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UNIVERSITY** Jnana Sangama, Belagavi – 590 018



A Computer Graphics Project Report On

“PARK IT RIGHT”

**Submitted in Partial fulfillment of the Requirements for the VI Semester of the
Degree of**

**Bachelor of Engineering
In
Computer Science & Engineering**

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CERTIFICATE

Certified that the Computer Graphics Project work entitled **“Park It Right”** has been carried out by **K Prathvi Rao (4MW20CS032)** and **Krithika (4MW20CS040)** respectively bonafide student of Shri Madhwa Vadiraja Institute of Technology and Management in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belagavi during the year **2022-2023**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The Graphics Project Report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said Degree.

Ms. R Soundharya Dr. NAGARAJ BHAT Project Guide Professor and Head Dept. of CSE
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External Viva

Name of the examiners Signature with date 1.

2.

ABSTRACT

Graphics provides one of the most natural means of communicating with a computer, since our highly developed 2D or 3D pattern recognition abilities allow us to perceive and process pictorial data rapidly. Computers have become a powerful medium for the rapid and economic production of pictures. There is virtually no area in which graphical displays cannot be used to some advantage.

Graphics provide a natural means of communicating with the computer that they have become widespread. Interactive graphics have been the most important means of

producing pictures since the invention of photography and television. They can even be used in refining games in terms of improvements such as Flying Ball.

The general aim of implementing this game within graphics is to show how nearly everything can be improved through the use of a digital pattern visually. It aids in helping us understand the possibilities of betterment in a comprehensive way.

Main aim of this project is to illustrate the concepts of Static Pressure. This project uses the GLUT pre-built models' sub-API in OpenGL. We have used input devices like mouse and key board to interact with program.

ACKNOWLEDGEMENT

It is our duty to acknowledge the help rendered to us by various persons in completing this Computer Graphics Project titled "Flying Ball."

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Thanking you all,
Preran S Jathan

TABLE OF CONTENTS

Chapters	Pages
Abstract	I
Certificate	Ii
Acknowledgements	Iii
Table of Contents	Iv
List of Figures and Tables	V
1.Introduction	1
2.Requirement Specifications	3
3.Design	5
4.Implementation	6
5.Results	11
6.Conclusion	15
7.Bibliography	16
8.User guide	17

LISTS OF TABLES AND FIGURES

Flying Ball

Chapter 1

INTRODUCTION

1.1 About Computer Graphics

Graphics provides one of the most natural means of communicating with a computer, since our highly developed 2D Or 3D pattern-recognition abilities allow us to perceive and process pictorial data rapidly. Computers have become a powerful medium for the rapid and economical production of pictures. There is virtually no area in which graphical displays cannot be used to some advantage. Graphics provide a natural means of communicating with the computer that they have become widespread. Interactive graphics have been the most important means of producing pictures since the invention of photography and television. We can make pictures of not only the real-world objects but also of abstract objects such as mathematical surfaces on 4D and of data that have no inherent geometry. A computer graphics system is a computer system with all the components of the general-purpose computer system. There are five major elements in a system: input devices, processor, memory, frame buffer, output devices.

1.2 OpenGL Technology

OpenGL is the premier environment for developing portable, interactive 2D and 3D graphics applications. Since its introduction in 1992, OpenGL has become the industry's most widely used and supported 2D and 3D graphics application programming interface (API), bringing thousands of applications to a wide variety of computer platforms. OpenGL fosters innovation and speeds application development by incorporating a broad set of rendering, texture mapping, special effects, and other powerful visualization

functions. Developers can leverage the power of OpenGL across all popular desktop and workstation platforms, ensuring wide application deployment. OpenGL Available Everywhere: Supported on all UNIX® workstations, and shipped standard with every Windows 95/98/2000/NT and MacOS PC, no other graphics API operates on a wider range of hardware platforms and software environments. OpenGL runs on every major operating system including Mac OS, OS/2, UNIX, Windows 95/98, Windows 2000, Windows NT,

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1

Flying Ball

Linux, OPENStep, and BeOS; it also works with every major windowing system, including Win32, MacOS, Presentation Manager, and X-Window System. OpenGL is callable from Ada, C, C++, Fortran, Python, Perl and Java and offers complete independence from network protocols and topologies. The OpenGL interface: Our application will be designed to access OpenGL directly through functions in three libraries namely: gl,glu,glut .

Chapter 2

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2

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REQUIREMENT SPECIFICATIONS

2.1 Hardware Requirements

The standard output device is assumed to be a Color Monitor. It is quite essential for any graphics package to have this, as provision of color options to the user is a must. The mouse, the main input device, has to be functional i.e. used to give input in the game. A keyboard is used for controlling and inputting data in the form of characters, numbers i.e. to change the user views.

