EXPERIMENT – 01

EXPERIMENT: INTRODUCTION TO OPENGL:

[VIRTUAL LAB ENVIRONMENT SETUP]

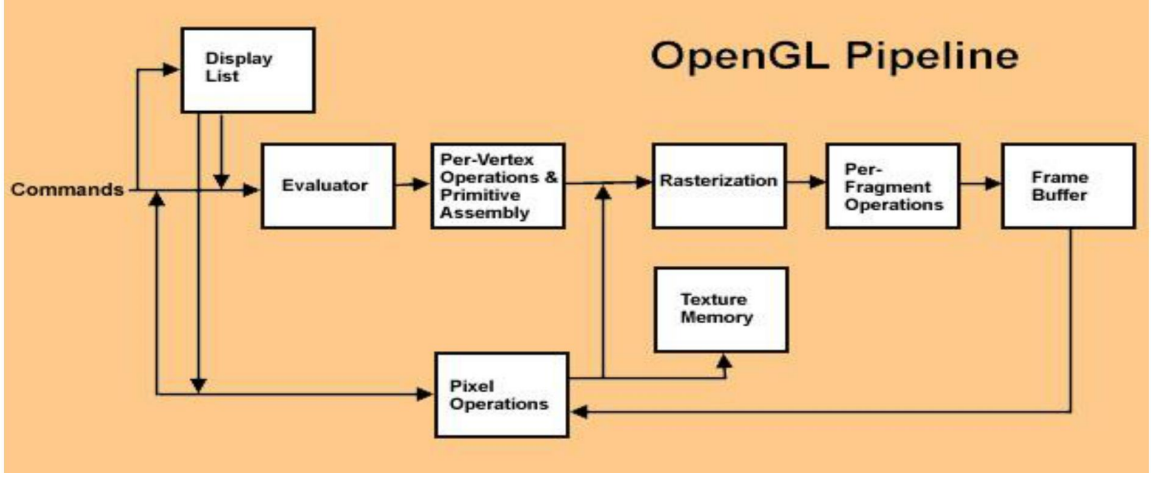
❖ *What Is OpenGL?*

- ***Open Graphics Library (OpenGL)*** *Is A Cross-Language (Language Independent), Cross-Platform (Platform-Independent) API For Rendering 2D and 3D Vector Graphics (Use Of Polygons To Represent Image). OpenGL API Is Designed Mostly In Hardware.*

❖ *What Is GLU/GLUT?*

- ***GLU:***
  - ✓ *The* ***OpenGL Utility Library (GLU)*** *Is A Computer Graphics Library For OpenGL.*
  - ✓ *It Consists Of A Number Of Functions That Use The Base OpenGL Library To Provide Higher-Level Drawing Routines From The More Primitive Routines That OpenGL Provides.*
  - ✓ *It Is Usually Distributed With The Base OpenGL Package*
- ***GLUT:***
  - ✓ *GLUT Is The OpenGL Utility Toolkit, A Window System Independent Toolkit For Writing OpenGL Programs.*
  - ✓ *It Implements A Simple Windowing Application Programming Interface (API) For OpenGL.*
  - ✓ *Glut Makes It Considerably Easier To Learn About And Explore OpenGL Programming.*

- ***What Is OpenGL Architecture?***
- *The OpenGL Architecture Is Structured As A State-Based Pipeline. Below Is A Simplified Diagram Of This Pipeline. Commands Enter The Pipeline From The Left.*



- *Commands May Either Be Accumulated In Display Lists, Or Processed Immediately Through The Pipeline. Display Lists Allow For Greater Optimization And Command Reuse, But Not All Commands Can Be Put In Display Lists.*
- *The First Stage In The Pipeline Is The Evaluator. This Stage Effectively Takes Any Polynomial Evaluator Commands And Evaluates Them Into Their Corresponding Vertex And Attribute Commands.*
- *The Second Stage Is The Per-Vertex Operations, Including Transformations, Lighting, Primitive Assembly, Clipping, Projection, And Viewport Mapping.*
- *The Third Stage Is Rasterization. This Stage Produces Fragments, Which Are Series Of Framebuffer Addresses And Values, From The Viewport-Mapped Primitives As Well As Bitmaps And Pixel Rectangles.*
- *The Fourth Stage Is The Per-Fragment Operations. Before Fragments Go To The Framebuffer, They May Be Subjected To A Series Of Conditional Tests And Modifications, Such As Blending Or Z-Buffering.*
- *Parts Of The Framebuffer May Be Fed Back Into The Pipeline As Pixel Rectangles. Texture Memory May Be Used In The Rasterization Process When Texture Mapping Is Enabled.*

❖ *First OpenGL Program: Initializes A Window Of Green Color?*

```
#include<stdio.h>
#include<GL/glut.h>
#include<GL/glu.h>
#include<math.h>
#define pi 3.142857

// function to initialize

void myInit (void){

 // making background color black as first

 // 3 arguments all are 0.0

 glClearColor(0.0, 1.0, 0.0, 0.0);

 // making picture color green (in RGB mode), as middle argument is 1.0

 glColor3f(0.0, 1.0, 0.0);

 // breadth of picture boundary is 1 pixel

 glPointSize(1.0);

 glMatrixMode(GL_PROJECTION);

 glLoadIdentity();
```

```
 // setting window dimension in X- and Y- direction
 gluOrtho2D(-780, 780, -420, 420);
}
void display (void){
 glClear(GL_COLOR_BUFFER_BIT);
 glBegin(GL_POINTS);
 float x, y;
glVertex2i(x, y);
glEnd();
 glFlush();
}
int main (int argc, char** argv){
 glutInit(&argc, argv);
 glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
 // giving window size in X- and Y- direction
 glutInitWindowSize(1366, 768);
 glutInitWindowPosition(0, 0);
 // Giving name to window
 glutCreateWindow("Window Drawing");
 myInit();
 glutDisplayFunc(display);
 glutMainLoop();
}
```