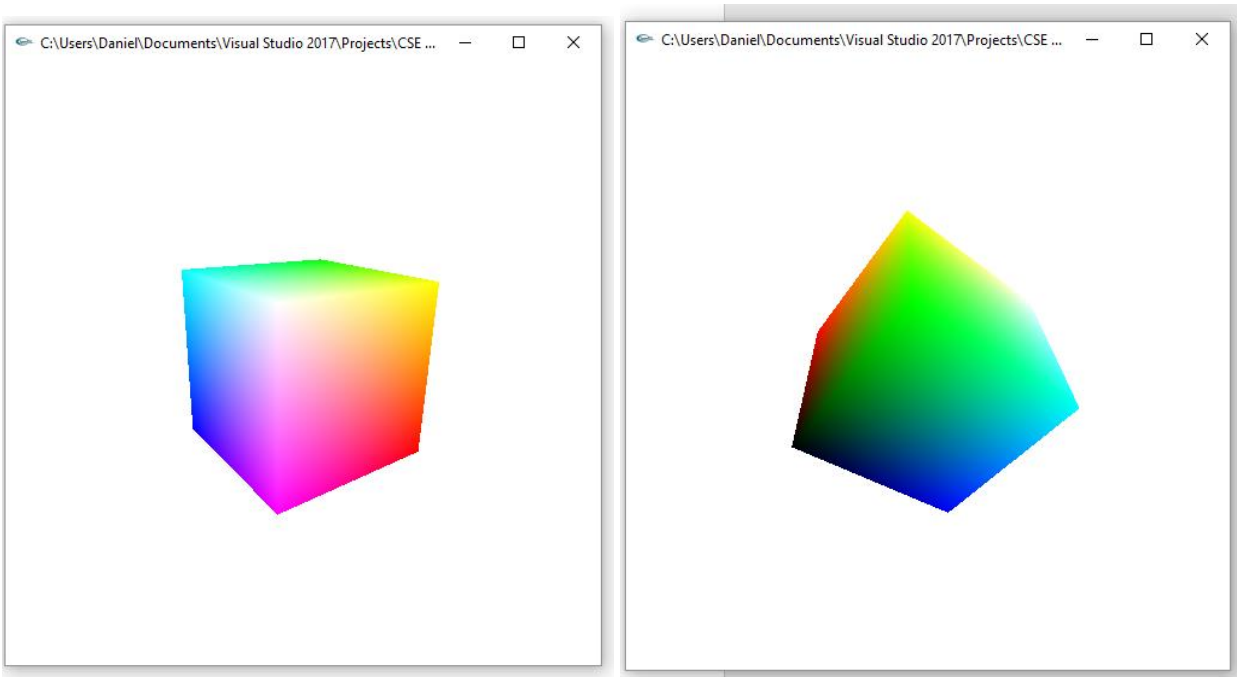
Daniel Meyer

CSE 420-01

Homework Extra Credit

Homework Extra Credit Report

Part 1: (success)



