## Aim
### Program to create a house like figure and rotate it about a given fixed point using OpenGL functions.

## Algorithm
1. Draw a house by choosing appropriate coordinate points.
2. Calculate the rotation matrix, which is calculate w.r.t rotation angle.
3. Multiply rotation matrix with coordinate points of house.
4. This gives us coordiante points of rotated house

## Code: rotateHouse.c
```c
#include<stdio.h>
#include<math.h>
#include<GL/glut.h>
GLfloat house[3]
[9]={{100.0,100.0,175.0,250.0,250.0,150.0,150.0,200.0,200.0},
{100.0,300.0,400.0,300.0,100.0,100.0,150.0,150.0,100.0},
{1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0,1.0}};
GLfloat rot_mat[3][3]={{0},{0},{0}};
GLfloat result[3][9]={{0},{0},{0}};
GLfloat h=100.0;
GLfloat k=100.0;
GLfloat theta;

void multiply()
{
        int i,j,l;
        for(i=0;i<3;i++)
        for(j=0;j<9;j++)
        {
                result[i][j]=0;
                for(l=0;l<3;l++)
                        result[i][j]=result[i][j]+rot_mat[i]
[l]*house[l][j];
        }
}

void rotate()
{
        GLfloat m,n;
        m=-h*(cos(theta)-1)+k*(sin(theta));
        n=-k*(cos(theta)-1)-h*(sin(theta));
        rot_mat[0][0]=cos(theta);
        rot_mat[0][1]=-sin(theta);
        rot_mat[0][2]=m;
        rot_mat[1][0]=sin(theta);
        rot_mat[1][1]=cos(theta);
        rot_mat[1][2]=n;
        rot_mat[2][0]=0;
        rot_mat[2][1]=0;
        rot_mat[2][2]=1;
        multiply();
}
```

```
//Draw Iniatial house
    void drawhouse()
    {
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_LINE_LOOP);
            glVertex2f(house[0][0],house[1][0]);
            glVertex2f(house[0][1],house[1][1]);
            glVertex2f(house[0][3],house[1][3]);
            glVertex2f(house[0][4],house[1][4]);
        glEnd();
        glColor3f(1.0,0.0,0.0);
        glBegin(GL_LINE_LOOP);
            glVertex2f(house[0][5],house[1][5]);
            glVertex2f(house[0][6],house[1][6]);
            glVertex2f(house[0][7],house[1][7]);
            glVertex2f(house[0][8],house[1][8]);
        glEnd();
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_LINE_LOOP);
            glVertex2f(house[0][1],house[1][1]);
            glVertex2f(house[0][2],house[1][2]);
            glVertex2f(house[0][3],house[1][3]);
        glEnd();
    }

    void drawrotatedhouse()
    {
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_LINE_LOOP);
            glVertex2f(result[0][0],result[1][0]);
            glVertex2f(result[0][1],result[1][1]);
            glVertex2f(result[0][3],result[1][3]);
            glVertex2f(result[0][4],result[1][4]);
        glEnd();
        glColor3f(1.0,0.0,0.0);
        glBegin(GL_LINE_LOOP);
            glVertex2f(result[0][5],result[1][5]);
            glVertex2f(result[0][6],result[1][6]);
            glVertex2f(result[0][7],result[1][7]);
            glVertex2f(result[0][8],result[1][8]);
        glEnd();
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_LINE_LOOP);
            glVertex2f(result[0][1],result[1][1]);
            glVertex2f(result[0][2],result[1][2]);
            glVertex2f(result[0][3],result[1][3]);
        glEnd();
    }

    void display()
    {
        glClear(GL_COLOR_BUFFER_BIT);
        drawhouse();
        rotate();
```

```c
            drawrotatedhouse();
            glFlush();
        }

        void myinit()
        {
            glClearColor(1.0,1.0,1.0,1.0);
            glColor3f(1.0,1.0,0.0);
            glPointSize(10.0);
            glMatrixMode(GL_PROJECTION);
            glLoadIdentity();
            gluOrtho2D(0.0,499.0,0.0,499.0);
        }

        int main(int argc,char **argv)
        {
            printf("Enter the rotation angle\n");
            scanf("%f",&theta);
            glutInit(&argc,argv);
            glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
            glutInitWindowSize(500,500);
            glutInitWindowPosition(0,0);
            glutCreateWindow("house rotation");
            glutDisplayFunc(display);
            myinit();
            glutMainLoop();
        }
```

## Output:
*Commands for execution:-*

* Open a terminal and Change directory to the file location in both
the terminals.
* compile as gcc –lGLU –lGL –lglut rotateHouse.c –o rthouse
* If no errors, run as ./rthouse

*Screenshots:-*

![Screenshot of Output](rthouse.png)