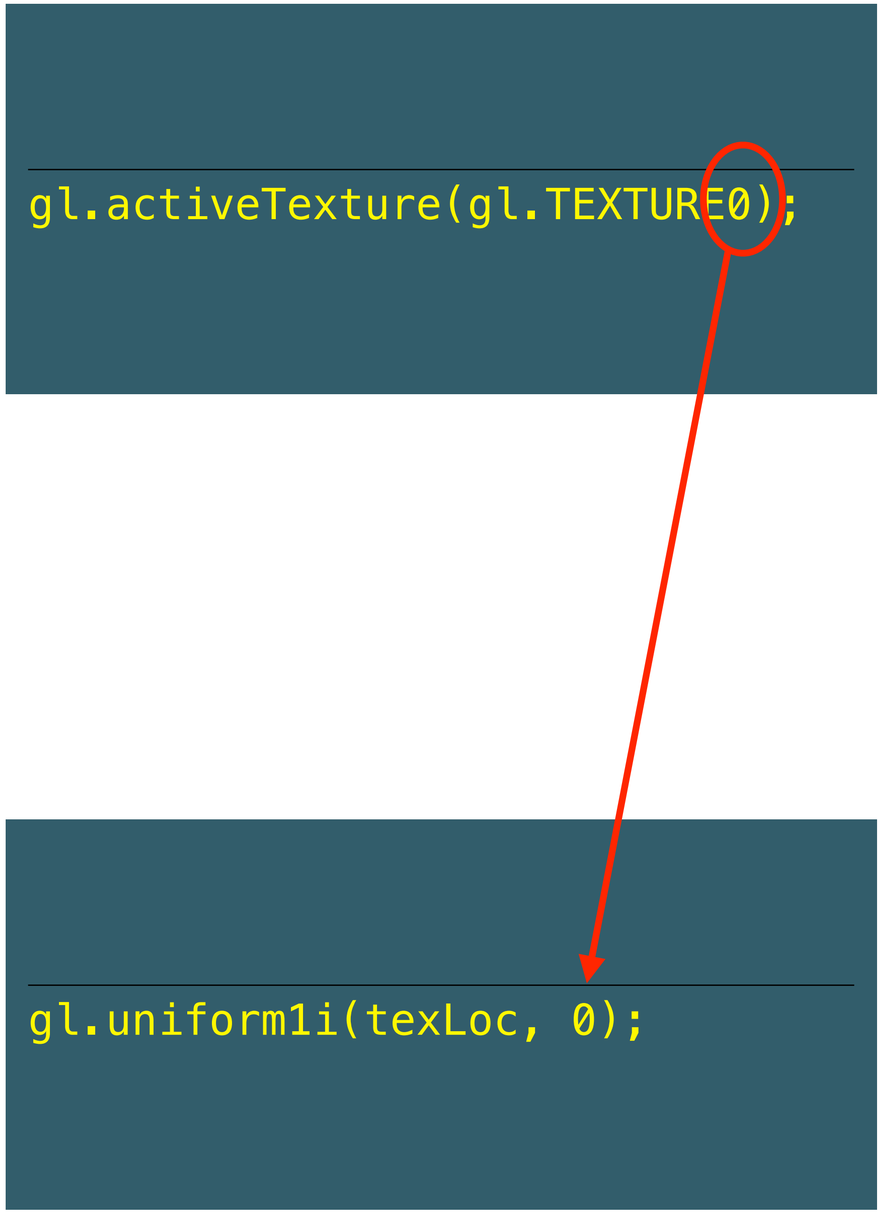
More Texture Mapping

CS 385 - Class 20
12 April 2022

Specifying the Texture Sampler

- Samplers specify the *texture unit* in the shader
- They control a number of parameters about textures
  - which texture to retrieve values from
  - how those values are *sampled*
- Samplers are merely integer uniform values



Setting up an Active Texture

- It's a bit like binding buffers and textures
- First, call `gl.activeTexture()` with the appropriate texture unit
  - `gl.TEXTURE`*n*
- Next, call `gl.bindTexture()` with the appropriate texture
- Before rendering specify *n* as the value for the sampler uniform

