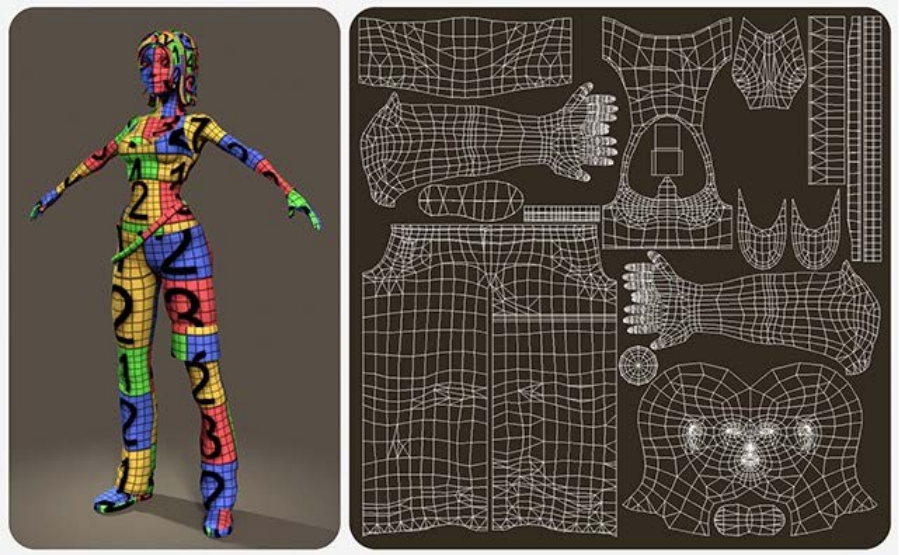
Computer Graphics Practice

Lecture 06

Dept. of Game Software
Yejin Kim

Plan

- Texturing
  - Texture Mapping
  - Texel
  - Texture Filter
- Tutorial
  - Texturing



Texturing

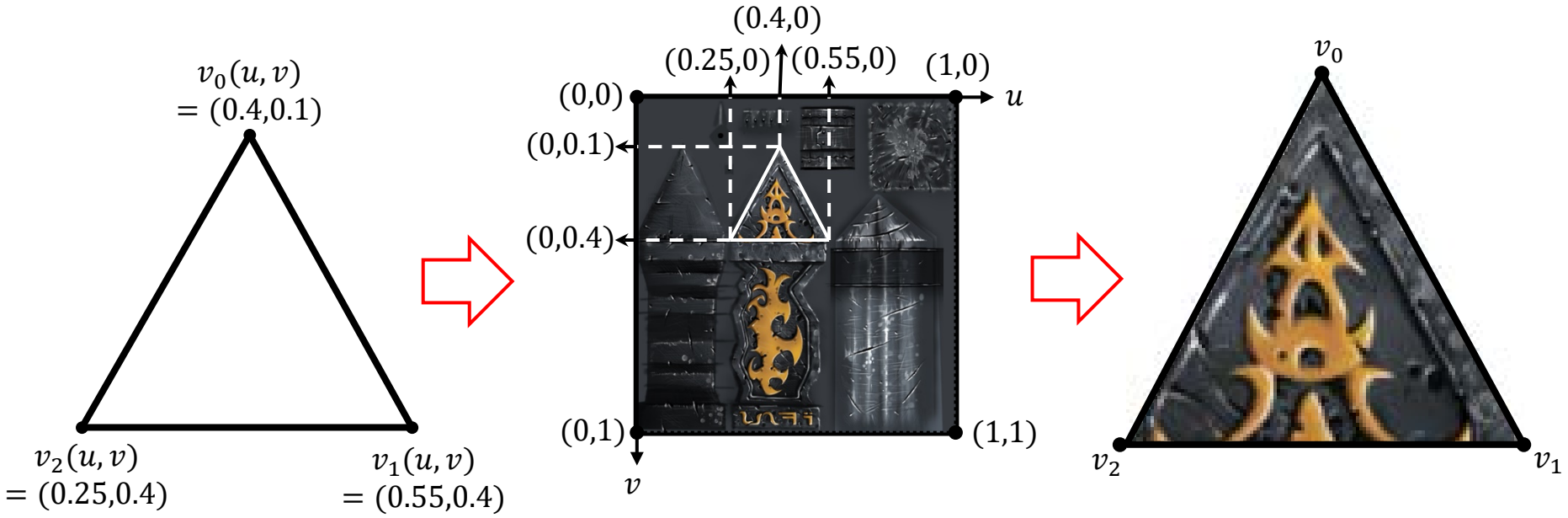
- Texture (diffuse) mapping
  - A method to wrap a 2D image on a 3D object [Edwin Catmul, 74]
  - Texture map: an image(two-dimensional array of color values) applied (mapped) to the polygon surface
  - Defining high frequency details on the object surface
  - e.g. Multitexturing, mipmaps, bump mapping, normal mapping, …

