NATIONAL INSTITUTE OF TECHNOLOGY SILCHAR

Cachar, Assam

B.Tech. VIth Sem

Subject Code: CS-317

Subject Name: Graphics and Multimedia Lab

Submitted By:

Name : Subhojit Ghimire

Sch. Id. : 1912160

Branch : CSE – B

1. **Rotation of a rectangle based on pivot points (20, 30).**
    a. **Translate object to origin from its original position as shown in fig (b).**
    b. **Rotate the object about the origin as shown in fig (c).**
    c. **Translate the object to its original position from origin. It is called as reverse translation as shown in fig (d).**

➔ **CODE:**

```
#include <iostream>
#include <GL/glut.h>
using namespace std;

GLfloat px, py, Rotation;
GLfloat ax, ay, bx, by, cx, cy, dx, dy;

void myinit (void) {
    glClear (GL_COLOR_BUFFER_BIT);
    glClearColor (0.0, 0.0, 0.0, 0.0);
    glMatrixMode (GL_PROJECTION);
    glLoadIdentity ();
    gluOrtho2D (-100, 100, -100, 100);
}

void drawRect () {
    glBegin (GL_LINE_LOOP);
        glVertex2f (ax, ay);
        glVertex2f (bx, by);
        glVertex2f (dx, dy);
        glVertex2f (cx, cy);
    glEnd ();
}

void drawQuadrants () {
    glPointSize (3.0);
    glColor3f (0.0f, 0.5f, 0.5f);

    glBegin (GL_LINE_LOOP);
        glVertex3f (-500.0, 0.0, 0.0);
        glVertex3f (500.0, 0.0, 0.0);
    glEnd ();

    glBegin (GL_LINE_LOOP);
        glVertex3f (0.0, -500.0, 0.0);
        glVertex3f (0.0, 500.0, 0.0);
    glEnd ();
}

void display () {
```

```
        drawQuadrants ();
    // Original Points
    ax = 15.0, ay = 35.0, bx = 30.0, by = 35.0, cx = 15.0, cy = 25.0,
dx = 30.0, dy = 25.0;
    // Pivot Points
    px = 20.0, py = 30.0;

    glColor3f (1.0f, 1.0f, 1.0f);
    drawRect ();

    // 1. Translate object to origin from its original position
    GLfloat midX, midY;
    midX = (ax + bx + cx + dx) / 4.0;
    midY = (ay + by + cy + dy) / 4.0;
    glColor3f (0.0f, 1.0f, 0.0f);
    glTranslatef (-midX, -midY, 0.0);
    glTranslatef (midX-px, midY-py, 0.0);
    drawRect ();
    // 2. Rotate the object about the origin
    Rotation = -90;
    glColor3f (1.0f, 0.0f, 0.0f);
    glTranslatef (px, py, 0.0f);
    glRotatef (Rotation, 0.0f, 0.0f, 1.0f);
    glTranslatef (-px, -py, 0.0f);
    drawRect ();
    // 3. Translate the object to its original position from origin.
    glColor3f (0.0f, 0.0f, 1.0f);
    glTranslatef (px, py, 0.0f);
    glRotatef (-Rotation, 0.0f, 0.0f, 1.0f);
    glTranslatef (-px, -py, 0.0f);
    glTranslatef (px-midX, py-midY, 0.0);
    glTranslatef (midX, midY, 0.0);
    drawRect ();

    glFlush ();
}

int main (int argc, char **argv) {
    glutInit (&argc, argv);
    glutInitWindowSize (1000, 1000);
    glutInitWindowPosition (500, 0);
    glutInitDisplayMode (GLUT_SINGLE | GLUT_RGB);
    glutCreateWindow ("Rotating rectangle on pivot points (20, 30)");
    myinit ();
    glutDisplayFunc (display);
    glutMainLoop ();
    return 0;
}
```

OUTPUT:

