East Delta University

Experiment Name: Implementation of Mid-Point Ellipse

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Section: 02

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Course Name: CSE 322 Computer Graphics Lab

Title : Implementation of Mid-Point Ellipse.

Introduction :

Mid point ellipse algorithm is an incremental method of drawing an ellipse. Mid point ellipse algorithms plots points of an ellipse on the first quadrant by dividing the quadrant into two regions. Each point (x,y) is the projected into other three quadrants $(-x,y)$, $(x,-y)$, $(-x,-y)$.

Descriptions:

Mid point ellipse algorithm is an incremental method for scan converting an ellips that is centered at the origin in standard position, with the major and minor axis parallel to cordinate system axis. It is very simillar to the midpoint circle algorithm. In this algorithm we took input radius along x axis and y axis and obtain center of ellipse. Initially we assume ellipse to be centered at origin and the final point as (x_0,y_0) is

$(0, r_y)$. The initial decision parameter for region 1 as $p1_0 = r_y^2 + 1/4 r_x^2 - r_x^2 r_y$ to obtain the initial value in region 2 using the last point (x_0, y_0) of region 1 as:

$$P2_0 = r_y^2 (x_0 + \frac{1}{2})^2 + r_x^2 (y_0 - 1)^2 - r_x^2 r_y$$

at each y_k in each y_k in region 2 starting at $k = 0$.

If $p2_k > 0$ the next point is $(x_k, y_k - 1)$ else next point is $(x_{k+1}, y_k - 1)$, then pointing in the quadrants and plot coordinates values as $x = x + x_c, y = y + y_c$.

Then repeat the steps for region 1 until $\cancel{2r_y}$ $2r_y^2 x >= 2r_x^2 y$.

The mid point ellipse algorithm is used to calculate all the perimeter point of an ellipse. In the algorithm, the mid point between the two pixel is calculated which helps in calculating the decision parameter.

Conclusion:

Mid point Ellipse algorithm is efficient scan conversion for drawing geometric curves on raster display. The algorithm was applied smoothly, and I did not encounter any difficulties during its implementation. The ellipse generated by the algorithm is a time consuming algorithm.

Code:

main.cpp - Code::Blocks 20.03

```cpp
#include<windows.h>
#include<GL/glut.h>
#include<stdlib.h>
#include<stdio.h>
float h, k, a, b;
void display(void)
{
    glBegin(GL_POINTS);
    float x, y, fx, fy, P;
    x = 0, y = b;
    fx=0;
    fy=2*a*a*b;

    P=(b*b)-(a*a*b)+(0.25*a*a);

    // for region 1. y calculate.
    while(fx<fy)
    {
        glVertex2f(h+x,k+y);
        glVertex2f(h-x,k+y);
        glVertex2f(h-x,k-y);
        glVertex2f(h+x,k-y);
        if(P<0)
        {
            fx=fx+2*b*b;
            P=P+fx+b*b;
            x++;
        }
        if(P>=0)
        {
            fx=fx+2*b*b;
            x++;
```

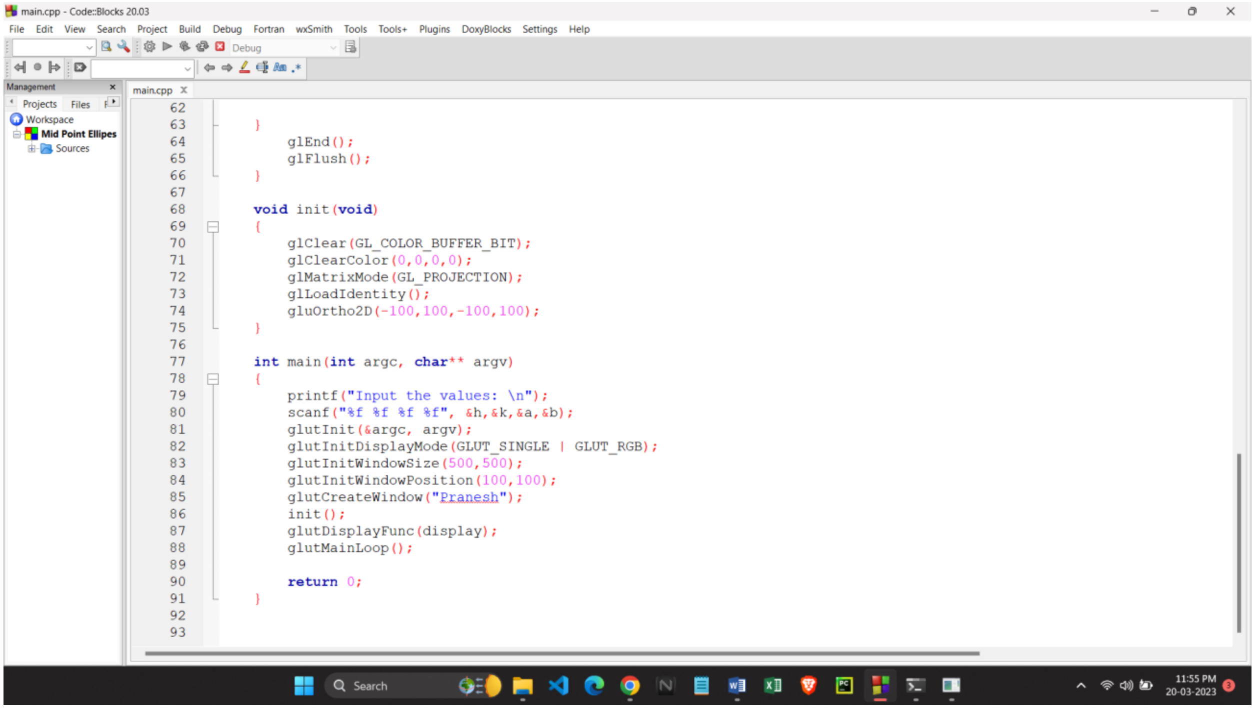
main.cpp - Code::Blocks 20.03

```cpp
            fy=fy-2*a*a;
            P=P+fx+b*b-fy;
        }
    }

    P=(b*b)*(x+.5)*(x+.5)+(a*a)*(y-1)*(y-1)-(a*a)*(b*b);
    // for region 2.
    while(y>=0)      // for the (a, 0)

    {
        glVertex2f(h+x,k+y);
        glVertex2f(h-x,k+y);
        glVertex2f(h-x,k-y);
        glVertex2f(h+x,k-y);
        if(P>=0)
        {
            y--;
            fy=fy-2*a*a;
            P=P-fy+a*a;
        }
        if(P<0)
        {
            y--;
            x++;
            fy=fy-2*a*a;
            fx=fx+2*b*b;
            P=P+fx-fy+a*a;
        }

    }
    glEnd();
    glFlush();
```