Processor	Pentium III or higher
RAM	16 MB or higher
CD-ROM	Speed 48x and above
Cache memory	256 KB
Display	800x600 or higher

2.2 Software Requirements

The editor has been implemented on the OpenGL platform and mainly requires an appropriate version of eclipse compiler to be installed and functional in ubuntu. Though it is implemented in OpenGL, it is very much performed and independent with the restriction that there is support for the execution of C and C++ files. Text Modes are recommended.

Operating System	Windows 11
Language Used	C/C++
Used Application	Codeblocks 16.01

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3

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2.2.1 Header Files

- GL/glut.h
- stdio.h
- stdlib.h
- math.h

- string.h

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Flying Ball

4

Chapter 3

DESIGN

3.1 Transformation Functions

Matrices allow arbitrary linear transformations to be represented in a consistent format, suitable for computation. This also allows transformations to be concatenated easily (by multiplying their matrices). Linear transformations are not the only ones that can be represented by matrices. Using homogeneous coordinates, both affine transformation and perspective projection on \mathbb{R}^n can be represented as linear transformations on \mathbb{RP}^{n+1} (that is, $n+1$ -dimensional real projective space). For this reason, 4×4 transformation matrices are widely used in 3D computer graphics. 3×3 or 4×4 transformation matrices containing homogeneous coordinates are often called, somewhat improperly, "homogeneous transformation matrices". However, the transformations they represent are, in most cases, definitely non-homogeneous and nonlinear (like translation, roto-translation or perspective projection). And even the matrices themselves look rather heterogeneous, i.e. composed of different kinds of elements (see below). Because they are multi-purpose transformation matrices, capable of representing both affine and projective transformations, they might be called "general transformation matrices", or, depending on the application, "affine transformation" or "perspective projection" matrices. Moreover, since the homogeneous coordinates describe a projective vector space, they can also be called "projective space transformation matrices".

IMPLEMENTATION

4.1 Header Files

4.1.1 GL/glut.h

The OpenGL Utility Toolkit (GLUT) handles most of the system dependent actions required to display a window, put OpenGL graphics in it, and accept mouse and keyboard input. glut.h includes gl.h and glu.h.

4.1.2 Stdio.h

The C Programming language provides many library functions of standard form for file input and output. It consists of operations such as file access, unformatted input and/or output, file positioning and error handling.

4.1.3 Stdlib.h

is the header of the general purpose standard library of C programming language which includes functions involving memory allocation, process control, conversions and others. It is compatible with C++ and is known as cstdlib.h in C++. The name "stdlib" stands for "standard library".

4.1.4 Math.h

are C mathematical operations as a group of functions in the standard library of the C programming language implementing basic mathematical functions

4.2 Functions Used

4.2.1 glColor3f();

This function is used to mention the color in which the pixel should appear. The number 3 specifies the number of arguments that the function would take. 'f' gives the type that is float. The arguments are in the order RGB(Red, Green, Blue). The color of the pixel can be specified as the combination of these 3 primary colors.

4.2.2 glClearColor();

This function is used to clear the color of the screen. The 4 values that are passed as arguments for this function are (Red, Green, Blue, Alpha) where the red green and blue components are taken to set the background color and alpha is a value that specifies depth of the window. It is used for 3D images.

4.2.3 glutKeyboardFunc();

Void glutKeyboardFunc(void (*func)(unsigned char key, int x, int y)); where func is the new keyboard callback function. glutKeyboardFunc sets the keyboard callback for the current window. When a user types into the window, each key press generating an ASCII character will generate a keyboard callback. The key callback parameter is the generated ASCII character. The x and y callback parameters indicate the mouse location in window relative coordinates when the key was pressed.

4.2.4 glFlush();

Different GL implementations buffer commands in several different locations, including network buffers and the graphics accelerator itself. glFlush empties all of these buffers, causing all issued commands to be executed as quickly as they are accepted by the actual rendering engine. Though this execution may not be completed in any particular time period, it does complete in finite time.

4.2.5 glMatrixMode();

Flying Ball

where mode Specifies which matrix stack is the target for subsequent matrix operations. Three values are accepted: GL_MODELVIEW, GL_PROJECTION, and GL_TEXTURE. The initial value is GL_MODELVIEW. glMatrixMode sets the current matrix mode. mode can assume one of three values:

GL_MODELVIEW: Applies subsequent matrix operations to the modelview matrix stack.

GL_PROJECTION: Applies subsequent matrix operations to the projection matrix stack

4.2.6 glutInit();

glutInit will initialize the GLUT library and negotiate a session with the window system. During this process, glutInit may cause the termination of the GLUT program with an error message to the user if GLUT cannot be properly initialized. Examples of this situation include the failure to connect to the window system, the lack of window system support for OpenGL, and invalid command line options. glutInit also processes command line options, but the specific options parse are window system dependent. void glutReshapeFunc(void (*func)(int width, int height)); glutReshapeFunc sets the reshape callback for the current window. The reshape callback is triggered when a window is reshaped. A reshape callback is also triggered immediately before a window's first display callback after a window is created or whenever an overlay for the window is established. The width and height parameters of the callback specify the new window size in pixels.

