 0.433594   0.438477    5
…

125 } 0.573242  0.576172    3
126 ~ 0.577148  0.583984    7
```

4-3 Text with DirectWrite

- Surface sharing technique (*BraynzarSoft)
  - D3D 11, D3D 10.1, and D2D all use the DXGI 1.1 so we can use DXGI to create a render target which can be shared between the three API's
  1. Use D2D with a D3D 10.1 device to render to a surface
  2. Use a D3D 11 device to render that shared surface onto a square in screen space which overlays the entire scene



4-3 Text with DirectWrite

- D3D10.1, D2D, and DirectWrite setup
  - Use the same adapter as the D3D 11 device
  - Create a square and a shader resource view from the shared texture
    - ID3D11Texture2D: a shared texture between API's
  - Render a text onto the square

```
bool InitD2D_D3D101_DWrite(IDXGIAdapter1 *Adapter);
void InitD2DScreenTexture();
void RenderText(std::wstring text);
```

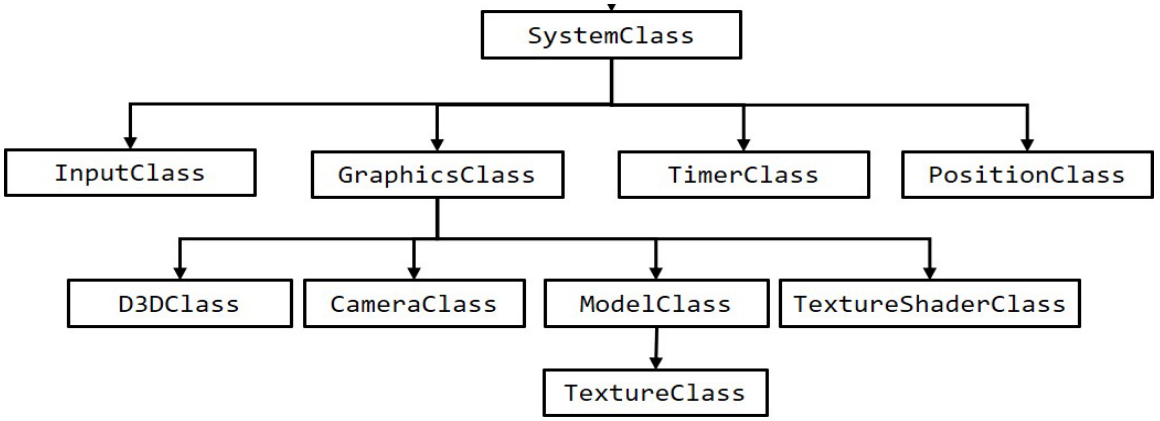
- Creating a font format using DirectWrite
  - IDWriteFactor::CreateTextFormat()
    - Set font weight, style, stretch, size, language

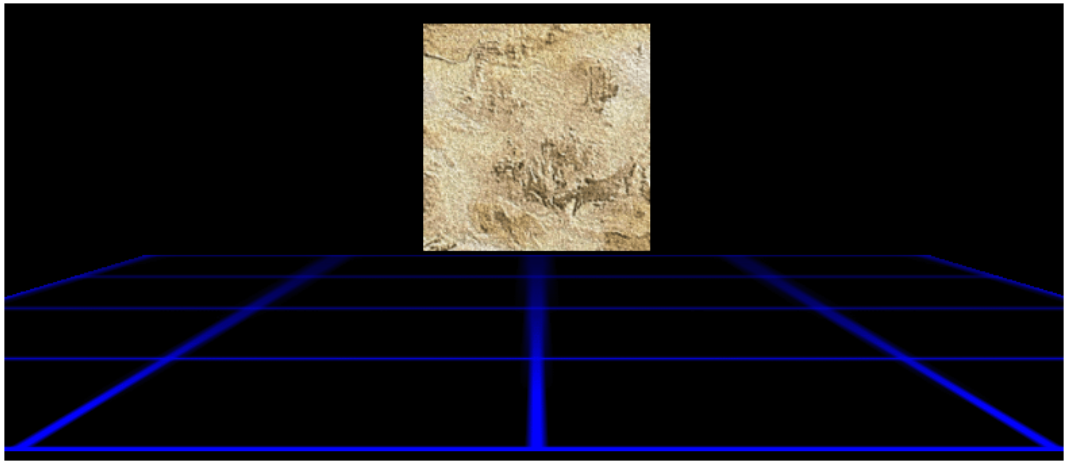