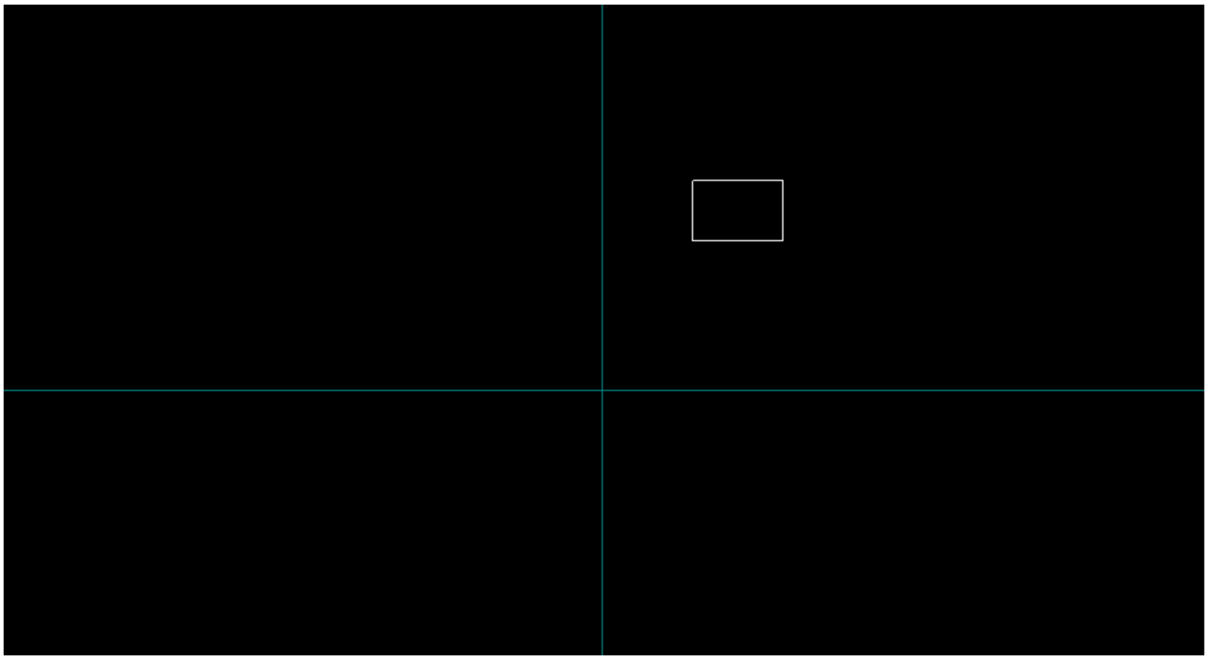

Fig.: Rectangle ABCD (White) with coordinates A (15, 35), B (30, 35), C (15, 25) and D (30, 25) and pivot point (20, 30)

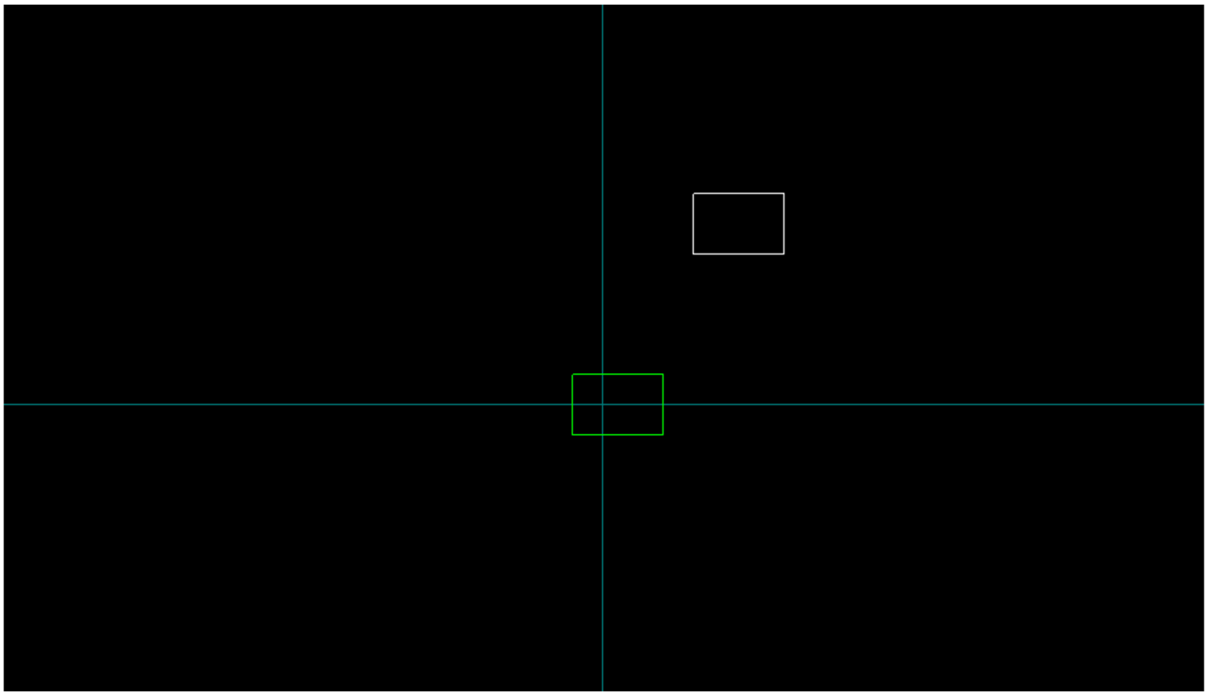

Fig.: Rectangle ABCD Translated to origin (Green) from its original position (White) about the pivot point (20, 30) with origin as new pivot point (i.e., new pivot point (0, 0).