4.2.7 glViewport() ;

Where x, y Specify the lower left corner of the viewport rectangle, in pixels. The initial value is (0, 0). width, height Specify the width and height of the viewport. When a GL context is first attached to a surface, width and height are set to the dimensions of that surface. glViewport specifies the affine transformation of x and y from normalized device coordinates to window coordinates.

4.2.8 glClear();

The glClear function clears buffers to preset values.

SYNTAX: glClear(GLbitfield mask);

where 'mask' is Bitwise OR operators of masks that indicate the buffers to be cleared. The masks used are as follows:

GL_COLOR_BUFFER_BIT: The buffers currently enabled for color writing.

GL_DEPTH_BUFFER_BIT: The depth buffer.

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8

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4.2.9 glMatrixMode();

The glMatrixMode function specifies which matrix is the current matrix.

SYNTAX: void glMatrixMode(GLenum mode);

where the 'mode' indicates the matrix stack that is the target for subsequent matrix operations. The mode parameter can assume values like GL_PROJECTION which applies subsequent matrix operations to the projection matrix stack or GL_MODELVIEW etc.

4.2.10 glClearColor();

Sets the present RGBA clear color used when clearing the color buffer. Variables of type GLclampf are floating-point numbers between 0.0 and 1.0.

SYNTAX: void glClearColor(GLclampf r, GLclampf g, GLclampf b, GLclampf a);

4.2.11 glFlush();

Forces any buffered OpenGL command to execute. It ensures that points are rendered to the screen as soon as possible.

SYNTAX: void glFlush();

4.2.12 glutSwapBuffers();

Swaps the front and back buffers.

SYNTAX: void glutSwapBuffers();

4.2.14 glutInitDisplayMode();

glutInitDisplayMode sets the initial display mode.

SYNTAX: void glutInitDisplayMode(unsigned int mode);

where 'mode' is normally the bitwise OR-ing of GLUT display mode bit masks.

4.2.15 glutInitWindowPosition() and glutInitWindowSize();

glutInitWindowPosition and glutInitWindowSize set the initial window position and size respectively.

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9

Flying Ball

SYNTAX: void glutInitWindowSize(int width, int height);
void glutInitWindowPosition(int x, int y);

4.2.16 glutCreateWindow();

glutCreateWindow creates a top-level window with the name contained in the string 'title'. SYNTAX: int glutCreateWindow()

4.2.17 glutMainLoop();

glutMainLoop enters the GLUT event processing loop.

SYNTAX: void glutMainLoop();

4.2.18 glutKeyboardFunc();

Registers the keyboard callback function f in main. The callback function returns the ASCII code of the key pressed and the position of the mouse.

SYNTAX: void glutKeyboardFunc(void *f(int width, int height));

4.2.19 glutDisplayFunc();

glutDisplayFunc sets the display callback for the current window.

SYNTAX: void glutDisplayFunc(void (*func)(void));

4.2.20 glPushMatrix() and glPopMatrix();

They are used to push the transformation matrix onto the stack and to recover later the original condition respectively.

4.2.21 glTranslatef();

This is used to displace an object by a fixed distance in a given direction. dx, dy, dz are the components of the displacement vector.

4.2.22 glutPostRedisplay();

Requests that the display callback be executed after the current callback returns.

