NAME:- BHAMARE LAJARI ANIL CLASS:- SE DIV:-B

ROLL NO.:-205 BATCH:-B1

ASSIGNMENT NO.:- 6

AIM:- Write c++ program to draw 3d cube and perform following transformation on it using OpenGL

1-scaling

2-translation

3-rotation about an axis x/y/z.

**SOURCE CODE:-**

#include<iostream>

#include<math.h>

#include<GL/glut.h>

using namespace std;

typedef float Matrix4 [4][4];

Matrix4 theMatrix;

static GLfloat input[8][3]=

{

 {40,40,-50},{90,40,-50},{90,90,-50},{40,90,-50},

 {30,30,0},{80,30,0},{80,80,0},{30,80,0}

};

float output[8][3];

float tx,ty,tz;

float sx,sy,sz;

float angle;

int choice,choiceRot;

void setIdentityM(Matrix4 m)

{

for(int i=0;i<4;i++)

 for(int j=0;j<4;j++)

 m[i][j]=(i==j);

}

void translate(int tx,int ty,int tz)

{

for(int i=0;i<8;i++)

{

output[i][0]=input[i][0]+tx;

output[i][1]=input[i][1]+ty;

output[i][2]=input[i][2]+tz;

}

}

void scale(int sx,int sy,int sz)

{

 theMatrix[0][0]=sx;

 theMatrix[1][1]=sy;

 theMatrix[2][2]=sz;

}

void RotateX(float angle) //Parallel to x

{

angle = angle\*3.142/180;

 theMatrix[1][1] = cos(angle);

theMatrix[1][2] = -sin(angle);

theMatrix[2][1] = sin(angle);

theMatrix[2][2] = cos(angle);

}

void RotateY(float angle) //parallel to y

{

angle = angle\*3.14/180;

theMatrix[0][0] = cos(angle);

theMatrix[0][2] = -sin(angle);

theMatrix[2][0] = sin(angle);

theMatrix[2][2] = cos(angle);

}

void RotateZ(float angle) //parallel to z

{

angle = angle\*3.14/180;

theMatrix[0][0] = cos(angle);

theMatrix[0][1] = sin(angle);

theMatrix[1][0] = -sin(angle);

theMatrix[1][1] = cos(angle);

}

void multiplyM()

{

//We Don't require 4th row and column in scaling and rotation

//[8][3]=[8][3]\*[3][3] //4th not used

for(int i=0;i<8;i++)

{

 for(int j=0;j<3;j++)

 {

 output[i][j]=0;

 for(int k=0;k<3;k++)

 {

 output[i][j]=output[i][j]+input[i][k]\*theMatrix[k][j];

 }

 }

}

}

void Axes(void)

{

glColor3f (0.0, 0.0, 0.0); // Set the color to BLACK

glBegin(GL\_LINES); // Plotting X-Axis

glVertex2s(-1000 ,0);

glVertex2s( 1000 ,0);

glEnd();

glBegin(GL\_LINES); // Plotting Y-Axis

glVertex2s(0 ,-1000);

glVertex2s(0 , 1000);

glEnd();

}

void draw(float a[8][3])

{

 glBegin(GL\_QUADS);

 glColor3f(0.7,0.4,0.5); //behind

 glVertex3fv(a[0]);

 glVertex3fv(a[1]);

 glVertex3fv(a[2]);

 glVertex3fv(a[3]);

 glColor3f(0.8,0.2,0.4); //bottom

 glVertex3fv(a[0]);

 glVertex3fv(a[1]);

 glVertex3fv(a[5]);

 glVertex3fv(a[4]);

 glColor3f(0.3,0.6,0.7); //left

 glVertex3fv(a[0]);

 glVertex3fv(a[4]);

 glVertex3fv(a[7]);

 glVertex3fv(a[3]);

 glColor3f(0.2,0.8,0.2); //right

glVertex3fv(a[1]);

glVertex3fv(a[2]);

glVertex3fv(a[6]);

glVertex3fv(a[5]);

glColor3f(0.7,0.7,0.2); //up

glVertex3fv(a[2]);

glVertex3fv(a[3]);

glVertex3fv(a[7]);

glVertex3fv(a[6]);

glColor3f(1.0,0.1,0.1);

glVertex3fv(a[4]);

glVertex3fv(a[5]);

glVertex3fv(a[6]);

glVertex3fv(a[7]);

glEnd();

