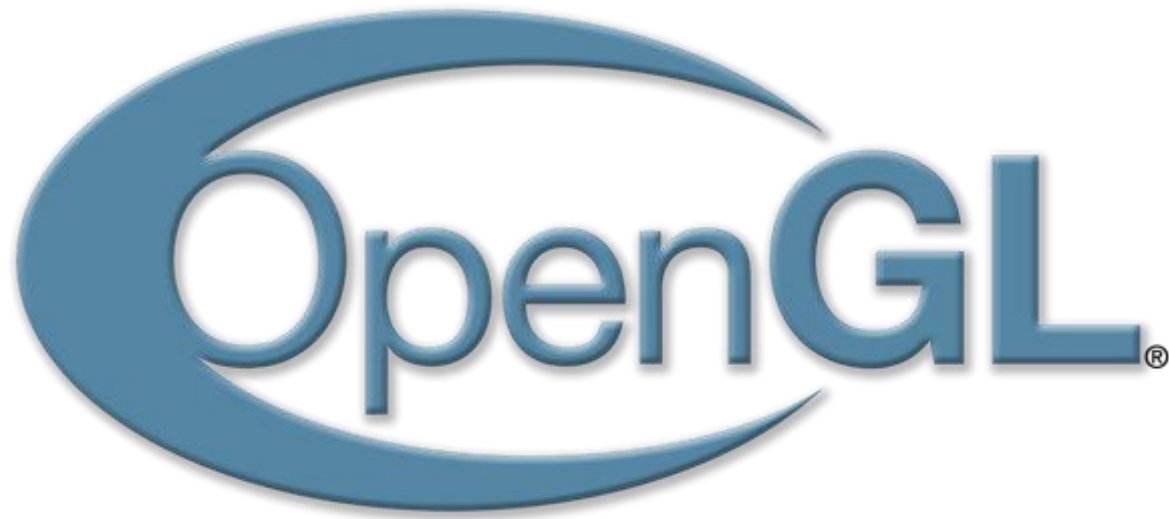


GRAFIKA KOMPUTER

~ M. Ali Fauzi

Introduction to OpenGL

The Logo



HISTORY

History

SGI (Silicon Graphics, Inc)
started developing OpenGL
in 1991 and released it in
January 1992

History

1992 SGI led the creation of the OpenGL Architecture Review Board (ARB), the group of companies that would maintain and expand the OpenGL specification in the future.

History

2006 controlled by The
Khronos group.

**WHAT IS
OPENGL?**

What Is OpenGL?

A software **interface** to
graphics hardware

What Is OpenGL?

Graphics rendering **API**
(Low Level)

What Is OpenGL?

**This interface consists of
more than 700 distinct
commands**

What Is OpenGL?

OpenGL is designed as a **streamlined, hardware-independent** interface to be implemented on many different hardware platforms.

What Is OpenGL?

OpenGL **can only** render :

- **Geometric primitives**

Lines, points, polygons, etc...