Virtual Fighter (1993)

Virtua Fighter 2 (1994)

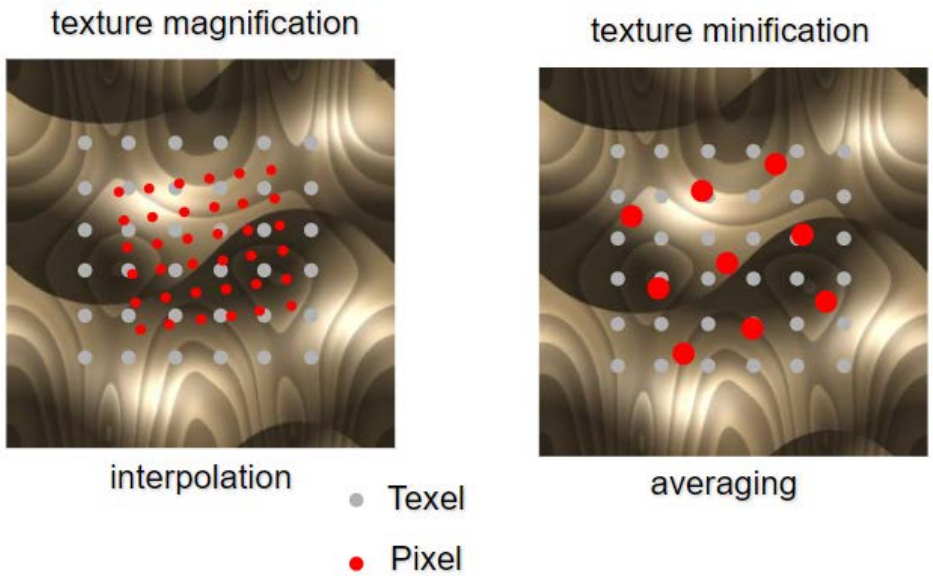
Texturing

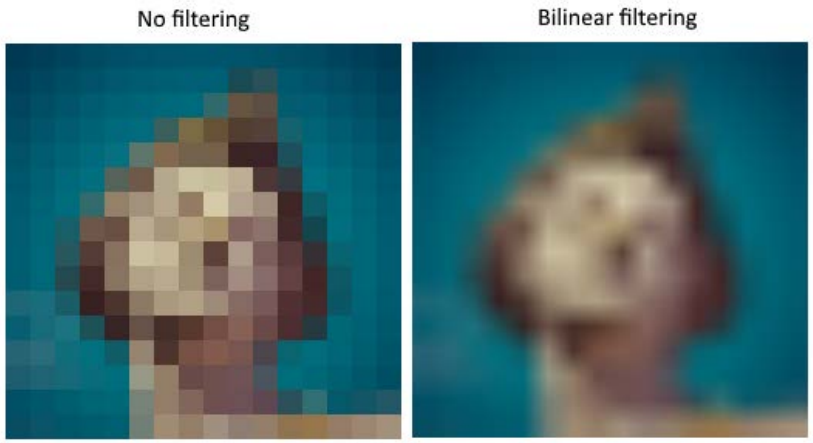
- Texel (texture pixel)
  - Fundamental unit of a texture map
  - Specified by texture coordinate (*u, v*)
  - Map (*u, v*) space to polygon's space



