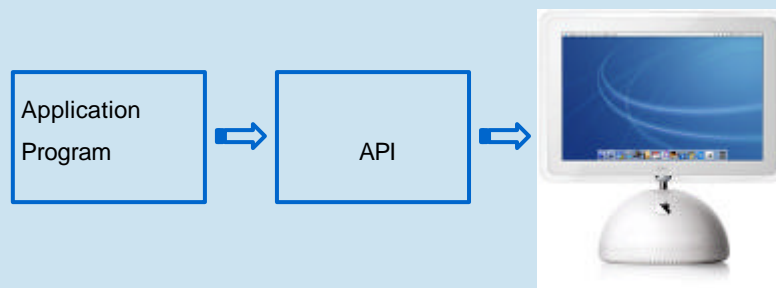


Introduction to OpenGL

Sheelagh Carpendale

Graphics programming

- Our approach is programming oriented
- Application programmer's interface (API)
- OpenGL as our API



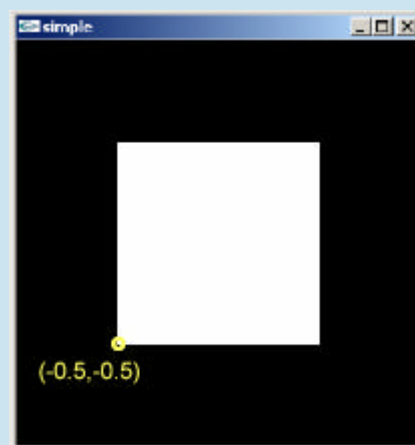
OpenGL

- GL in SGI
- Close to hardware / easy to use
- 200 functions in OpenGL
- Portable and platform independent
- OpenGL is concerned primarily with rendering

Simple Program

```
#include <glut.h>
void mydisplay(){
    glClear(GL_COLOR_BUFFER_BIT);
    glBegin(GL_POLYGON);
        glVertex2f(-0.5, -0.5);
        glVertex2f(-0.5, 0.5);
        glVertex2f(0.5, 0.5);
        glVertex2f(0.5, -0.5);
    glEnd();
    glFlush();
}

int main(int argc, char** argv){
    glutInit(&argc, argv);
    glutCreateWindow("simple");
    glutDisplayFunc(mydisplay);
    glutMainLoop();
}
```





Glut

OpenGL utility toolkit

- glutInit
- glutCreateWindow
- Default values
 - Background – black
 - Drawing – white
 - In the glut window origin in the centre



Loops and Callback Functions

- Events based programming
- Events queue
- Callback functions
- glutDisplayFunc
- glutMainLoop()

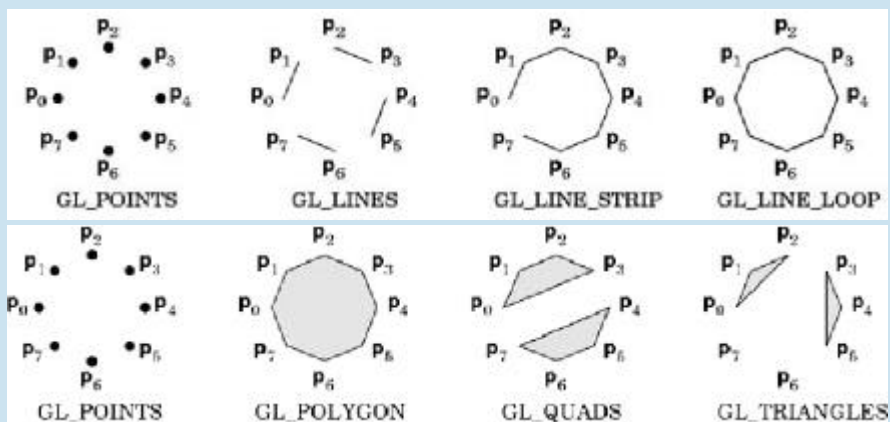
Drawing a rectangle

- Display callback
- Vertex is fundamental entity for specifying geometric objects
- OpenGL has two, three and four dimensional points
- glVertex2f
- glVertex{2, 3, 4}(s, i, f, d)

Primitives

- glBegin(?)
- glEnd

GL_POINTS, GL_LINES, GL_POLYGON, ...

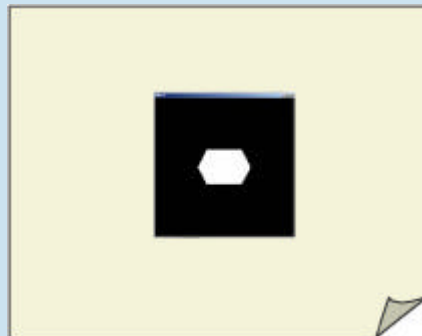


Changing Glut Defaults


- `glutInitWindowSize(int width, int height)`
- `glutInitWindowPosition(int x,int y)`

Two-Dimension Viewing

- Two-Dimension Viewing
- Infinite sheet of paper




- `glutOrtho2D(left,right,bottom,top)`
- Clipping window




Graphics functions

- Primitives
- Attributes
- Viewing
- Transformation
- Input
- Control – relating to system
- Inquiry



Graphics functions

- What is to be seen (primitives)
- State change



what is this course really about?

Not!

- Paint and Imaging packages (Adobe Photoshop)
- CAD packages (AutoCAD)
- Rendering packages (Lightscape)
- Modeling packages (3D Studio MAX)
- Animation packages (Digimation)
- Graphics API (OpenGL, Directx)
- Graphics Modeling and Languages (RenderMan)

We will cover

- Graphics programming algorithms
- Graphics data structures
- Graphical interface design and programming
- geometry and modeling
- numerical computing