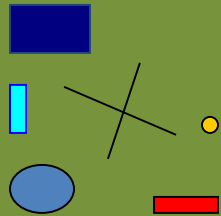
- **Bitmaps and Images**

Images and geometry linked
through texture mapping

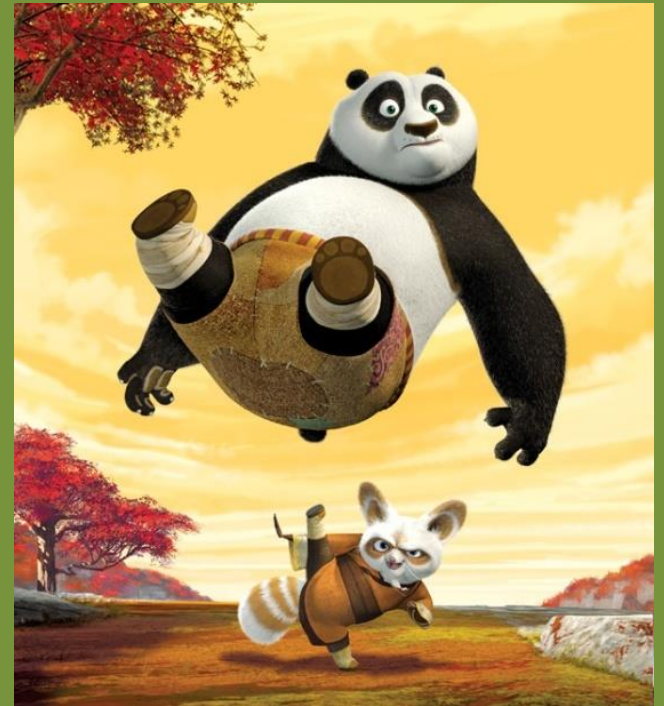
What Is OpenGL?

OpenGL **doesn't provide** high-level commands for describing models of three-dimensional objects.

What Is OpenGL?



Graphics Pipeline



What Is OpenGL?

OpenGL is operating system independent

What Is OpenGL?

OpenGL is window system independent

What Is OpenGL?

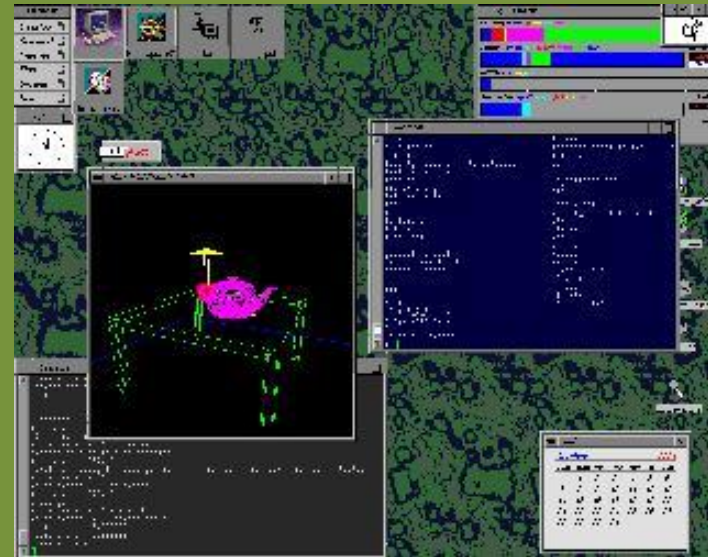
No commands for performing windowing tasks or obtaining user input are included in OpenGL.

What Is OpenGL?

Non-window based environment

```
[root@localhost ~]# ping -q fa.wikipedia.org
PING text.pmtpa.wikimedia.org (208.80.152.2) 56(84) bytes of data.
^C
--- text.pmtpa.wikimedia.org ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 540.528/540.528/540.528/0.000 ms
[root@localhost ~]# pwd
/root
[root@localhost ~]# cd /var
[root@localhost var]# ls -la
total 72
drwxr-xr-x. 18 root root 4096 Jul 30 22:43 .
drwxr-xr-x. 23 root root 4096 Sep 14 20:42 ..
drwxr-xr-x. 2 root root 4096 May 14 00:15 account