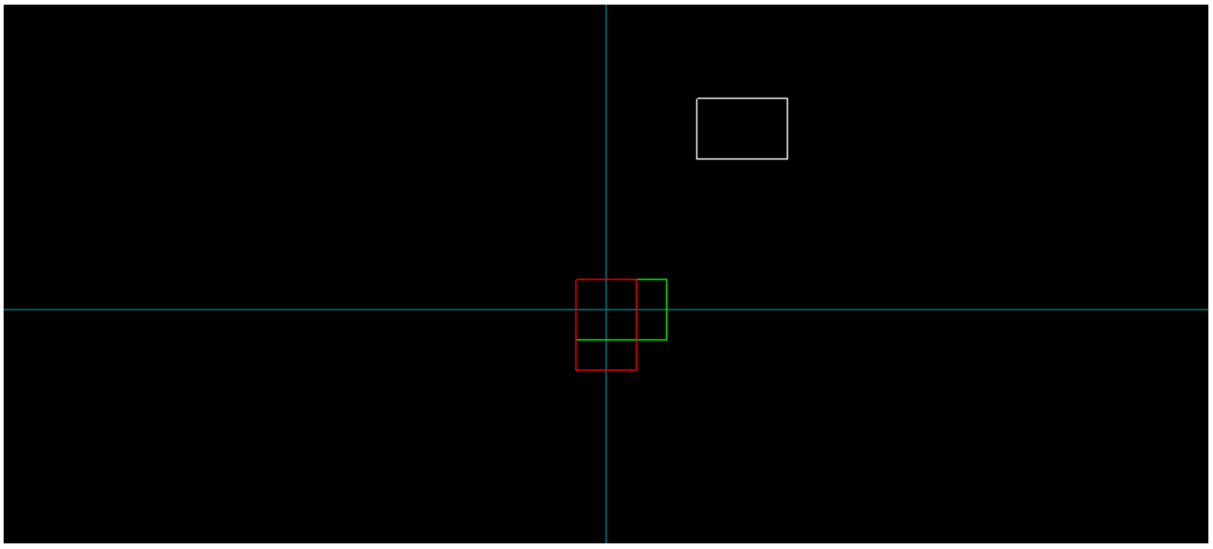

Fig.: Translated Rectangle ABCD (Green) rotated 90 degrees anticlockwise about the origin (Red) at the pivot point (20, 30).

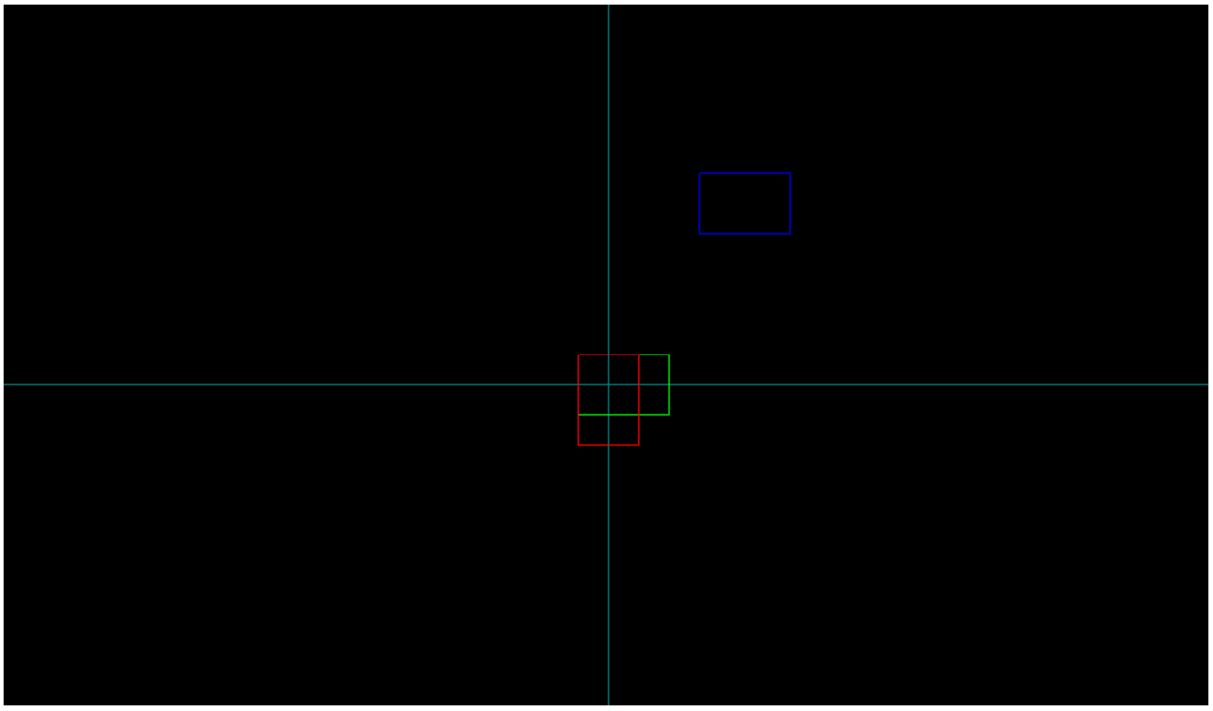

Fig.: Rotated Rectangle ABCD (Red) translated back to its original position (Blue) about the pivot point (20, 30) from the origin.