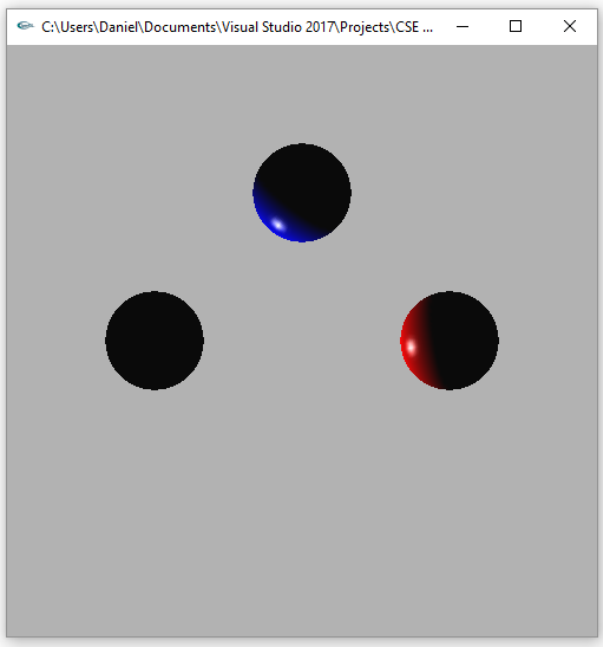

```
#include <stdlib.h>
#include <stdio.h>
#include <iostream>
#include <GL/glut.h>

float ax = 0, ay = 0, az = 0;    // rotations


static GLubyte allIndices[] = { 4, 5, 6, 7, //front
                                1, 2, 6, 5,     //right
                                0, 1, 5, 4,     //bottom
                                0, 3, 2, 1,     //back
                                0, 4, 7, 3,     //left
                                2, 3, 7, 6 };   //top

static GLint vertices[] = { -1, -1, -1,   //0
                            1, -1, -1,
                            1, 1, -1,
                            -1, 1, -1,        //3
```

```
                                        -1, -1, 1,
                                        1, -1, 1,
                                        1, 1, 1,          //6
                                        -1, 1, 1 };       //7

static GLfloat colors[] = { 0.0, 0.0, 0.0,
                                        1.0, 0.0, 0.0,
                                        1.0, 1.0, 0.0,
                                        0.0, 1.0, 0.0,
                                        0.0, 0.0, 1.0,
                                        1.0, 0.0, 1.0,
                                        1.0, 1.0, 1.0,
                                        0.0, 1.0, 1.0
};

//0 = black
//1 = red
//2 = yellow
//3 = green
//4 = blue
//5 = magenta
//6 = white
//7 = cyan

void init()
{
      glClearColor(1.0, 1.0, 1.0, 0.0);
      glShadeModel(GL_SMOOTH);

      glEnableClientState(GL_VERTEX_ARRAY);
      glEnableClientState(GL_COLOR_ARRAY);
}

void display(void)
{
      glClear(GL_COLOR_BUFFER_BIT);
      glColor3f(1.0, 1.0, 1.0);
      glLoadIdentity();
      gluLookAt(3.0, 3.0, 3.0, 0.0, 0.0, 0.0, 0.0, 1.0, 0.0);
      glRotatef(ax, 1, 0, 0);
      glRotatef(ay, 0, 1, 0);
      glRotatef(az, 0, 0, 1);

      glVertexPointer(3, GL_INT, 0, vertices);
      glColorPointer(3, GL_FLOAT, 0, colors);
      glEnable(GL_CULL_FACE);
```

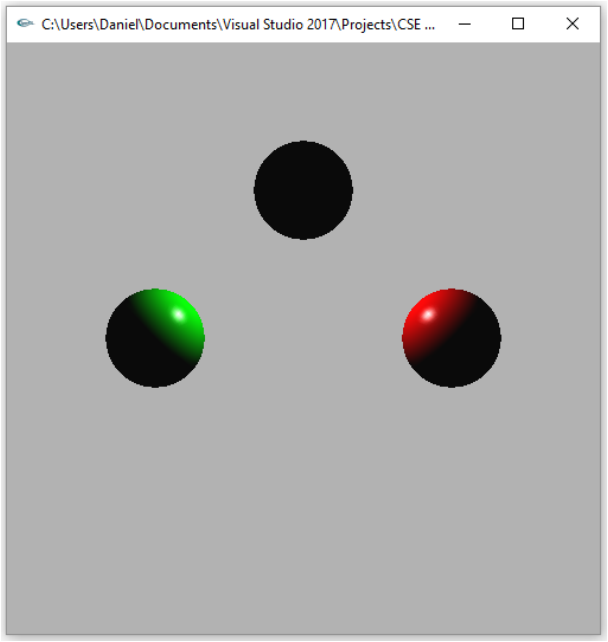
```
	glCullFace(GL_BACK);

	glDrawElements(GL_QUADS, 24, GL_UNSIGNED_BYTE, allIndices);

	glFlush();
}

void reshape(int w, int h)
{
	glViewport(0, 0, (GLsizei)w, (GLsizei)h);
	glMatrixMode(GL_PROJECTION);
	glLoadIdentity();
	glFrustum(-1.0, 1.0, -1.0, 1.0, 1.5, 20.0);
	glMatrixMode(GL_MODELVIEW);
}

void keyboard(unsigned char key, int x, int y)
{
	switch (key)
	{
	case 'x':		// up
		ax += 5;
		break;
	case 'X':		// down
		ax -= 5;
		break;
	case 'y':		//north
		ay += 5;
		break;
	case 'Y':		//south
		ay -= 5;
		break;
	case 'z':		//west
		az -= 5;
		break;
	case 'Z':		//east
		az += 5;
		break;
	case 27:
		exit(0);
		break;
	}
	glutPostRedisplay();
}

int main(int argc, char** argv)
```

```
{
	glutInit(&argc, argv);
	glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
	glutInitWindowSize(500, 500);
	glutInitWindowPosition(600, 600);
	glutCreateWindow(argv[0]);
	init();
	glutDisplayFunc(display);
	glutKeyboardFunc(keyboard);
	glutReshapeFunc(reshape);

	glutMainLoop();
	return 0;
}
```