}

void init()

{

 glClearColor(1.0,1.0,1.0,1.0); //set backgrond color to white

 glOrtho(-454.0,454.0,-250.0,250.0,-250.0,250.0);

 // Set the no. of Co-ordinates along X & Y axes and their gappings

 glEnable(GL\_DEPTH\_TEST);

 // To Render the surfaces Properly according to their depths

}

void display()

{

glClear(GL\_COLOR\_BUFFER\_BIT|GL\_DEPTH\_BUFFER\_BIT);

Axes();

glColor3f(1.0,0.0,0.0);

draw(input);

setIdentityM(theMatrix);

switch(choice)

{

case 1:

 translate(tx,ty,tz);

 break;

case 2:

 scale(sx,sy,sz);

multiplyM();

 break;

case 3:

 switch (choiceRot) {

 case 1:

 RotateX(angle);

 break;

 case 2: RotateY(angle);

 break;

 case 3:

 RotateZ(angle);

 break;

 default:

 break;

 }

multiplyM();

 break;

}

draw(output);

glFlush();

}

int main(int argc, char\*\* argv)

{

 glutInit(&argc,argv);

 glutInitDisplayMode(GLUT\_SINGLE|GLUT\_RGB|GLUT\_DEPTH);

 glutInitWindowSize(1362,750);

 glutInitWindowPosition(0,0);

 glutCreateWindow("3D TRANSFORMATIONS");

 init();

 cout<<"Enter your choice number:\n1.Translation\n2.Scaling\n3.Rotation\n=>";

 cin>>choice;

 switch (choice) {

 case 1:

 cout<<"\nEnter Tx,Ty &Tz: \n";

 cin>>tx>>ty>>tz;

 break;

 case 2:

 cout<<"\nEnter Sx,Sy & Sz: \n";

 cin>>sx>>sy>>sz;

 break;

 case 3:

 cout<<"Enter your choice for Rotation about axis:\n1.parallel to X-axis."

 <<"(y& z)\n2.parallel to Y-axis.(x& z)\n3.parallel to Z-axis."

 <<"(x& y)\n =>";

 cin>>choiceRot;

 switch (choiceRot) {

 case 1:

 cout<<"\nENter Rotation angle: ";

 cin>>angle;

 break;

 case 2:

 cout<<"\nENter Rotation angle: ";

 cin>>angle;

 break;

 case 3:

 cout<<"\nENter Rotation angle: ";

 cin>>angle;

 break;

 default:

 break;

 }

 break;

 default:

 break;

 }

 glutDisplayFunc(display);