Configuring Texturing

Specifying how textures are sampled

Texture Coordinate Wrap Modes

- Recall that texture coordinates are defined only in the range [0,1]
- Two options if outside that range
  - clamp values to range
  - ignore integer part and only use fractional part

Repeat Mode

Clamp Mode

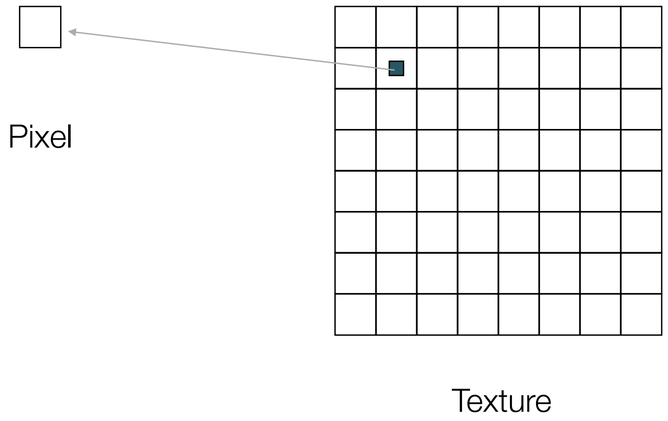
Setting Texture Wrap Modes

```
gl.texParameteri( target, prop, param );
```

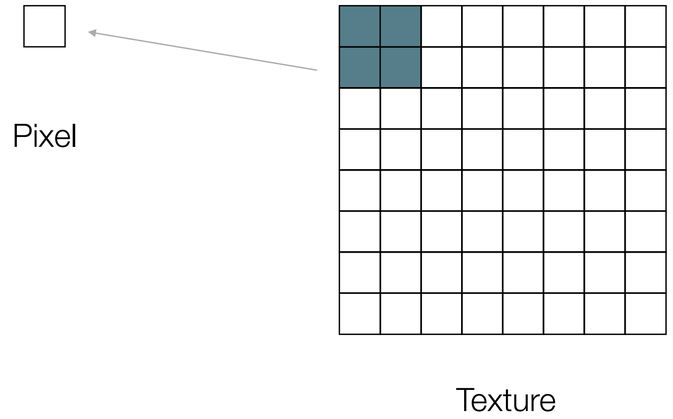
- target is `gl.TEXTURE_{2D,CUBE_MAP}`
- prop is `gl.TEXTURE_WRAP_{S,T}`
- param is one of:
  - `gl.CLAMP_TO_EDGE`
  - `gl.REPEAT`
  - `gl.MIRRORED_REPEAT`

Filter Modes

- *Magnification*
  - when the texture map is *smaller* than the primitive it's being mapped onto
  - more pixels than texels, so just repeat texel data



- *Minification*
  - when the texture map is *larger* than the primitive it's being mapped onto
  - more texels than pixels, so filter excess data



Texture Magnification in WebGL

```
gl.texParameteri( target, prop, param );
```

- target is `gl.TEXTURE_{2D,CUBE_MAP}`
- prop is `gl.TEXTURE_MAG_FILTER`
- param is one of:
  - `gl.NEAREST`
  - `gl.LINEAR`

Texture Minification

- Opposite problem of magnification
  - too much information
  - more processing options
- Same sampling options as magnification
  - `gl.NEAREST`
  - `gl.LINEAR`
- Additional technique to reduce aliasing - *mipmapping*

Mipmaps

- Multiple resolution versions of the same image

Level 0

Level 1

Level 2

Level 3

Generating Mipmaps

```
gl.generateMipmap( target );
```

- target is `gl.TEXTURE_{2D,CUBE_MAP}`
- Uses level zero of currently bound texture to create mipmap stack

Setting Texture Filtering

```
gl.texParameteri( target, prop, param );
```

- target is `gl.TEXTURE_{2D,3D,CUBE_MAP}`
- prop is `gl.TEXTURE_MIN_FILTER`
- param is one of:
  - `gl.NEAREST`
  - `gl.LINEAR`
  - `gl.NEAREST_MIPMAP_NEAREST`
  - `gl.NEAREST_MIPMAP_LINEAR` ⟵ (default value)
  - `gl.LINEAR_MIPMAP_NEAREST`
  - `gl.LINEAR_MIPMAP_LINEAR`