Getting Started with OpenGL

Woo, Neider et Al., Chapter 1

OpenGL Resources

- OpenGL main site:
  http://www.opengl.org/

- GLUT: OpenGL Utility Toolkit:
  http://www.xmission.com/~nate/glut.html

- Programs from the book:
  ftp://ftp.sgi.com/opengl/

- Nate Robins' Tutorial:
  http://www.xmission.com/~nate/opengl.html

OpenGL as a State Machine

- Set various stated and modes and they remain in effect until you change them
- Possible to read and write these state variables (even as a collection, on a stack)

- Example:

```
glutInitDisplayMode(GLUT_RGB);
glColor3f(1.0, 1.0, 1.0);
```

Write operations will be performed with the RGB color white (1.0, 1.0, 1.0)

Program: Hello.c

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

void display(void) {
   glClear (GL_COLOR_BUFFER_BIT);                    /* clear all pixels  */

   /* draw white polygon with corners at (0.25, 0.25, 0.0) and (0.75, 0.75, 0.0)  */
   glColor3f (1.0, 1.0, 1.0);
   glBegin(GL_POLYGON);
      glVertex3f (0.25, 0.25, 0.0);
      glVertex3f (0.75, 0.25, 0.0);
      glVertex3f (0.75, 0.75, 0.0);
      glVertex3f (0.25, 0.75, 0.0);
   glEnd();

   glFlush ();                    /* start processing buffered OpenGL routines */
}
```

Program: Hello.c

```
void init (void)  {
   glClearColor (0.0, 0.0, 0.0, 0.0);                /* select clearing color */
   glMatrixMode(GL_PROJECTION);                      /* initialize viewing values  */
   glLoadIdentity();
   glOrtho(0.0, 1.0, 0.0, 1.0, -1.0, 1.0);
}

/* Declare initial window size, position, and display mode. Open window with
    "hello“ in its title bar.  Call initialization routines. Register callback function
    to display graphics. Enter main loop and process events. */
int main(int argc, char** argv) {
   glutInit(&argc, argv);
   glutInitDisplayMode (GLUT_SINGLE | GLUT_RGB);
   glutInitWindowSize (250, 250);
   glutInitWindowPosition (100, 100);
   glutCreateWindow ("hello");
   init ();
   glutDisplayFunc(display);
   glutMainLoop();
   return 0;   /* ANSI C requires main to return int. */
}
```

Handling Input Events

glutReshapeFunction()
To register the function that should be called when resizing the window

glutKeyboardFunc(), glutMouseFunc()
To register the functions called to handle keyboard and mouse events

glutMotionFunc()
To register the function that handles the mouse movement when a button pressed

Handling Input Events - Example

```
void keyboard(unsigned char key, int x, int y) {
   switch (key) {
      case 27:                    /* ASCII code of the ESC key */
         exit(0);
         break;
   }
}

/*  Main Loop  */
int main(int argc, char** argv) {
    …..
    glutKeyboardFunc (keyboard);
    …..
}
```

Double Buffering

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

static GLfloat spin = 0.0;

void display(void) {
  glClear(GL_COLOR_BUFFER_BIT);
  glPushMatrix();
  glRotatef(spin, 0.0, 0.0, 1.0);
  glColor3f(1.0, 1.0, 1.0);
  glRectf(-25.0, -25.0, 25.0, 25.0);
  glPopMatrix();

  glutSwapBuffers();
}
```

Double Buffering

```
void spinDisplay(void) {
   spin = spin + 2.0;
   if (spin > 360.0)
      spin = spin - 360.0;
   glutPostRedisplay();
}

void init(void) {
   glClearColor (0.0, 0.0, 0.0, 0.0);
   glShadeModel (GL_FLAT);
}

void reshape(int w, int h) {
   glViewport (0, 0, (GLsizei) w, (GLsizei) h);
   glMatrixMode(GL_PROJECTION);
   glLoadIdentity();
   glOrtho(-50.0, 50.0, -50.0, 50.0, -1.0, 1.0);
   glMatrixMode(GL_MODELVIEW);
   glLoadIdentity();
}
```

Double Buffering

```
void mouse(int button, int state, int x, int y)  {
  switch (button) {
    case GLUT_LEFT_BUTTON:
      if (state == GLUT_DOWN)
        glutIdleFunc(spinDisplay);
      break;
    case GLUT_MIDDLE_BUTTON:
    case GLUT_RIGHT_BUTTON:
      if (state == GLUT_DOWN)
        glutIdleFunc(NULL);
      break;
    default:
      break;
  }
}
```

Double Buffering

```
int main(int argc, char** argv)
{
   glutInit(&argc, argv);
   glutInitDisplayMode (GLUT_DOUBLE | GLUT_RGB);
   glutInitWindowSize (250, 250);
   glutInitWindowPosition (100, 100);
   glutCreateWindow (argv[0]);
   init ();
   glutDisplayFunc(display);
   glutReshapeFunc(reshape);
   glutMouseFunc(mouse);
   glutMainLoop();
   return 0;   /* ANSI C requires main to return int. */
}
```