Texturing

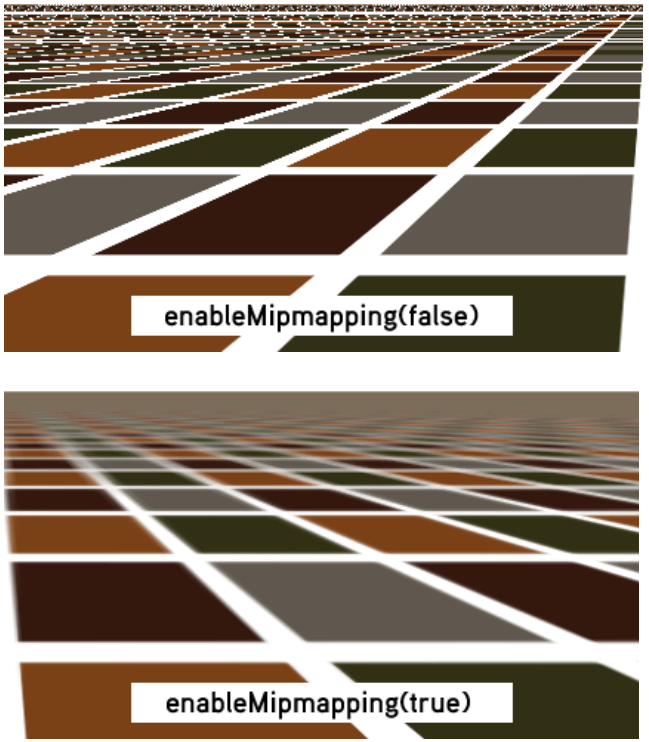
- Texture filtering (smoothing)
  - One pixel ≠ one texel
  - Method used to determine the texture color for a texture mapped pixel using the colors of nearby texels
- Magnification and minification filters
  - Texture appears magnified(interpolated) or minified(averaged) on screen





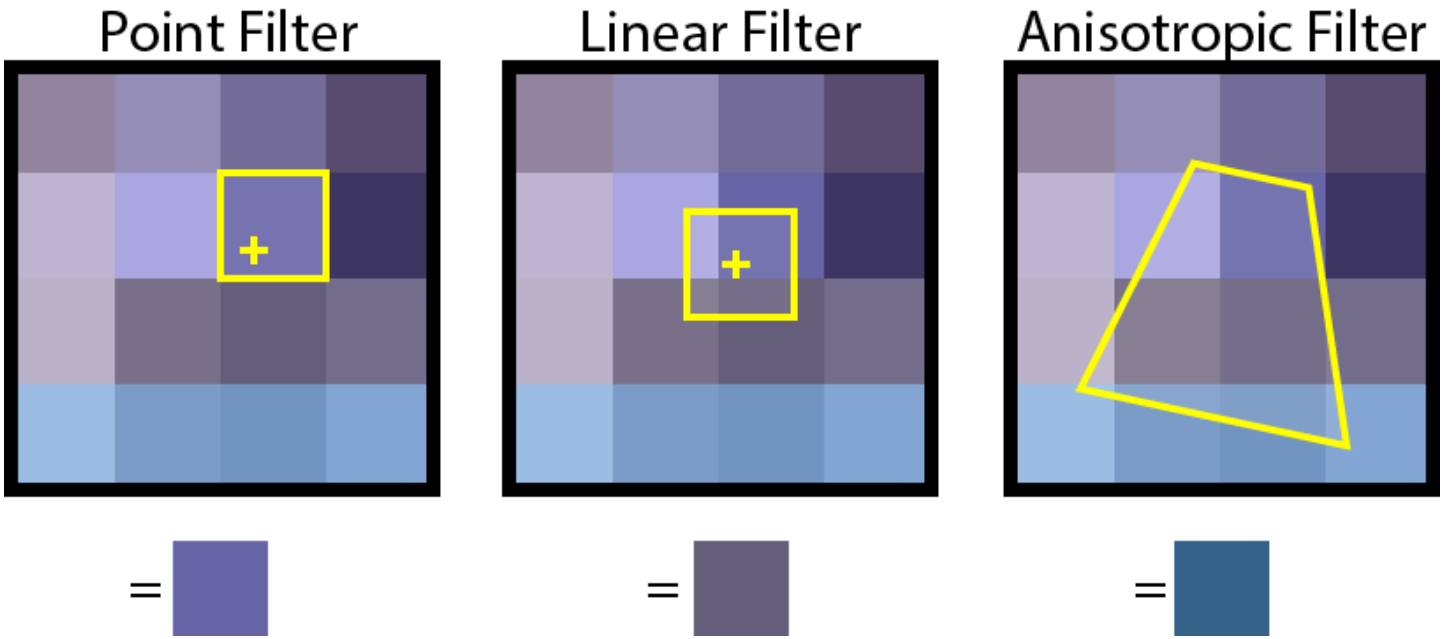
Texturing

- Mipmapping (MIP map)
  - Texture minification filter to avoid aliasing effects
  - Use a collection of multi-resolution images
  - Apply different sizes (levels) of the mipmap images depending on the distance between the camera and object