Chapter 5

RESULTS

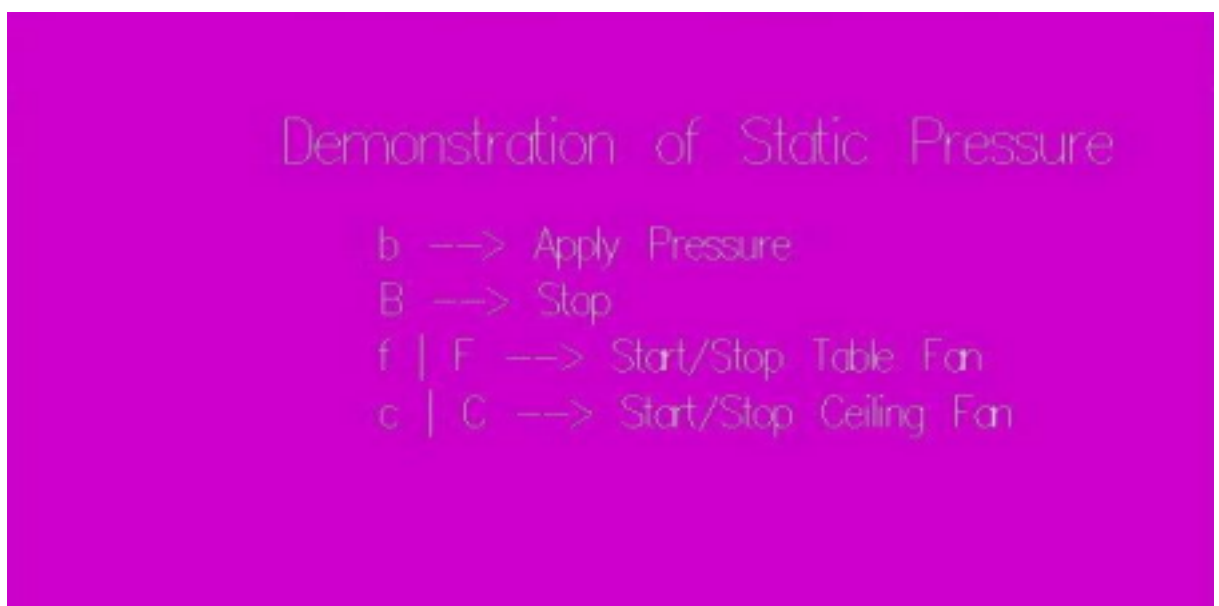


Fig 5.1 Initial window with minimum instructions

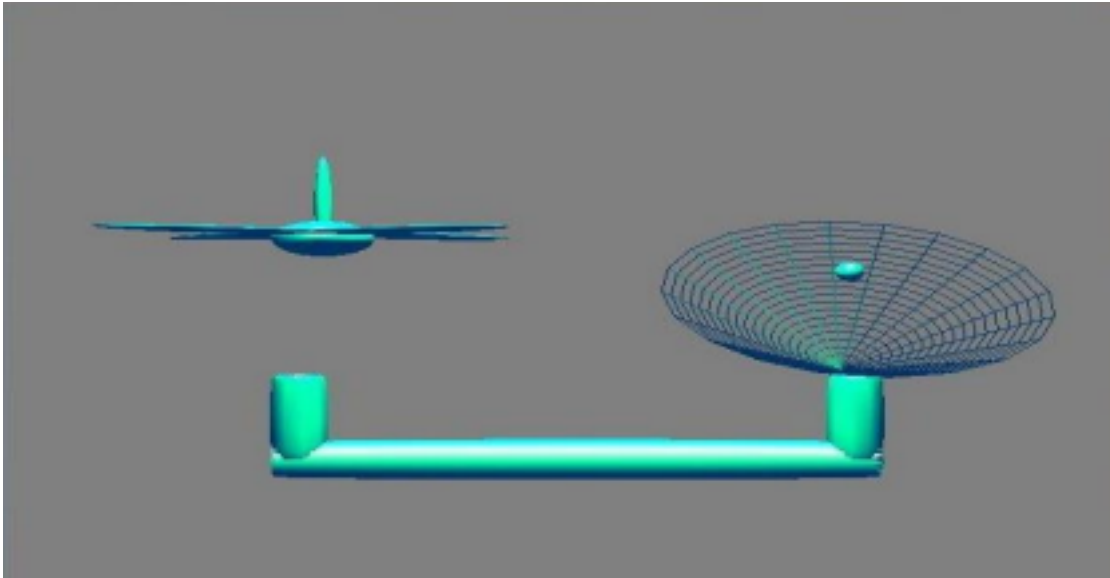


Fig 5.2 Working Model of Flying ball

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11

Flying Ball

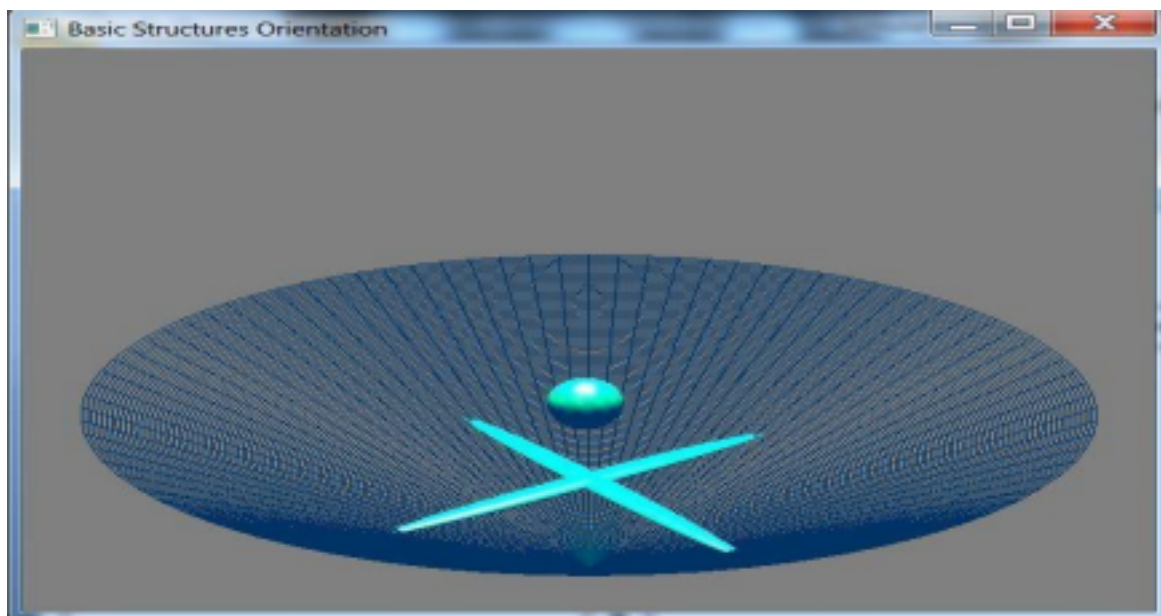


Fig 5.3 Image Ball Flying using static pressure concept

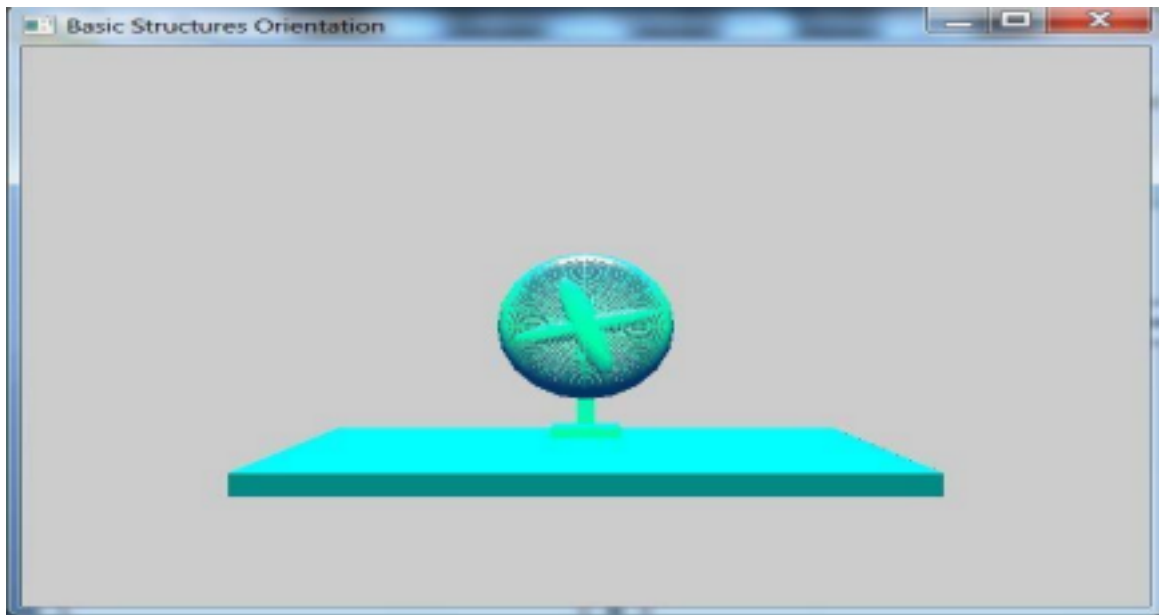


Fig 5.4 Image of Fan

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12

Flying Ball

Chapter 6

CONCLUSION

The full designing and creating of Flying ball have been executed under windows 10 operating system using Code blocks. This platform provides and satisfies the basic need of a good compiler. Using the GL/glut.h library and built-in functions make it easy to design good graphics packages such as this simple game.

It uses built-in functions of the OpenGL interface. The development of this project was very helpful to develop my programming skills and to know C/C++ better. It also aided in implementation of concepts in the project such as translation, drawing objects on the window screen using points, lines. This has given a brief insight as to how programs,

involving graphics, are written using OpenGL.

Designing and developing this project are interesting and a good learning experience. It helped to learn about computer graphics, design of graphical interfaces, interface to the user, user interaction handling and screen management.