drwxr-xr-x. 11 root root 4096 Jul 31 22:26 cache
drwxr-xr-x. 3 root root 4096 May 18 16:03 db
drwxr-xr-x. 3 root root 4096 May 18 16:03 empty
drwxr-xr-x. 2 root root 4096 May 18 16:03 games
drwxrwx--T. 2 root gdm 4096 Jun 2 18:39 gdm
drwxr-xr-x. 38 root root 4096 May 18 16:03 lib
drwxr-xr-x. 2 root root 4096 May 18 16:03 local
lrwxrwxrwx. 1 root root 11 May 14 00:12 lock -> ../run/lock
drwxr-xr-x. 14 root root 4096 Sep 14 20:42 log
lrwxrwxrwx. 1 root root 10 Jul 30 22:43 mail -> spool/mail
drwxr-xr-x. 2 root root 4096 May 18 16:03 nis
drwxr-xr-x. 2 root root 4096 May 18 16:03 opt
drwxr-xr-x. 2 root root 4096 May 18 16:03 preserve
drwxr-xr-x. 2 root root 4096 Jul 1 22:11 report
lrwxrwxrwx. 1 root root 6 May 14 00:12 run -> ../run
drwxr-xr-x. 14 root root 4096 May 18 16:03 spool
drwxrwxrwt. 4 root root 4096 Sep 12 23:50 tmp
drwxr-xr-x. 2 root root 4096 May 18 16:03 yp
[root@localhost var]# yum search wiki
Loaded plugins: langpacks, presto, refresh-packagekit, remove-with-leaves
rpmfusion-free-updates | 2.7 kB | 00:00
rpmfusion-free-updates/primary.db | 206 kB | 00:04
```