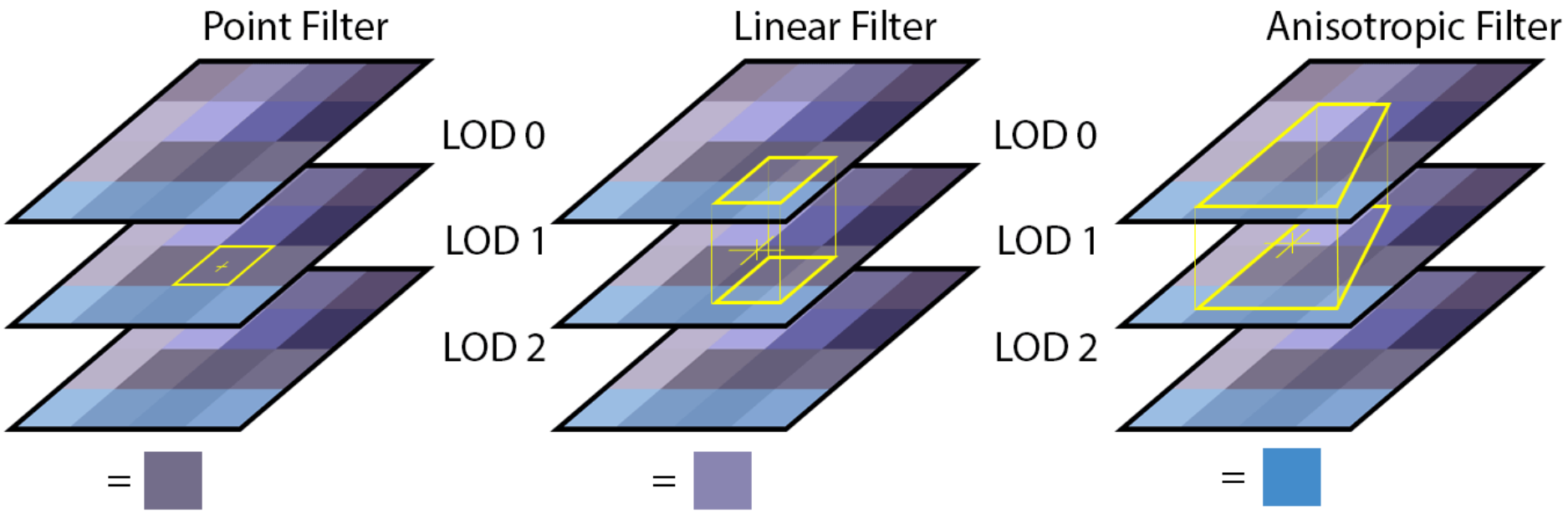
Texturing

- Filter methods
  - Point: uses the color of the texel closest to the pixel center
  - Bilinear: uses the weighted average color of the four nearest texels to the pixel center
  - Anisotropic: sampling the texture as a non-square shape
    - Anisotropy(비등방성): the property of being directionally dependent



