

Computer Graphics

Bing-Yu Chen
National Taiwan University

Introduction to OpenGL

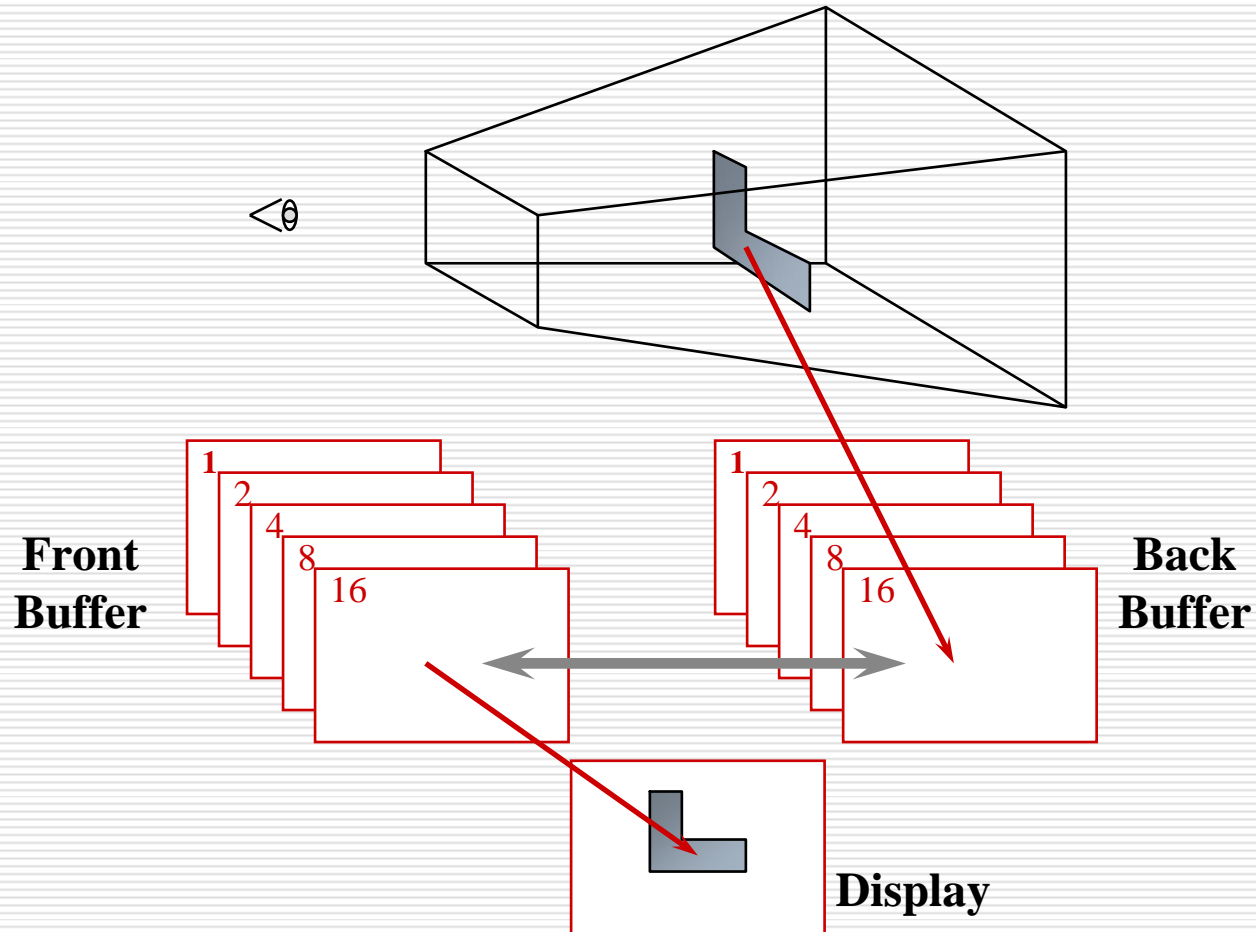
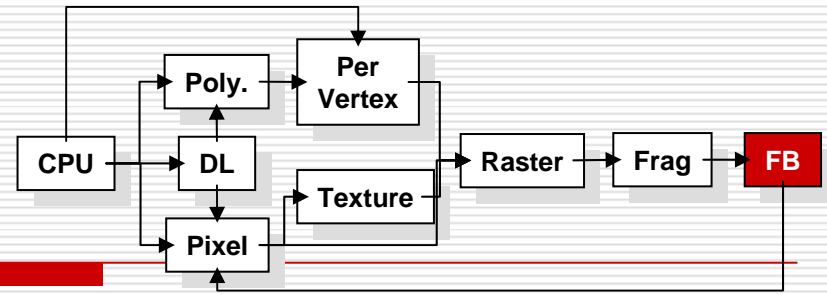
- General OpenGL Introduction
- An Example OpenGL Program
- Drawing with OpenGL
- Transformations
- Animation and Depth Buffering
- Lighting
- Evaluation and NURBS
- Texture Mapping
- Advanced OpenGL Topics
- Imaging

modified from
Dave Shreiner, Ed Angel, and Vicki Shreiner.
An Interactive Introduction to OpenGL Programming.
ACM SIGGRAPH 2001 Conference Course Notes #54.
& *ACM SIGGRAPH 2004 Conference Course Notes #29.*

Animation and Depth Buffering

- Discuss double buffering and animation
 - Discuss hidden surface removal using the depth buffer
-