The project Flying ball is based on concepts of Static pressure. This program illustrates the concept of static pressure using various functions. Finally, we conclude that this program clearly illustrates the static pressure in OpenGL.

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13

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Flying Ball

14

USER GUIDE

In order to use this simple openGL program, here are the operations:

- Right click to open the pop-up menu or just click on the menu.
- Select any of the options:

1. Click 'Start fan' to start the fan.
2. Click 'Stop fan' to stop the fan.
3. Click 'Start ceiling fan' to to start ceiling fan.
4. Click 'Stop ceiling fan' to stop ceiling fan.
5. Click 'flying ball' ball floats in air
6. Click 'exit' to exit game

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15

Flying Ball

APPENDIX

Program of Flying ball Game using OpenGL

*/*An Interactive Program to create 3d objects*/*

```

#include <windows.h>
#include<string.h>
#include<stdarg.h>
#include<stdio.h>
#include <Gl/glut.h>
static double x=0.0;
static double inc=0.0;
void
stroke_output(GLfloat x, GLfloat y, char *format,...)
{
    va_list args;
    char buffer[200], *p;
    va_start(args, format);
    vsprintf(buffer, format, args);
    va_end(args);
    glPushMatrix();
    glTranslatef(-2.5, y, 0);
    glScaled(0.003, 0.005, 0.005);
    for (p = buffer; *p; p++)
        glutStrokeCharacter(GLUT_STROKE_ROMAN, *p);
    glPopMatrix();
}

//changing backgroun color

// Table Fan