Texturing

- Mipmapping with texture filters

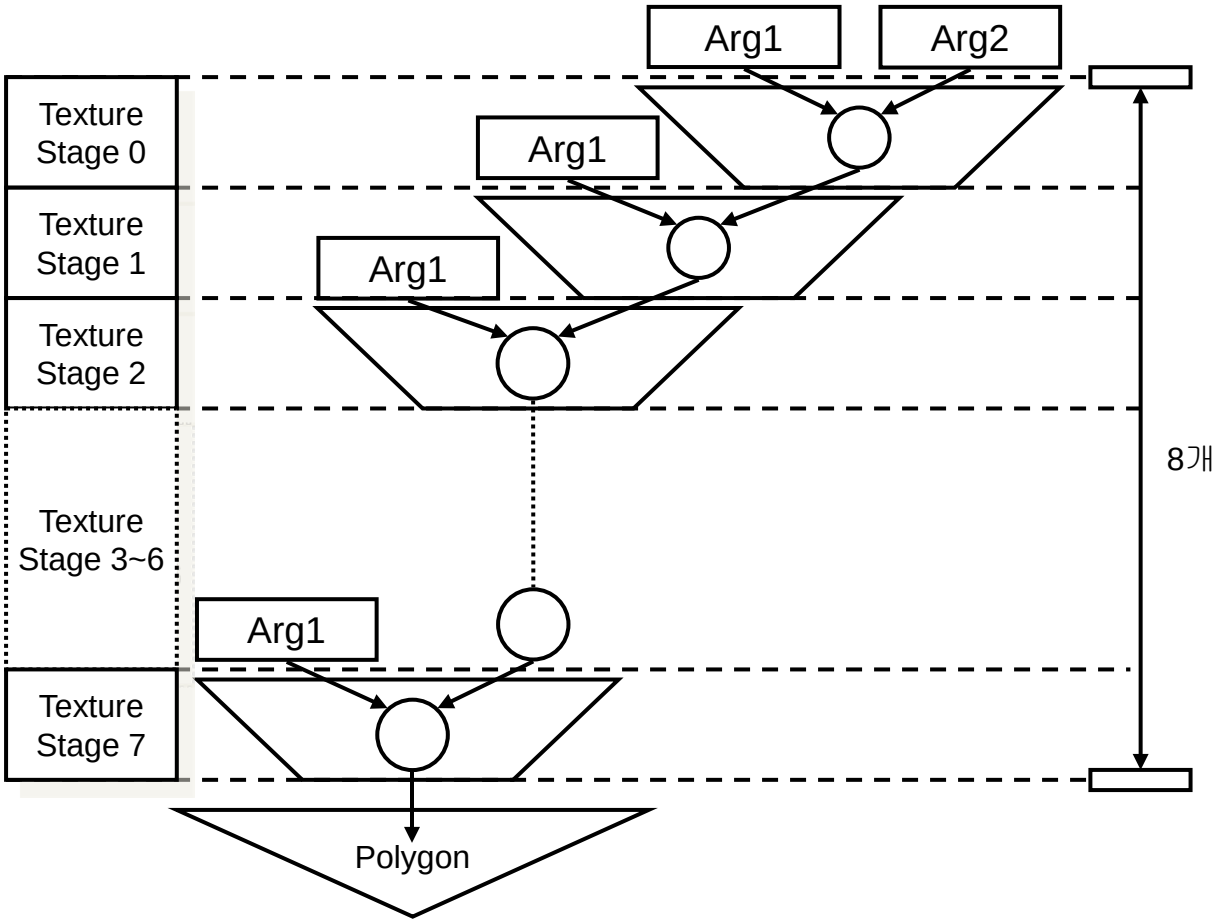


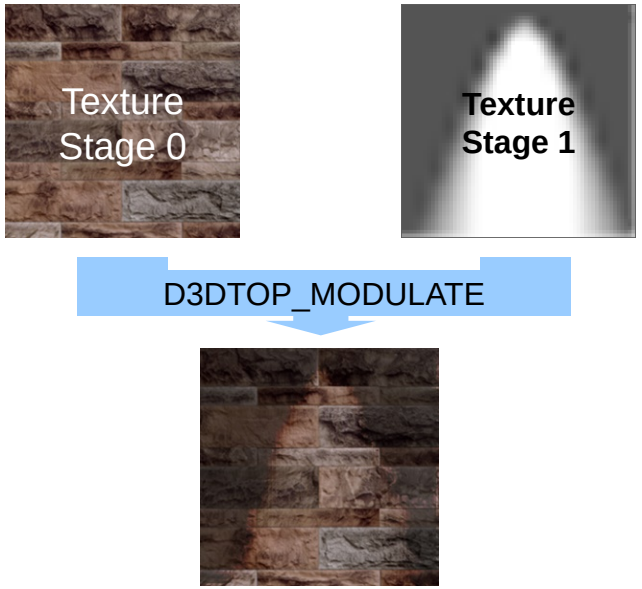
Texturing

- Anisotropic filtering effects
  - Mapped texel is NOT perfectly square in the rendered space
  - Reducing blur and preserving detail at extreme viewing angles

Texturing

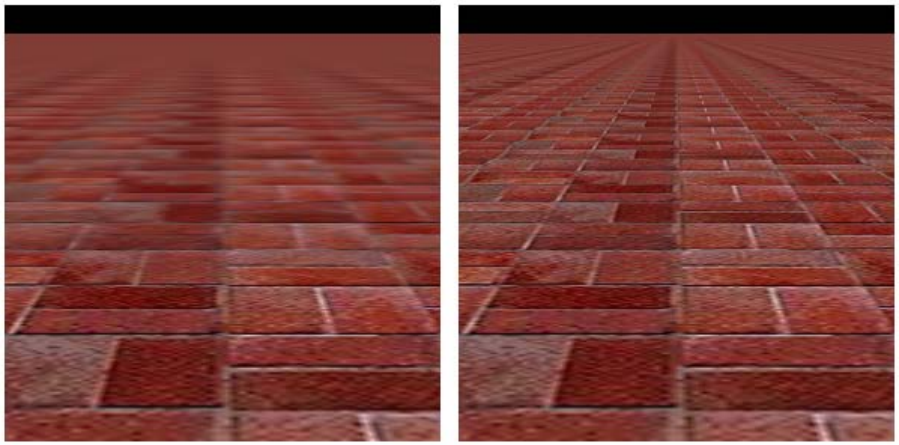
- Multi-texturing (*Computer Graphics Practice(2) 주제)
  - Uses multiple textures on polygon surface