Window based environment

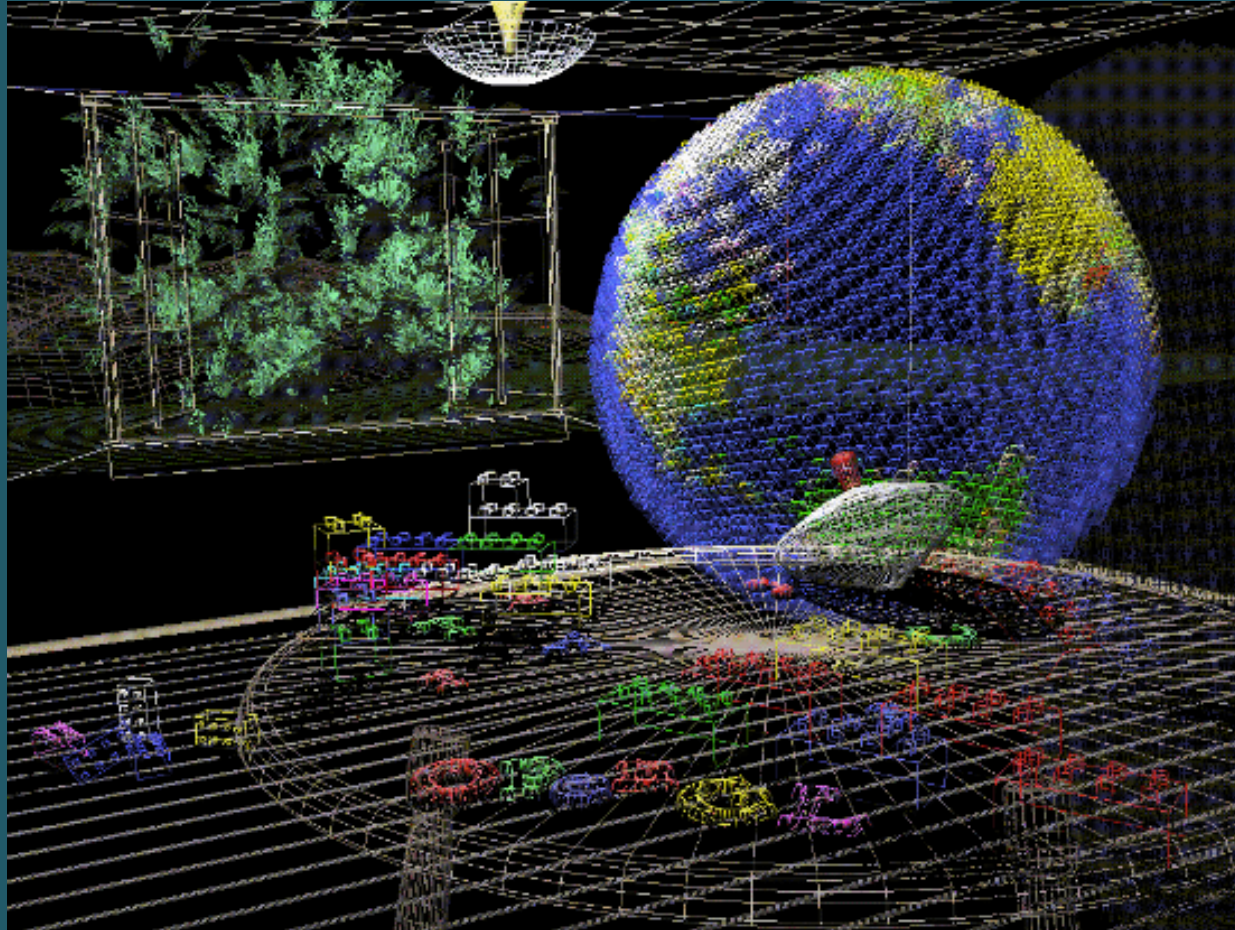


What Is OpenGL?