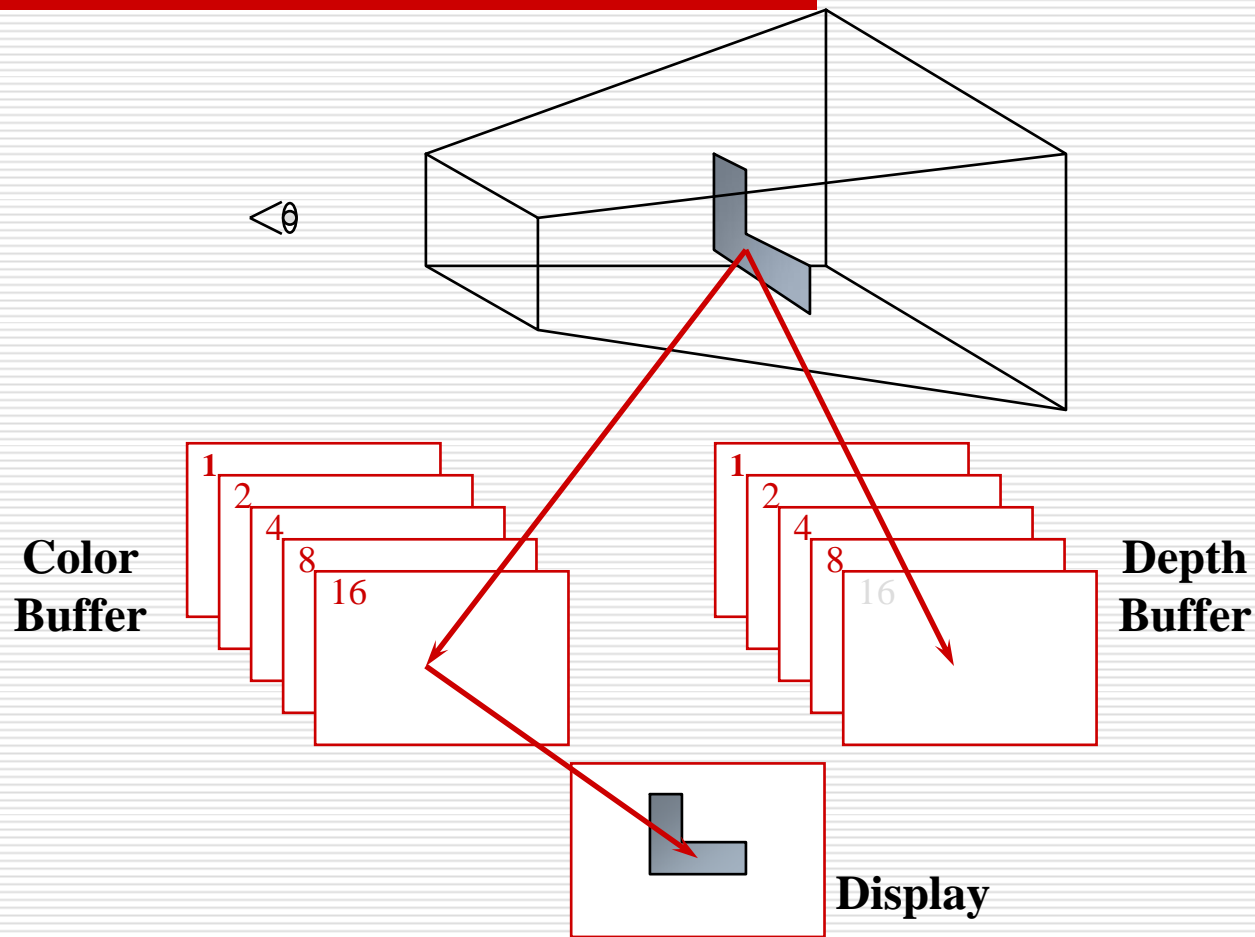
Double Buffering



Animation Using Double Buffering

- ❑ Request a double buffered color buffer
`glutInitDisplayMode(GLUT_RGB | GLUT_DOUBLE);`
 - ❑ Clear color buffer
`glClear(GL_COLOR_BUFFER_BIT);`
 - ❑ Render scene
 - ❑ Request swap of front and back buffers
`glutSwapBuffers();`
 - ❑ Repeat steps 2 - 4 for animation
-

Depth Buffering and Hidden Surface Removal



Depth Buffering Using OpenGL

- Request a depth buffer

```
glutInitDisplayMode( GLUT_RGB |  
                    GLUT_DOUBLE |  
                    GLUT_DEPTH );
```

- Enable depth buffering

```
glEnable( GL_DEPTH_TEST );
```

- Clear color and depth buffers

```
glClear( GL_COLOR_BUFFER_BIT |  
        GL_DEPTH_BUFFER_BIT );
```

- Render scene

- Swap color buffers
-

An Updated Program Template

```
void main( int argc, char** argv )
{
    glutInit( &argc, argv );
    glutInitDisplayMode( GLUT_RGB |
                        GLUT_DOUBLE |
                        GLUT_DEPTH );
    glutCreateWindow( "Tetrahedron" );
    init();
    glutIdleFunc( idle );
    glutDisplayFunc( display );
    glutMainLoop();
}
```

An Updated Program Template

```
void init( void )
{
    glClearColor( 0.0, 0.0, 1.0, 1.0 );
}
```

```
void idle( void )
{
    glutPostRedisplay();
}
```

An Updated Program Template

```
void drawScene( void )
{
    GLfloat vertices[] = { ... };
    GLfloat colors[] = { ... };
    glClear( GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT );
    glBegin( GL_TRIANGLE_STRIP );
    /* calls to glColor*() and glVertex*() */
    glEnd();
    glutSwapBuffers();
}
```