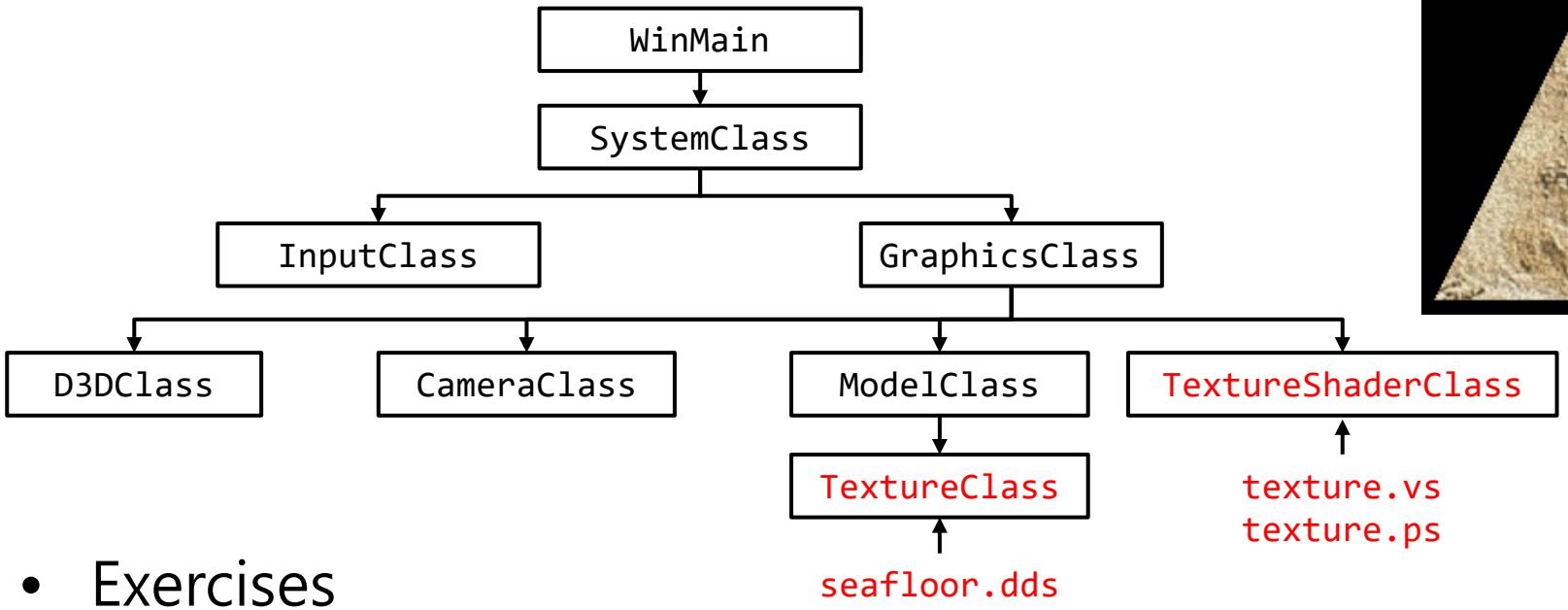
Tutorial: Texturing

- Direct3D texture filter modes
  - Point filter
    - D3D11_FILTER_MIN_MAG_MIP_POINT
  - Bilinear filter
    - D3D11_FILTER_MIN_MAG_LINEAR_MIP_POINT
  - Trilinear filter
    - D3D11_FILTER_MIN_MAG_MIP_LINEAR
  - Anisotropic
    - D3D11_FILTER_ANISOTROPIC
    - MaxAnisotropy = 2, 4, 8, 16



Tutorial: Texturing

- Adding texture classes to the Framework
  - **TextureClass**: handle a single texture resource
  - **TextureShaderClass**: render a texture using HLSL



- Exercises
  - Map a DDS texture to a square
  - Show the point, linear, and anisotropic filter effects

Q & A