```

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16

Flying Ball

```

void fan(double ang)
{ glClearColor(0.8,0.8,0.8,0.0);
  glClear(GL_COLOR_BUFFER_BIT |
GL_DEPTH_BUFFER_BIT);
  glLoadIdentity();

```

```
glTranslatef(0.0f,0.0f,-13.0f);  
glRotatef(180,0.0f,1.0f,0.0f);
```

```
//fan Blades  
glPushMatrix();  
glRotatef(ang,0.0f,0.0f,1.0f);  
glScaled(0.9,0.2,0.1);  
glTranslatef(0.0,0.0,0.0);  
glRotatef(ang,0.0f,0.0f,1.0f);  
glutSolidSphere(0.7,20,60);  
glPopMatrix();
```

```
//2nd blade  
glPushMatrix();  
glRotatef(ang,0.0f,0.0f,1.0f);  
glScaled(0.2,0.9,0.1);  
glTranslatef(0.0,0.0,0.0);  
glRotatef(ang,0.0f,0.0f,1.0f);  
glutSolidSphere(0.7,20,60);  
glPopMatrix();
```

```
//base cube
```

```
glPushMatrix();  
glScaled(0.8,0.04,0.8);  
glTranslatef(0.0,-40.2,0.0);  
glutSolidCube(6.0);  
glPopMatrix();
```

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17

Flying Ball

```
// leg 1  
glPushMatrix();  
glScaled(0.04,0.4,0.04);  
glTranslatef(0.0,-40.2,0.0)
```

```

; glutSolidCube(6.0);
glPopMatrix();

//fan cover

glPushMatrix();
glScaled(0.8,1.0,0.2);
glTranslatef(0.0,0.0,0.0);
glutWireSphere(0.9,20,60);
glPopMatrix();

//fan stand

glPushMatrix();
glScaled(0.2,1.8,0.2);
glTranslatef(0.0,-0.36,1.2)
; glutSolidCube(0.7);
glPopMatrix();

//fan Base

glPushMatrix();
glScaled(0.8,0.18,0.8);
glTranslatef(0.0,-7.2,0.0)
; glutSolidCube(0.7);
glPopMatrix();

//Fan motor

```

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```

glPushMatrix();
glScaled(0.35,0.4,0.5);
glTranslatef(0.0,0.0,0.5);

```



```

        glutSolidSphere(0.5,20,60);
        glPopMatrix();

//

        glFlush();
        glutSwapBuffers();
    }

// Ceiling Fan
void cfan(double rang)
{
    glClear(GL_COLOR_BUFFER_BIT |
GL_DEPTH_BUFFER_BIT);
    glClearColor(0.5,0.5,0.5,0.0);
    glLoadIdentity();
    glTranslatef(0.0f,0.0f,-13.0f);

    glPushMatrix();
    glTranslatef(-2.0f,0.0f,0.0f);
    glRotatef(rang,0.0f,1.0f,0.0f);
    glScaled(0.7,0.7,0.7);

    glPushMatrix();
    glTranslated(0.0,1.5,0.0);
    glScaled(0.1,0.8,0.1);
    glutSolidSphere(1.0,20,60);
    glPopMatrix();

```

```
glTranslated(0.0,0.9,0.0);  
glScaled(0.6,0.3,0.6);  
glutSolidSphere(1.0,20,60)  
; glPopMatrix();
```

```
glPushMatrix();  
glTranslated(1.2,1.0,0.0);  
glScaled(1.8,0.05,0.6);  
glutSolidSphere(1.0,20,60)  
; glPopMatrix();
```

```
glPushMatrix();  
glTranslated(-1.2,1.0,0.0);  
glScaled(1.8,0.05,0.6);  
glutSolidSphere(1.0,20,60)  
; glPopMatrix();
```

```
glPushMatrix();  
glTranslated(0.0,1.0,-1.2);  
glScaled(0.6,0.05,1.8);  
glutSolidSphere(1.0,20,60)  
; glPopMatrix();
```

```
glPushMatrix();  
glTranslated(0.0,1.0,1.2);  
glScaled(0.6,0.05,1.8);  
glutSolidSphere(1.0,20,60)  
; glPopMatrix();
```

```
glPopMatrix();
```

```
// Cylinder 1
```

```
glPushMatrix();  
glTranslatef(-1.0,-2,0.0);
```

```
glPushMatrix();  
glTranslatef(1.1,0,0.0);  
glRotatef(90,0.0,1.0,0.0);  
glScaled(0.4,0.4,25);  
glColor3f(1,1,1);  
glutSolidTorus(0.1,.5,50,10);  
glPopMatrix();
```

// Cylinder 2