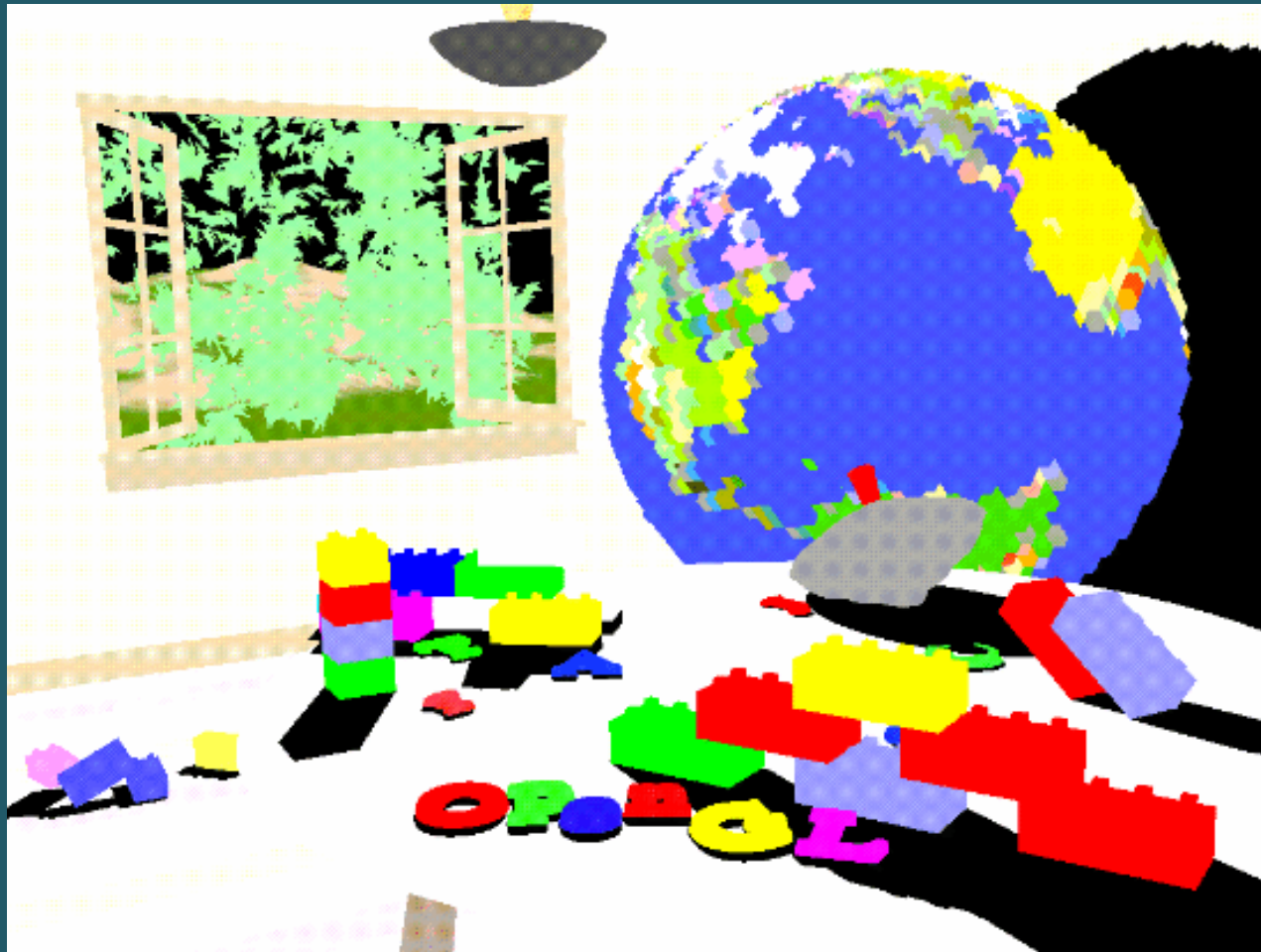
**This is to ensure the
application's portability**