main.cpp - Code::Blocks 20.03
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Mid Point Ellipes
Sources
main.cpp
}
glEnd();
glFlush();
}
void init(void)
{
glClear(GL_COLOR_BUFFER_BIT);
glClearColor(0,0,0,0);
glMatrixMode(GL_PROJECTION);
glLoadIdentity();
gluOrtho2D(-100,100,-100,100);
}
int main(int argc, char** argv)
{
printf("Input the values: \n");
scanf("%f %f %f %f", &h,&k,&a,&b);
glutInit(&argc, argv);
glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
glutInitWindowSize(500,500);
glutInitWindowPosition(100,100);
glutCreateWindow("Pranesh");
init();
glutDisplayFunc(display);
glutMainLoop();
return 0;
}
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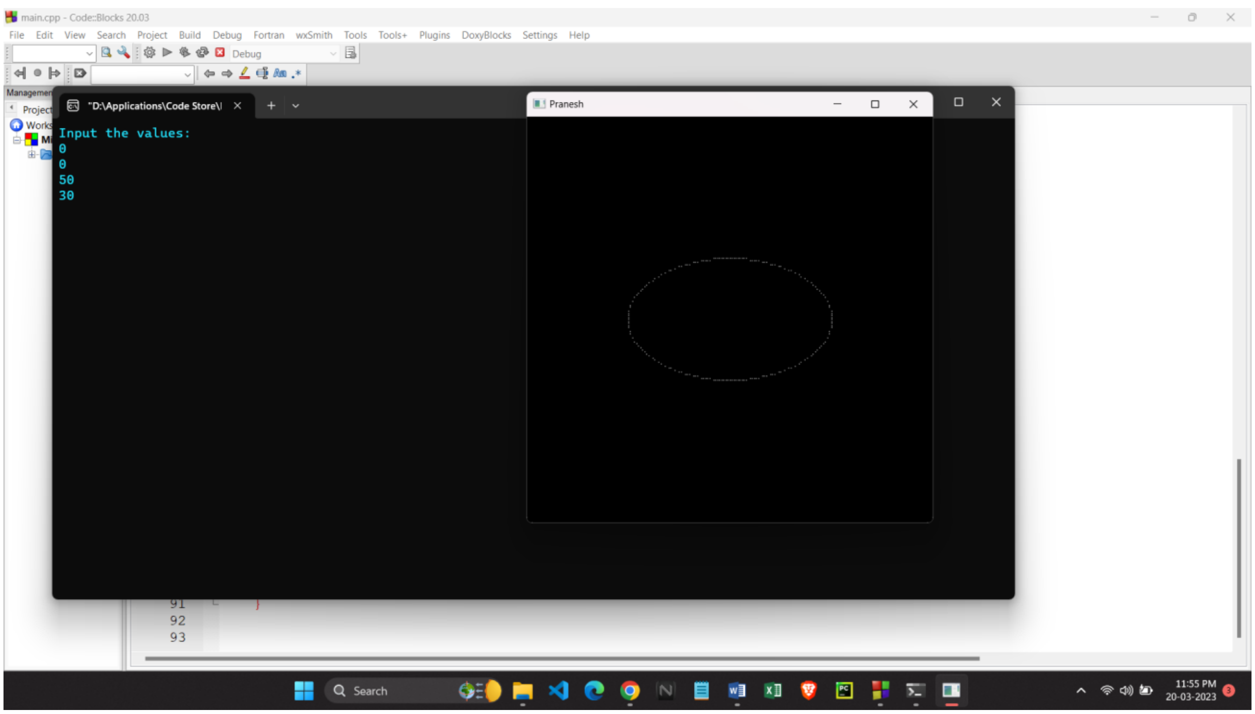
main.cpp - Code::Blocks 20.03
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