Assignment 3 (Exercise 6.6)

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Assignment Objective: Modify Exercise 5.3 (RotatingColorfulLetter.cpp) so that the letter rotates in response to user input, the letter rotates in three dimensions, and a matrix is used for transformations.

How Achieved: Before starting Exercise 6.6, I fixed the problems with discontinuities in my original H letter design by adding more vertices and triangles where needed. Then I completed Exercise 5.3 to better understand Chapter 5 material, duplicated that exercise's application file (*RotatingColorfulLetter.cpp*) and renamed it to *Rotate3DLetter.cpp*.

Starting Exercise 6.6, I first decided to create more space in *Rotate3DLetter.cpp* source file by moving the vertex and pixel shaders to separate *.shader* files in an internal project resources folder. I chose the *.shader* file extension because it provides some syntax highlighting in VS 2019. To read the shaders from files, the call to `LinkProgramViaCode()` in method `InitShader()` was changed to:

```
	LinkProgramViaFile(“res/shaders/vertex.shader”, “res/shaders/pixel.shader”);
```

Then, I added code to the Vertex Shader to support the use of a matrix. The full Vertex Shader:

```
	#version 130
	in vec2 point;
	in vec3 color;
	out vec4 vColor;
	uniform mat4 view;
	void main() {
		gl_Position = view * vec4(point, 0, 1);
		vColor = vec4(color, 1);
	}
```

Next, I added variables tracking mouse position in the application window and mouse clicks, and how the application should interpret those variables, to *Rotate3DLetter.cpp*:

```
	float rotSpeed = .3f;
	vec2 mouseDown(0, 0);
	vec2 rotOld(0, 0), rotNew(0, 0);
```

Then I added callback methods to respond to mouse clicks and mouse movement:

```
	void MouseButton(GLFWwindow* w, int butn, int action, int mods);
	void MouseMove(GLFWwindow* w, double x, double y);
```

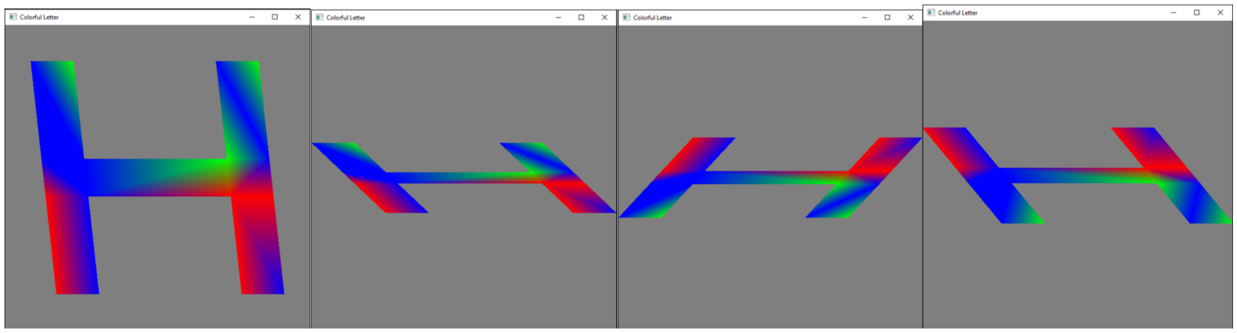
These callbacks were registered in *main* by adding lines:

```
	glfwSetMouseButtonCallback(window, MouseButton);
	glfwSetCursorPosCallback(window, MouseMove);
```

Then, I changed method `Display()` to compute the transformation matrix using routines in *VecMath.h*:

```
	mat4 view = RotateY(rotNew.y) * RotateX(rotNew.x);
	SetUniform(program, "view", view);
```

Resulting images:



[Different states of mouse-controlled 3D-rotation of model]