```
glPushMatrix();  
glTranslatef(3.4,0.5,0.0);  
glRotatef(90,1.0,0.0,0.0);  
glScaled(0.4,0.4,5);  
glutSolidTorus(0.1,.5,50,10);  
glPopMatrix();
```

// 3

```
glPushMatrix();  
glTranslatef(-1.2,0.5,0.0);  
glRotatef(90,1.0,0.0,0.0);  
glScaled(0.4,0.4,5);  
glutSolidTorus(0.1,.5,50,10);  
glPopMatrix();
```

```
glPopMatrix();
```

Flying Ball

```

        /***** MESH & Ball *****/

        glPushMatrix();

        glTranslatef(2.4,0,0);
        glRotatef(125,1.0f,0.0f,0.0f);
        glScaled(0.4,.4,0.4);
        glPushMatrix();
        glutWireCone(4,3,20,20);
        glPopMatrix();


        glPushMatrix();
        glTranslatef(0.0,1+inc,0.0);


        glPushMatrix();
        glRotated(x,0.0,1.0,0.0);
        glTranslatef(0.05,2.0,0.0);
        glutSolidSphere(0.3,20,60);
        glPopMatrix();


        glPopMatrix();


        glPopMatrix();


        glFlush();
        glutSwapBuffers();


    }

//Flying Ball

```

Flying Ball

```
void flying(double ang, double inc)
{
    glClear(GL_COLOR_BUFFER_BIT |
GL_DEPTH_BUFFER_BIT);
    glClearColor(0.5,0.5,0.5,0.0);
    glLoadIdentity();
    glTranslatef(0.0f,-.5f,-13.0f);
    glRotatef(115,1.0f,0.0f,0.0f);

    //fan
    glPushMatrix();
    glRotatef(ang,0.0f,0.0f,1.0f);
    glScaled(2.9,0.2,0.1);
    glTranslatef(0.0,0.0,16.0);
    glRotatef(ang,0.0f,0.0f,1.0f);
    glutSolidSphere(0.7,20,60);
    glPopMatrix();

    //2nd blade
    glPushMatrix();
    glRotatef(ang,0.0f,0.0f,1.0f);
    glScaled(0.2,2.9,0.1);
    glTranslatef(0.0,0.0,16.0);
    glRotatef(ang,0.0f,0.0f,1.0f);
    glutSolidSphere(0.7,20,60);
    glPopMatrix();

    glPushMatrix();
    glutWireCone(4,3,80,120);
    glPopMatrix();
```

```
glPushMatrix();
```

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23

Flying Ball

```
glTranslatef(0.0,inc,0.0);
```

```
    glPushMatrix();  
    glRotated(ang,0.0,1.0,0.0)  
    ;  
    glTranslatef(0.05,2.0,0.0);  
    glutSolidSphere(0.3,20,60)  
    ; glPopMatrix();
```

```
glPopMatrix();
```

```
    glFlush();  
    glutSwapBuffers();  
}
```

```
void f()  
{  
    x += 9.0;  
    fan(x);  
}
```

```
//stop the fan
```

```
void F()  
{  
    x = 0.0;  
    fan(x);  
}
```

```

void c()
{
    x += 10.9;
    cfan(x);
}

```

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24

Flying Ball

```

}

void C()
{
    x+=0.0;
    cfan(x);
}

```

```

void fly1()
{
    if (inc<=-4){
        x+=5.30;
        cfan(x);
    }
    else
    {
        inc-=0.01;
        x += 5.30;
        cfan(x);
    }
}

```

```

void StopFly1()
{
    if(inc>=0){

```

```
cfan(0);
```

```
}
```

```
else if(x>=0)
```

```
{x+=0.3;
```

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25

Flying Ball

```
inc+=.01;
```

```
cfan(x);
```

```
}else{
```

```
cfan(0);
```

```
}
```

```
}
```

```
void fly()
```

```
{
```

```
if (inc<=-4){
```

```
x+=5.30;
```

```
flying(x,inc);
```

```
}
```

```
else
```

```
{
```

```
inc-=0.01;
```

```
x += 5.30;
```

```
flying(x,inc);
```

```
}
```

```
}
```



```

void StopFly()
{
    if(inc>=0){

        flying(0,0);

    }
}

```

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26

Flying Ball

```

        else if(x>=0)
        {x+=0.3;
        inc+=.01;
        flying(x,inc);

        }else{
        flying(0,0);
        }
    }
}

```

```

void doInit()
{

    /* Background and foreground color */
    glClearColor(0.8,0.0,0.8,0.0);

    glViewport(0,0,640,480);

    /* Select the projection matrix and reset it then
    setup our view perspective */
    glMatrixMode(GL_PROJECTION);
    glLoadIdentity();
}

```