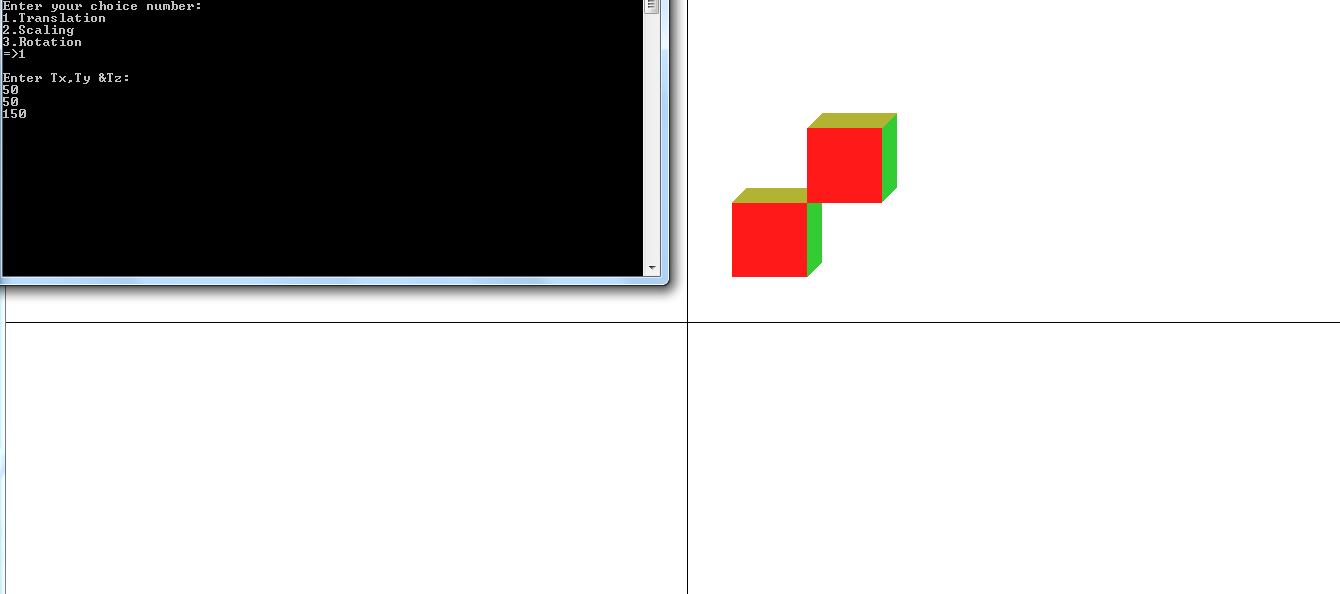
 glutMainLoop();

return 0;