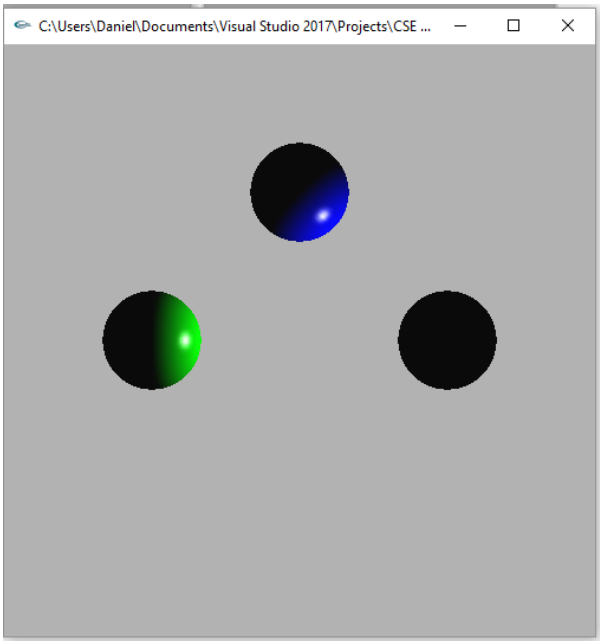
Part 2: (success)