**WHAT OPENGL
CAN DO?**

Creating Objects



Coloring



Lighting & Shading



Texture & Shadowing



Viewing & Camera



Sum Up



And etc.



SOME TERMS IN OPENGL

Rendering

Converting
geometric/mathematical
model/object descriptions into
frame buffer values

Models

These models, or objects, are constructed from **geometric primitives**—points, lines, and polygons—that are specified by their vertices

Rendering

Then Calculate the colors of all the objects.

Rasterization

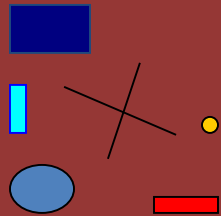
The final rendered image **consists of pixels** drawn on the screen.

This process is called **rasterization**.

Pixel

a pixel is the **smallest visible element** the display hardware can put on the screen

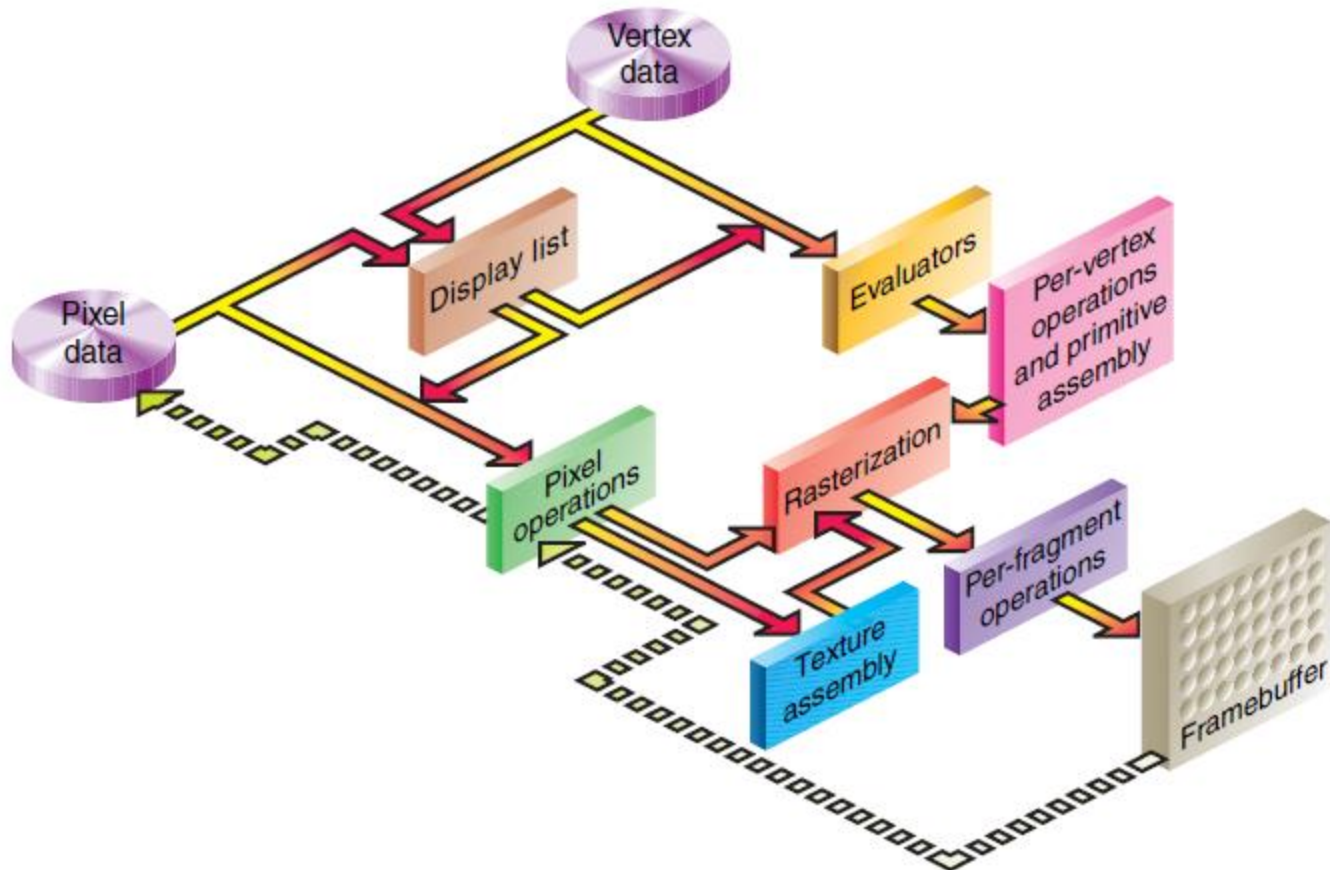
Rendering



Graphics Pipeline



The Rendering Pipeline



OPENGL

RELATED LIBRARIES

OpenGL

OpenGL is **window system independent**

OpenGL

No **window management** functions – create windows, resize windows, event handling, etc

OpenGL

Create some headache though
– just a pure OpenGL
program **won't work**
anywhere.

More API is Needed!!!

