


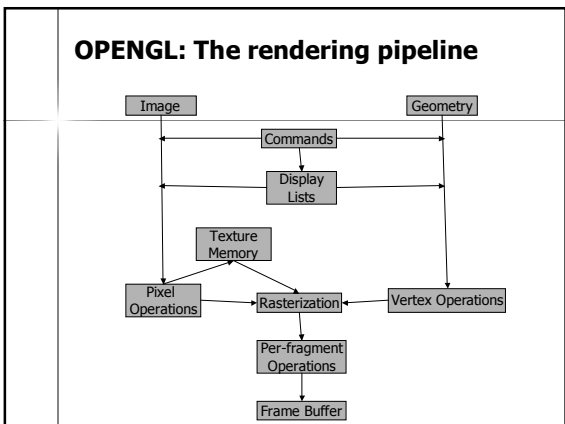
<h1>OPENGL</h1> <p>By Neal Patel</p>	

<h2>What is OPENGL?</h2>	
<ul style="list-style-type: none"> ■ Short for Open Graphics Library ■ OpenGL provides programmers with a software interface to graphics hardware. ■ Low level rendering and modeling software library on all major hardware platforms. <ul style="list-style-type: none"> – Windows, Mac, Linux, Unix, etc..... 	

<h2>OPENGL (cont.)</h2>	
<ul style="list-style-type: none"> ■ Designed for use in any graphics applications <ul style="list-style-type: none"> – Games – Modeling – CAD ■ Callable from C, C++, Fortran, Perl, Python, Java, as well as many other languages. ■ Provides only low level rendering routines allowing the programmer to easily build high level rendering and modeling libraries. 	

<h2>History of OPENGL</h2>	
<ul style="list-style-type: none"> ■ Originally developed by Silicon Graphics, Inc. (SGI) ■ Currently on version 2.0 which was just released on September 7, 2004. <ul style="list-style-type: none"> – Specifications do not get updated often 	

<h2>OPENGL Architecture</h2>	
<ul style="list-style-type: none"> ■ Collection of several hundred functions <ul style="list-style-type: none"> – Provide access to all features offered by the graphics hardware. ■ Internally acts as a state machine <ul style="list-style-type: none"> – Collection of states that tell OpenGL what to do. – Using the API, easily set various aspects of the state machine. <ul style="list-style-type: none"> ■ Color, lighting blending, texture, etc.... 	



Before Getting Started

- The OpenGL Utility Library
 - Known as GLU, supplements OpenGL providing higher-level functions
 - Uses lower level OpenGL commands
 - Part of every OpenGL implementation
- Features
 - 2D image scaling
 - Rendering 3D objects
 - Spheres, cylinders, and disks
 - Automatic mipmap generation from a single image
 - Support for curves surfaces through NURBS
 - Handling simple nonconvex polygons
 - Special purpose transformation and matrices

What in the heck is GLUT

- OpenGL Utility Toolkit
 - Set of support libraries
- OpenGL does not directly support any form of windowing, menus, or inputs, such as reading events from the mouse or keyboard.
- GLUT provides basic functionality, while remaining platform independent
 - Multiple windows for OpenGL rendering
 - Callback driven event processing
 - Command line argument processing
 - A simple pop up menu facility

More on Glut

- Contains the more complex 3d objects
 - Sphere, torus, cone, cube, teapot
- Windows management
 - glutinit(&argc, argv);
 - initializes GLUT & processes any command line arguments
 - Must be called before any other GLUT routine

Using OpenGL in my program

- Header files contents
 - Defined types
 - Constant declarations
 - Function prototypes
- Header files you may or may not use
 - #include<GL/gl.h>
 - #include<GL/glu.h>
 - #include<GL/glut.h>
 - #include<GL/glx.h>
 - #include<GL/glaux.h>

How do I start using OpenGL on my machine?

- First off make sure your graphics card supports OpenGL.
- Download the library, header, and dll files into the appropriate directory in your compiler.
 - gl.h C:\Program Files\Microsoft Visual Studio\VC98\include\GL
 - glu.h C:\Program Files\Microsoft Visual Studio\VC98\include\GL
 - glut.h C:\Program Files\Microsoft Visual Studio\VC98\include\GL
 - opengl32.lib C:\Program Files\Microsoft Visual Studio\VC98\lib
 - glu.lib C:\Program Files\Microsoft Visual Studio\VC98\lib
 - glut.lib C:\Program Files\Microsoft Visual Studio\VC98\lib
 - glut32.lib C:\Program Files\Microsoft Visual Studio\VC98\lib
 - glut.dll C:\Windows\system
 - glut32.dll C:\Windows\system32

OpenGL command syntax

- glVertex3fv(.....)
 - 3 - Number of arguments(2,3,4)
 - f - data type
 - f 4-byte float
 - d 8-byte float
 - s signed 2-byte int
 - i signed 4-byte int
 - v - indicates vector format, if present
 - Absence of v is result in scalar format

OPENGL States and Primitives

- OpenGL state machine
 - Consists of hundred of settings that effect various aspects of rendering.
- glGet() used to query the state machine for its current settings.
 - void glGetBooleanv(GLenum pname, GLboolean *params);
 - void glGetDoublev(GLenum pname, GLdouble *params);
 - void glGetFloatv(GLenum pname, GLfloat *params);
 - void glGetIntegerv(GLenum pname, GLint *params);

What are primitives?

- Webster's Dictionary
 - An unsophisticated person
- Basic geometric entities such as points, lines, triangles, etc...
- Draw points in 3D


```
glBegin(GL_POINTS);
  glVertex3f(0.0, 0.0, 0.0);
glEnd();
```

Some data types you should be aware of

OpenGL data type	Minimum Precision	Description
GLboolean	1 bit	Boolean value
GLbyte	8 bits	Signed 2's comp int
GLsizei	32 bits	Non-neg int size
GLfloat	32 bits	Floating point value
GLshort	16 bits	Signed 2's comp int
GLint	32 bits	Unsigned int
GLdouble	64 bits	Floating point value

Famous Games that use OpenGL

- Call of Duty (Activision)
- Half Life (Sierra)
- Jedi Knights II (Lucas Arts)
- Medal of Honor (Electronic Arts)
- Quake III Arena (ID)