

Brief Introduction to OpenGL

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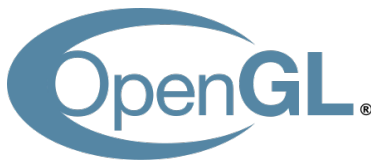
2017.06.06

Getting started

What is OpenGL



What is OpenGL



- **Open Graphics Library(OpenGL)** is a cross-language, cross-platform application programming interface(API) for rendering 2D and 3D vector graphics.

Libraries

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- **GLFW**: a new alternative, more game-oriented

OpenGL API

Point

- `glVertex2f(x, y);`
- `glVertex3f(x, y, z);`
- `GLfloat vertex[3] = {x, y, z};`
- `glVertex3fv(vertex);`

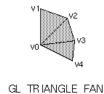
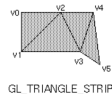
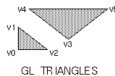
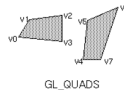
Line and Plane

- `glBegin(PATTERN)`
- `//vertex...`
- `glEnd()`

Line and Plane

■ PATTERNS:

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- `//vertex...`
- `glEnd()`



Color

- RGBA color:

Color

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- `void glColor3f(GLfloat red, GLfloat green, GLfloat blue);`
- `void glColor4f(GLfloat red, GLfloat green, GLfloat blue, GLfloat alpha);`

Matrix

- Every transform in opengl is based on matrix.

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```
1 glMatrixMode(GL_PROJECTION);  
2 glLoadIdentity();  
3 gluPerspective(80, 1, 0.1, 100000000);  
4  
5 glMatrixMode(GL_MODELVIEW);  
6 glLoadIdentity();  
7 gluLookAt(90.0, 50.0, 50.0, 0.0, 0.0, 0.0, 0.0,  
8           0.0, 1.0);  
9 glRotatef(angle * 1.0, 0.0, 0.0, 1.0);
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```

- glRotatef(angle, x, y, z);
- glTranslatef(x, y, z);
- glScalef(x, y, z);

Double Buffering

Double Buffering

- `glutSwapBuffers();`

Examples

First OpenGL program

First OpenGL program

```
1 #include <GLUT/GLUT.h>
2 #include <cmath>
3 void mydisplay()
4 {
5     static const double PI = 3.14159265;
6     glClear(GL_COLOR_BUFFER_BIT);
7     glBegin(GL_LINES);
8     glVertex2f(-1.0f, 0.0f);
9     glVertex2f( 1.0f, 0.0f);
10    glVertex2f( 0.0f, -1.0f);
11    glVertex2f( 0.0f, 1.0f);
12    glEnd();
13    glBegin(GL_LINE_STRIP);
14    for (double x = -15; x <= 15; x += 0.001)
15        glVertex2f(x / 15.0, sin(x) / 10.0);
16    glEnd();
17    glFlush();
18 }
```

First OpenGL program

```
1  int main(int argc, char* argv[])
2  {
3      glutInit(&argc, argv);
4      glutInitDisplayMode(GLUT_RGB | GLUT_SINGLE);
5      glutInitWindowPosition(600, 100);
6      glutInitWindowSize(500, 500);
7
8      glutCreateWindow("first_program");
9      glutDisplayFunc(&mydisplay);
10     glutMainLoop();
11     return 0;
12 }
```


Result

Thank you for listening.