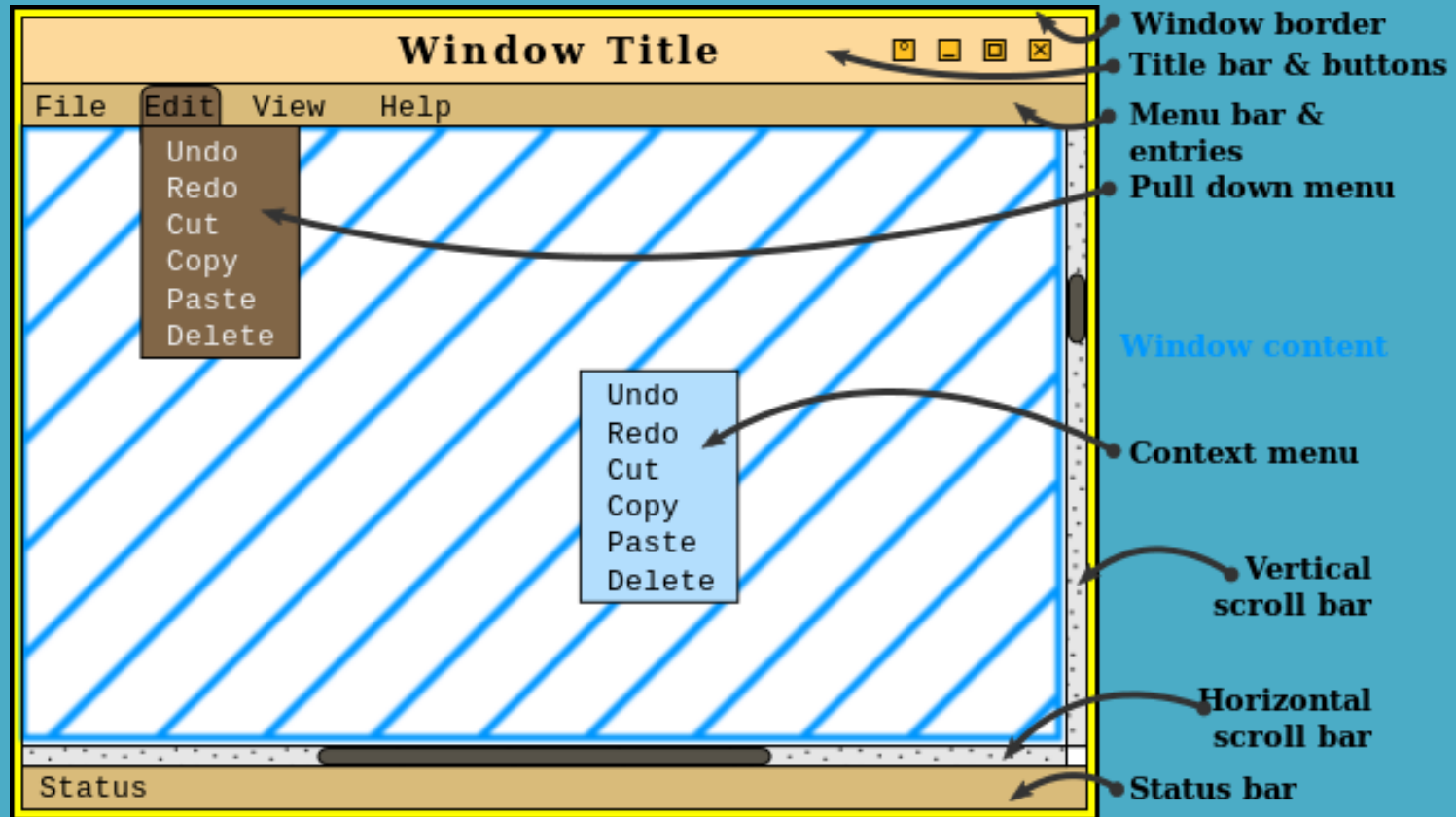
Related Library

- **X window system: GLX**
- **Apple Macintosh: AGL**
- **Microsoft Windows: WGL**

Related Library

These libraries provide complete functionality to create Graphics User Interface (GUI) such as sliders, buttons, menus etc.

Related Library



**Problem – you need
to learn and
implement them all to
write a true portable
software**

GLUT

(OpenGL Utility Toolkit)

Glut

For fast prototyping, we can **use GLUT** to interface with different window systems

Glut

GLUT is a **window independent** API – programs written using OpenGL and GLUT can be ported to X windows, MS windows, and Macintosh with no effort