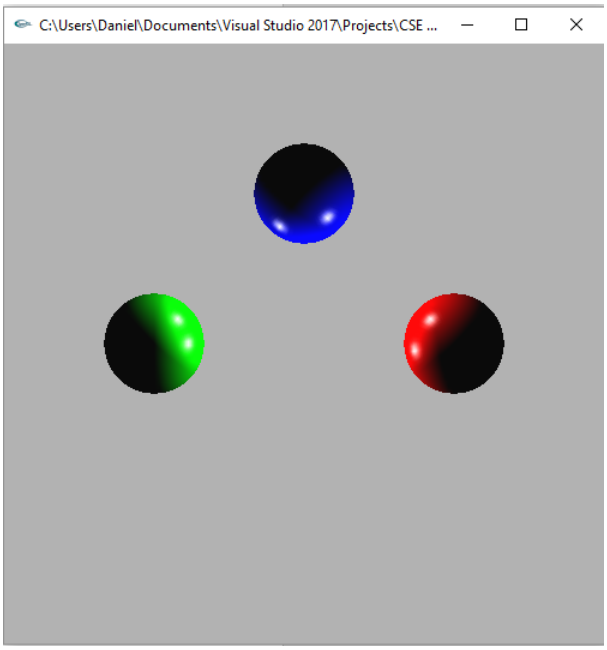
LIGHT0 enabled



LIGHT1 enabled



LIGHT2 enabled



LIGHT0, LIGHT1, LIGHT2 enabled

```
void init(void)
{
	GLfloat no_mat[] = { 0.0, 0.0, 0.0, 1.0 };
	GLfloat mat_specular[] = { 1.0, 1.0, 1.0, 1.0 };
	GLfloat diffuseMaterial[4] = { 1.0, 1.0, 1.0, 1.0 };
	GLfloat ambient[] = { 0.0, 0.0, 0.0, 1.0 };
	GLfloat light[] = { 1.0, 1.0, 1.0 };

	GLfloat light_position0[] = { -3.0, -1.0, -1.0, 1.0 };
	GLfloat light_position1[] = { 0.0, 3.0, 1.0, 1.0 };
	GLfloat light_position2[] = { 3.0, 0.0, 1.0, 1.0 };
	GLfloat spot_direction0[] = { 1.0, 1.0, 1.0 };
	GLfloat spot_direction1[] = { -1.0, -1.0, -1.0 };
	GLfloat spot_direction2[] = { 0.0, -1.0, 0.0 };

	GLfloat local_view[] = { 0.0 };

	glClearColor(0.7, 0.7, 0.7, 0.0);
	glShadeModel(GL_SMOOTH);
	glEnable(GL_DEPTH_TEST);

	glMaterialfv(GL_FRONT, GL_DIFFUSE, diffuseMaterial);
	glMaterialfv(GL_FRONT, GL_SPECULAR, mat_specular);
	glMaterialf(GL_FRONT, GL_SHININESS, 100.0);

	glLightfv(GL_LIGHT0, GL_AMBIENT, ambient);
```

```
	glLightfv(GL_LIGHT0, GL_DIFFUSE, light);
	glLightfv(GL_LIGHT0, GL_SPECULAR, light);
	glLightfv(GL_LIGHT0, GL_POSITION, light_position0);
	glLightfv(GL_LIGHT0, GL_SPOT_DIRECTION, spot_direction0);

	glLightfv(GL_LIGHT1, GL_AMBIENT, ambient);
	glLightfv(GL_LIGHT1, GL_DIFFUSE, light);
	glLightfv(GL_LIGHT1, GL_SPECULAR, light);
	glLightfv(GL_LIGHT1, GL_POSITION, light_position1);
	glLightfv(GL_LIGHT1, GL_SPOT_DIRECTION, spot_direction1);

	glLightfv(GL_LIGHT2, GL_AMBIENT, ambient);
	glLightfv(GL_LIGHT2, GL_DIFFUSE, light);
	glLightfv(GL_LIGHT2, GL_SPECULAR, light);
	glLightfv(GL_LIGHT2, GL_POSITION, light_position2);
	glLightfv(GL_LIGHT2, GL_SPOT_DIRECTION, spot_direction2);

	glEnable(GL_LIGHTING);
	glEnable(GL_LIGHT0);
	glEnable(GL_LIGHT1);
	glEnable(GL_LIGHT2);

	glColorMaterial(GL_FRONT, GL_DIFFUSE);
	glEnable(GL_COLOR_MATERIAL);
}


void display(void)
{
	glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
	glLoadIdentity();

	//Sphere A
	glPushMatrix();
	glColor3f(1, 0, 0);
	glTranslatef(3, 0, 0);
	glutSolidSphere(1.0, 50, 50);
	glPopMatrix();

	//Sphere B
	glPushMatrix();
	glColor3f(0, 1, 0);
	glTranslatef(-3, 0, 0);
	glutSolidSphere(1.0, 50, 50);
	glPopMatrix();
```

```
	//Sphere C
	glPushMatrix();
	glColor3f(0, 0, 1);
	glTranslatef(0, 3, 0);
	glutSolidSphere(1.0, 50, 50);
	glPopMatrix();

	glFlush();
}
```

Summary:

For the first part of this assignment I had to create a colored cube with specified colors at each of the 8 vertices. To do this I used 3 vertex arrays: 1 for the indices, 1 for the vertices, and 1 for the colors at each of the vertices. Then I used the GL_VERTEX_ARRAY and GL_COLOR_ARRAY states and set the vertex and color pointers to their respective arrays. Finally I used glDrawElements() with a pointer to the indices array to draw the colored cube. I also added the ability to rotate the cube about each axis using x, X, y, Y, z, Z for each axis respectively. Each time the keys were pressed, the cube would rotate about the specified axis +/- 5 degrees, depending on which key was pressed. The second part of the assignment was to light 3 different colored spheres with 3 different directional light sources with specified directions. Each sphere was to only be lit by the specified 2 directional lights. As seen in each of the screenshots above I was able to do this. Both programs compiled and ran without errors and performed their respective tasks per the assignment instructions. As a result, I believe I earned the full 30 points for this assignment.