```
gluPerspective(30.0f,(GLfloat)640/(GLfloat)480,0.1f,200.0f); /*
Select the modelview matrix, which we alter with rotatef() */
```

```
glMatrixMode(GL_MODELVIEW);
glLoadIdentity();
glClearDepth(2.0f);
glEnable(GL_DEPTH_TEST);
glDepthFunc(GL_LEQUAL);
}
```

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27

Flying Ball

```
void doDisplay()
{
    glClear(GL_COLOR_BUFFER_BIT |
GL_DEPTH_BUFFER_BIT);
    glLoadIdentity();
    glTranslatef(0.0f,0.0f,-13.0f);

    stroke_output(-2.0, 1.7, "Demonstration of Static Pressure ");

    glPushMatrix();
    glScaled(0.7,0.7,0.7);

    stroke_output(-2.0, 0.9, "b --> Apply Pressure");
    stroke_output(-2.0, 0.0, "B --> Stop ");
    stroke_output(-2.0, -0.9, "f | F --> Start/Stop Table Fan");
    stroke_output(-2.0, -1.8, "c | C --> Start/Stop Ceiling Fan");
    glPopMatrix();

    GLfloat mat_ambient[]={0.0f,1.0f,2.0f,1.0f};
    GLfloat mat_diffuse[]={0.0f,1.5f,.5f,1.0f};
    GLfloat mat_specular[]={5.0f,1.0f,1.0f,1.0f};
    GLfloat mat_shininess[]={50.0f};
```

```

glMaterialfv(GL_FRONT, GL_AMBIENT, mat_ambient);
glMaterialfv(GL_FRONT, GL_DIFFUSE, mat_diffuse);
glMaterialfv(GL_FRONT, GL_SPECULAR, mat_specular);
glMaterialfv(GL_FRONT, GL_SHININESS, mat_shininess);

```

```

/*light source properties*/
GLfloat lightIntensity[]={1.7f,1.7f,1.7f,1.0f};
GLfloat light_position[]={2.0f,0.0f,0.0f,0.0f};
glLightfv(GL_LIGHT0, GL_POSITION, light_position);
GLfloat light_position2[]={0.0f,0.0f,8.0f,0.0f};
glLightfv(GL_LIGHT0, GL_POSITION, light_position2);
; GLfloat light_position3[]={0.0f,5.0f,2.0f,0.5f};

```

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28

Flying Ball

```

glLightfv(GL_LIGHT0, GL_POSITION, light_position3);
; glLightfv(GL_LIGHT0, GL_DIFFUSE, lightIntensity);

```

```

glFlush();
glutSwapBuffers();

```

```

}

```

```

void menu(int id)
{
    switch(id)
    {
        case 1: glutIdleFunc(f);
                break;
        case 2: glutIdleFunc(F);
                break;
        case 3: glutIdleFunc(c);
                break;
        case 4: glutIdleFunc(C);
                break;
        case 5: glutIdleFunc(fly);

```

```

        break;
    case 6:exit(0);
        break;

    }
    glFlush();
    glutSwapBuffers();
    glutPostRedisplay();
}

void mykey(unsigned char key,int x,int y)
{

```

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29

Flying Ball

```

    if(key=='f')
    {
        glutIdleFunc(f);
    }
    if(key=='F')
    {
        glutIdleFunc(F);
    }
    if(key=='q'||key=='Q')
    {
        exit(0);
    }

    if(key=='C')
    {
        glutIdleFunc(StopFly1);
    }
    if(key=='c')
    {
        glutIdleFunc(fly1);
    }

```

```

    }
    if(key=='b')
    {
        glutIdleFunc(fly);
    }
    if(key=='B')
    {
        glutIdleFunc(StopFly);
    }
}

int main(int argc, char *argv[])

{

```

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30

Flying Ball

```

glutInit(&argc, argv);
glutInitDisplayMode(GLUT_DOUBLE|GLUT_RGB);
glutInitWindowSize(640,480);
glutInitWindowPosition(0,0);
glutCreateWindow("Basic Structures Orientation");
glutDisplayFunc(doDisplay);
    glEnable(GL_LIGHTING);
    glEnable(GL_LIGHT0);
    glShadeModel(GL_SMOOTH);
    glEnable(GL_DEPTH_TEST);
    glEnable(GL_NORMALIZE);
    glutKeyboardFunc(mykey);
    glutCreateMenu(menu);
glutAddMenuEntry("Start Fan 'f'",1);
    glutAddMenuEntry("Stop Fan 'F'",2);
    glutAddMenuEntry("Start Ceiling Fan 'c'",3);
    glutAddMenuEntry("Stop Ceiling Fan 'C'",4);

```

```
        glutAddMenuEntry("Flying Ball 'b'",5);

        glutAddMenuEntry("Exit 'q'",6);
        glutAttachMenu(GLUT_LEFT_BUTTON)
        ; doInit();
    glutMainLoop();
    return 0;

}
```