

Texturing in GLSL



Oregon State
University

Mike Bailey

mjb@cs.oregonstate.edu



This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/)



Oregon State
University
Computer Graphics

Textures.pptx

mjb - November 22, 2022

2D Texturing

Vertex shader:

```
#version 330 compatibility
out vec2 vST;

void
main()
{
    vST = gl_MultiTexCoord0.st;
    gl_Position = gl_ModelViewProjectionMatrix * gl_Vertex;
}
```

Rasterizer

Fragment shader:

```
#version 330 compatibility
in vec2 vST;
uniform sampler2D uTexUnit;

void
main()
{
    vec3 newcolor = texture( uTexUnit, vST ).rgb;
    gl_FragColor = vec4( newcolor, 1. );
}
```



Oregon State
University
Computer

mjb - November 22, 2022

2D Texturing in the OpenGL API

3

Fragment shader:

```
#version 330 compatibility
in vec2 vST;
uniform sampler2D uTexUnit;

void
main()
{
    vec3 newcolor = texture( uTexUnit, vST ).rgb;
    gl_FragColor = vec4( newcolor, 1. );
}
```

```
glGenTextures( 1, &TexName );
int nums, numt;
Texture = BmpToTexture( "filename.bmp", &nums, &numt );
glBindTexture( GL_TEXTURE_2D, TexName );
glTexParameteri( GL_TEXTURE_2D, GL_TEXTURE_WRAP_S, GL_REPEAT );
glTexParameteri( GL_TEXTURE_2D, GL_TEXTURE_WRAP_T, GL_REPEAT );
glTexParameteri( GL_TEXTURE_2D, GL_TEXTURE_MAG_FILTER, GL_LINEAR );
glTexParameteri( GL_TEXTURE_2D, GL_TEXTURE_MIN_FILTER, GL_LINEAR );
glTexImage2D( GL_TEXTURE_2D, 0, 3, nums, numt, 0, GL_RGB, GL_UNSIGNED_BYTE, Texture );
...
Pattern->Use();
glActiveTexture( GL_TEXTURE6 ); // use texture unit 6
glBindTexture( GL_TEXTURE_2D, TexName );
Pattern->SetUniformVariable( "uTexUnit", 6 );
```

2D Texturing in glman

4

Fragment shader:

```
#version 330 compatibility
in vec2 vST;
uniform sampler2D uTexUnit;

void
main()
{
    vec3 newcolor = texture( uTexUnit, vST ).rgb;
    gl_FragColor = vec4( newcolor, 1. );
}
```

```
Texture2D 6 worldtex.bmp
...
Program World uTexUnit 6
```

The OsuSphere Has Sensible s,t Coordinates Assigned

5




Oregon State
University
Computer Graphics

mjb - November 22, 2022

The GLUT Teapot Doesn't

6




Oregon State
University
Computer Graphics

mjb - November 22, 2022

What if You Want to Use Two Textures in One Shader?

7

C++ Program:

```
// In Display():
Pattern->Use( );
glActiveTexture( GL_TEXTURE5 );
glBindTexture( GL_TEXTURE_2D, TexName0 );

glActiveTexture( GL_TEXTURE6 );
glBindTexture( GL_TEXTURE_2D, TexName1 );

Pattern->SetUniformVariable( "uTexUnit0", 5 );
Pattern->SetUniformVariable( "uTexUnit1", 6 );

<< draw something >>
Pattern->UnUse( );
```

Fragment shader:

```
#version 330 compatibility
in vec2 vST;
uniform sampler2D uTexUnit0;
uniform sampler2D uTexUnit1;

void
main( )
{
    vec3 newColor0 = texture( uTexUnit0, vST );
    vec3 newColor1 = texture( uTexUnit1, vST );
    gl_FragColor = ...
}
```

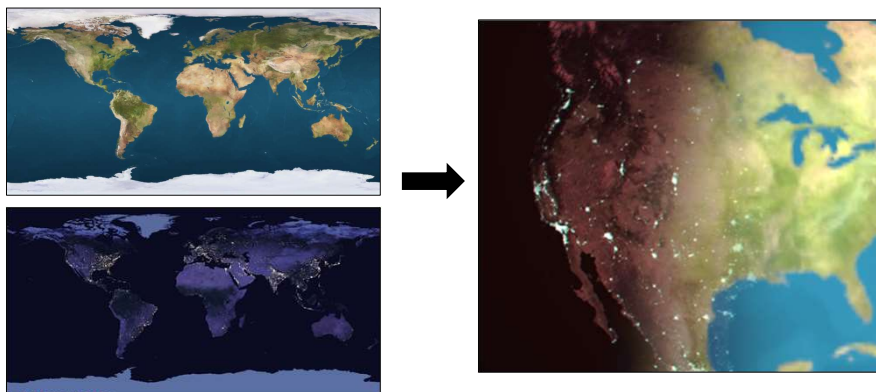
Oreg
Uni
Compu

mjb - November 22, 2022

Why Might You Want to Use Two Textures in One Shader?

8

Once the RGBs have been read from a texture, they are just numbers. You can do any arithmetic you want with the texture RGBs, other colors, lighting, etc. Here is an example of blending two textures at once:

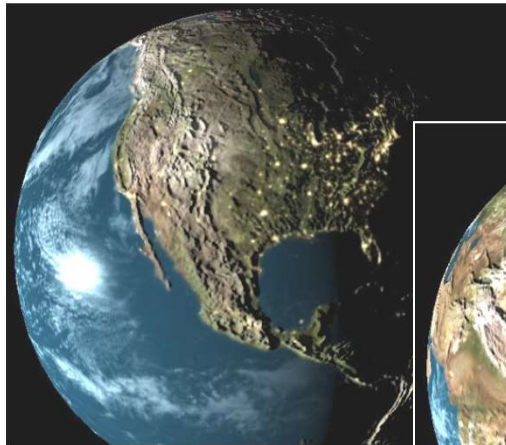


Oregon State
University
Computer Graphics

mjb - November 22, 2022

Shaders Can Combine More than Two Textures

9



Just assign each texture
a different texture unit



Textures used here:

- Day
- Night
- Heights (bump-mapping)
- Clouds
- Specular highlights



Oregon State
University
Computer Graphics

Visualization by Nick Gebbie



mjb - November 22, 2022