4-4 Billboarding

- Billboard
  - A technique in 3D graphics in which a sprite (i.e. a textured quad mesh) is rendered perpendicular to the camera without respect to camera movement
  - (+) Can reduce rendering computation

4-4 Billboarding

- Rotate (cylindrically) the billboard toward camera's position
  - PositionClass: Use left/right arrow keys to move with speed





4-4 Billboarding

- Billboarding calculation
  - Get a position of the camera and set a position of billboard
  - Determine the rotation for the billboard so it faces the camera based on the camera's position
  - Create a world matrix for each billboard by combining the rotation and translation matrices
    - Spherical rotation:

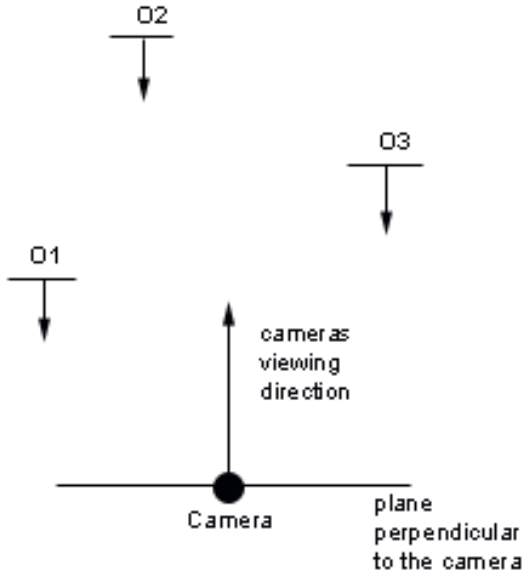
M1

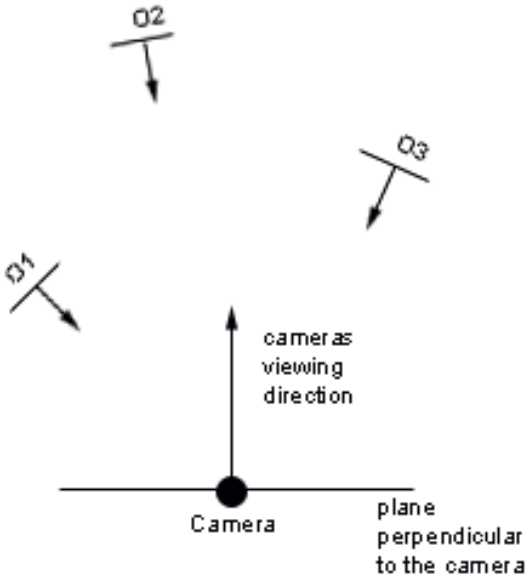
a0	a4	a8	a12
a1	a5	a9	a13
a2	a6	a10	a14
a3	a7	a11	a15

    - Cylindrical rotation:

M1

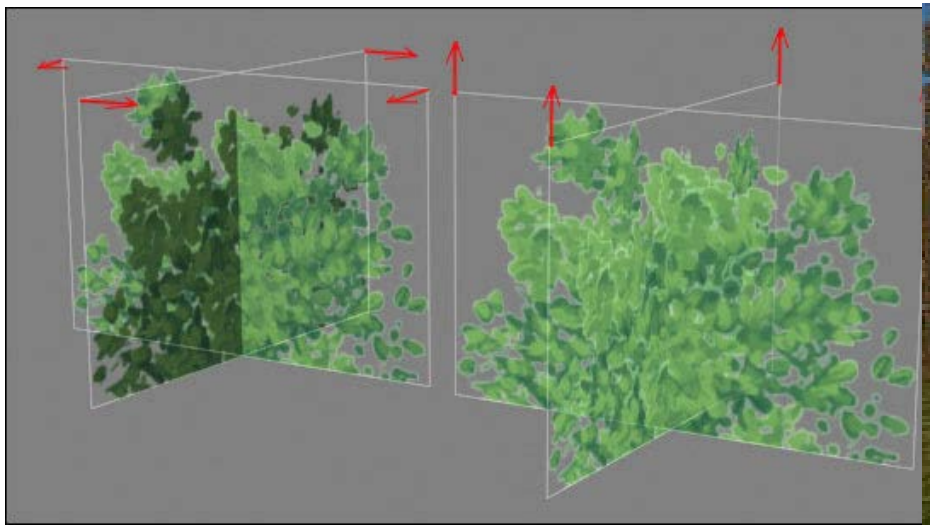
1	a4	0	a12
0	a5	0	a13
0	a6	1	a14
a3	a7	a11	a15





4-4 Billboarding

- Cross-billboards with multiple images



References

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Q & A