Glut is

- > **A portable windowing API**

Glut is

- > **Easier to show the output of your OpenGL application**

Glut is

> **Not officially part of
OpenGL**

Glut Handles

> **Window creation**

Glut Handles

> **OS system calls**

**Mouse buttons, movement,
keyboard, etc...**

Glut Handles

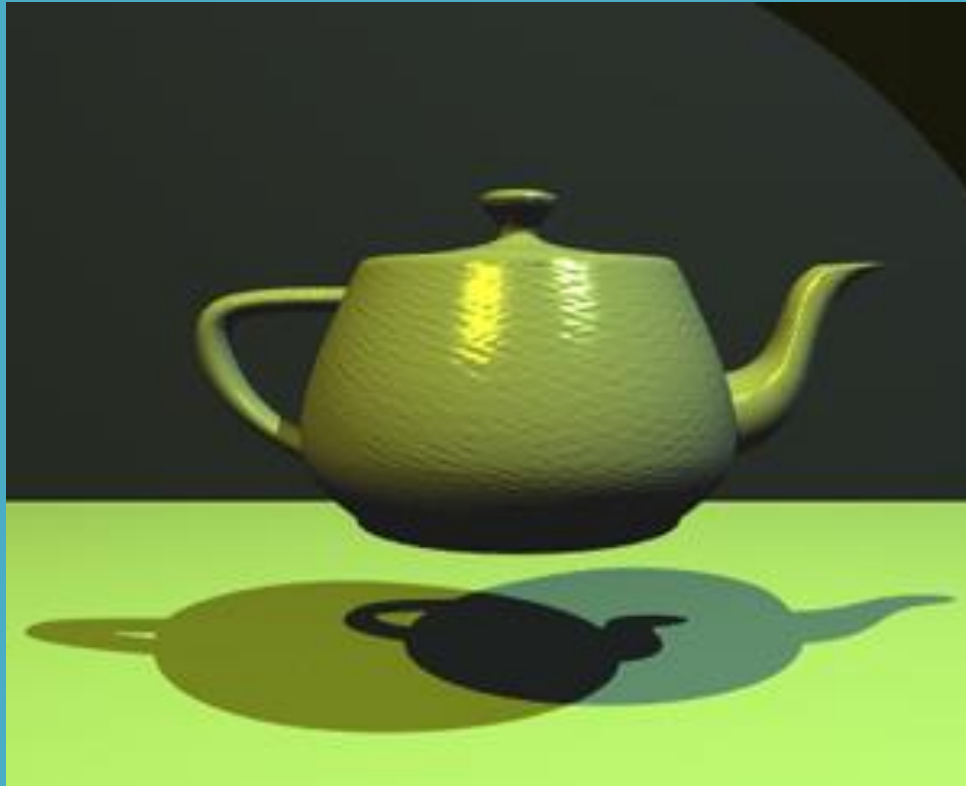
> Callbacks

Glut Extra

> Create utah teapot, a “hello, world” program for 3D modelling

Glut Extra

> Utah Teapot



Glut Extra

Drawing Three-Dimensional Objects

GLUT includes several routines for drawing these three-dimensional objects:

cone	icosahedron	teapot
cube	octahedron	tetrahedron
dodecahedron	sphere	torus

You can draw these objects as wireframes or as solid shaded objects with surface normals defined. For example, the routines for a cube and a sphere are as follows:

```
void glutWireCube(GLdouble size);
```

```
void glutSolidCube(GLdouble size);
```

```
void glutWireSphere(GLdouble radius, GLint slices, GLint stacks);
```

```
void glutSolidSphere(GLdouble radius, GLint slices, GLint stacks);
```

INSTALLATION

How to install OPENGL+GLUT in Windows?

- Download & Install CodeBlocks
- Download GLUT
 - <http://www.opengl.org/resources/libraries/glut.html>
- Copy the files to following folders:
 - glut.h → CodeBlock/include/gl/
 - libglut32.a → CodeBlock /lib/
 - glut32.dll → windows/system/
- Header Files:
 - `#include <GL/glut.h>`
 - Include glut automatically includes other header files

How to install OPENGL+GLUT in Ubuntu?

Just type on your terminal :

```
~ sudo apt-get install freeglut3-dev
```

Done!!

Tugas

- > **Install OpenGL**
- > **Buat Program sederhana dg OpenGL**
- > **Tuliskan penjelasan step by stepnya**
- > **Format PDF**

Tugas

> Kirim ke

moch.ali.fauzi@gmail.com

> Subject

GRAFKOM_[KELAS]_NIM_TugasInstalasiOpenGL

**PLAGIARISM =
ZERO**

**Cheers,
Old Sport**

~ M. Ali Fauzi

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