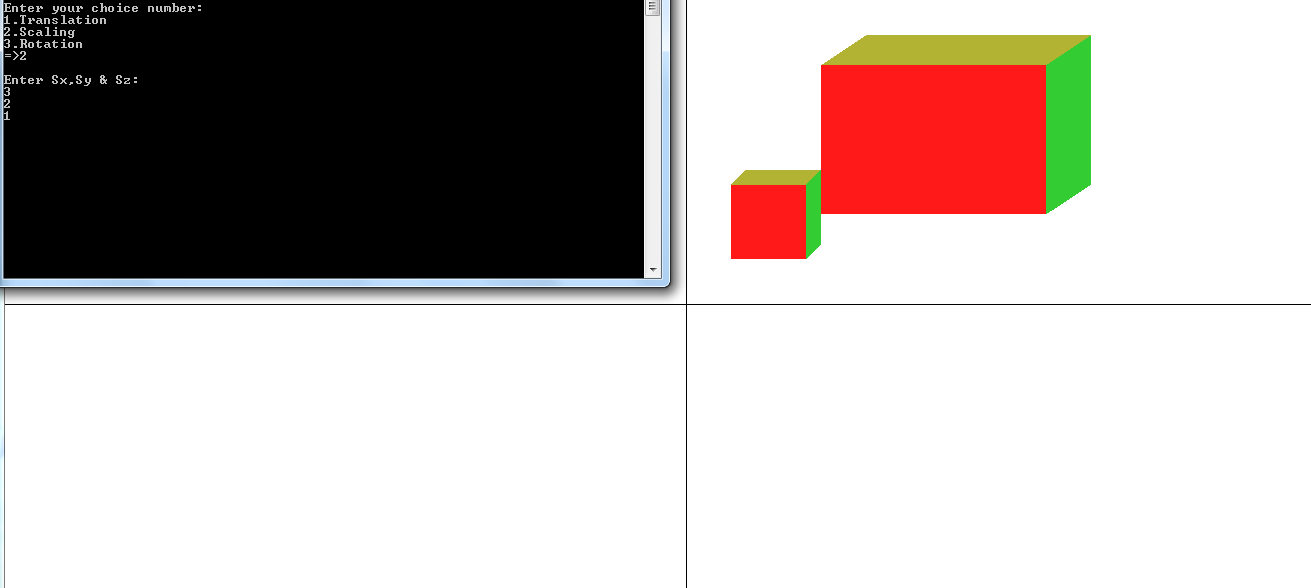
}

**Output :**

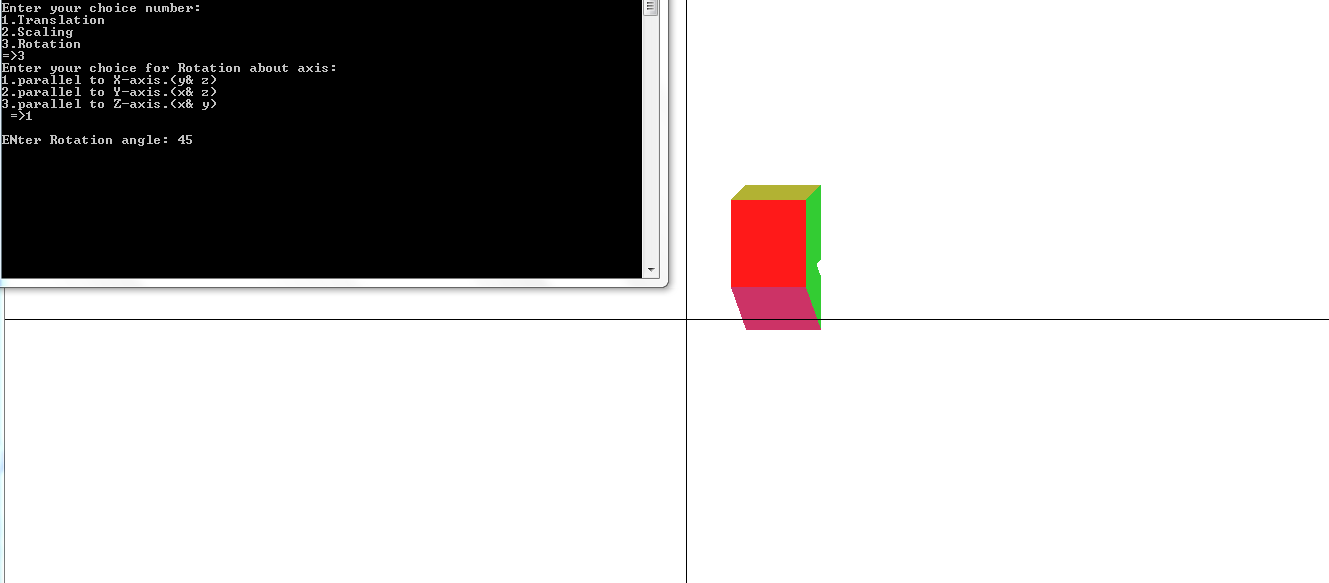
**1. Translation :**

[](https://blogger.googleusercontent.com/img/b/R29vZ2xl/AVvXsEg68cg7AudDBXqeqZ48xs1doz6fdE-CiM3MXptJe1xxEOjLjRS3_kJmDD-pMXtrTZHCCixOwSJbRpb63I2dmURrulJBVAqwyJS7lO3Ege3EtcHLbTzfQYeD3jWXZALRSCX1_Nm6yx-DCMjI/s1340/6_1_Translation.PNG)

**2. Scaling :**

[](https://blogger.googleusercontent.com/img/b/R29vZ2xl/AVvXsEiVj6UfWFYne5oShH08FJJxR2PevZ0w_nzc12pE8PmEd1MTDU5w-DkF_vPrM94Bq1cjFWnnxHx4OyMuKn9D6Vo_-m9FoO0NaUHI5ybs6t0KXpUc-z0vD8lkjw2H861eCitf0iZuw2bnHib4/s1311/6_2_Scaling.PNG)

**3. Rotation:**

[](https://blogger.googleusercontent.com/img/b/R29vZ2xl/AVvXsEiQZ6vDAHzcDNHHC7_vdBbWb9qmsMZYzaWCBKIn56FYQCa2APYiQ-V0sxowTKnfWJ6kBik-QrYNFSURqqurmau8LZRHabM-7fjd6XN9hRaCC9rqEewwuMXgYn_1EawblgDyLohaBIYdqFIE/s1329/6_3_rotation.PNG)