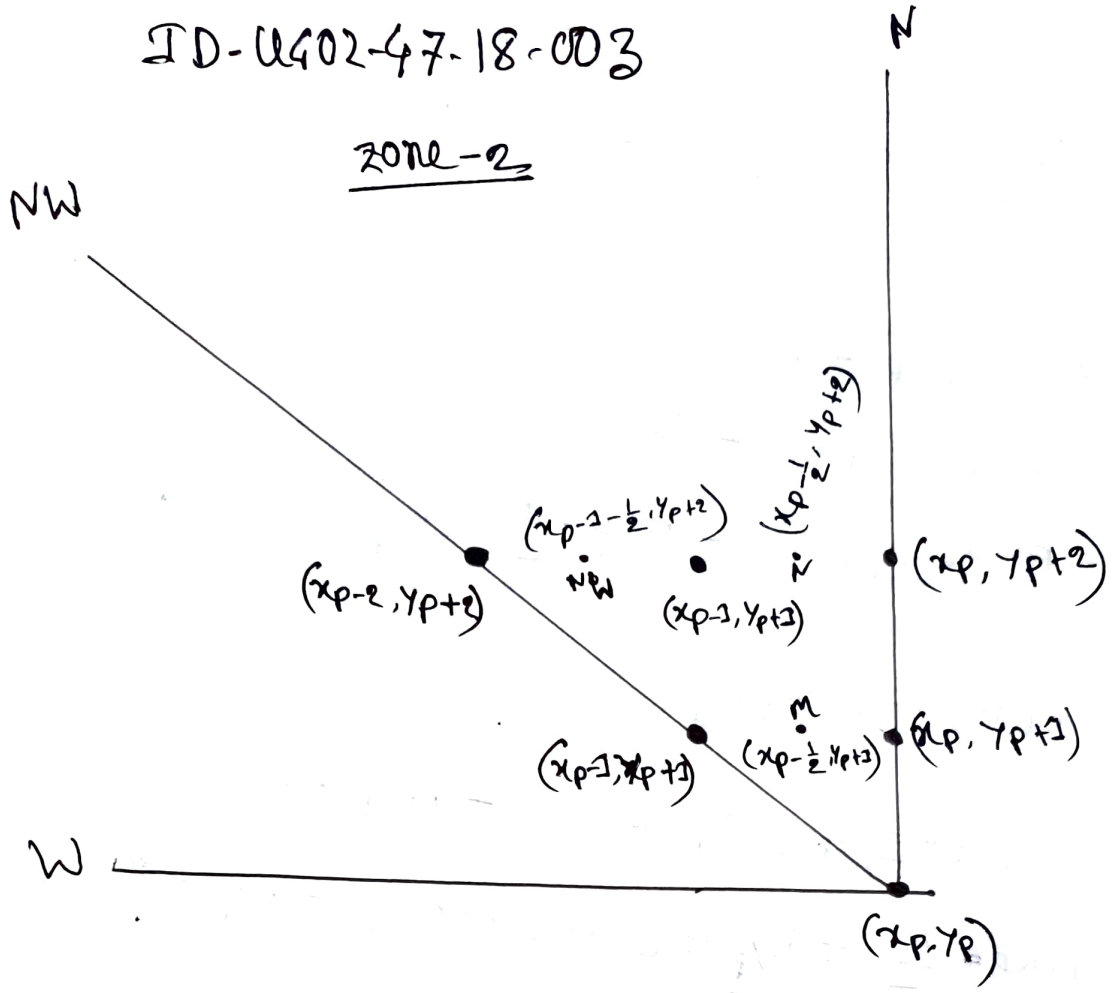
ID-UG02-47-18-003

Zone-2



Zone-2: $(x_1 <= x_0)$ && $(y_0 < y_1)$

$$F(x_p, y_p) = Ax_p + By_p + C$$

$$F(M) = F(x_p - \tfrac{1}{2}, y_p + 1)$$

$$= A(x_p - \tfrac{1}{2}) + B(y_p + 1) + C$$

$$F(N) = F(x_p - \tfrac{1}{2}, y_p + 2)$$

$$= A(x_p - \tfrac{1}{2}) + B(y_p + 2) + C$$

$$F(NW) = F(x_p - 1 - \tfrac{1}{2}, y_p + 2)$$

$$= A(x_p - 1 - \tfrac{1}{2}) + B(y_p + 2) + C$$

Now, calculating deviation —

~~$d_{init} = F(x_p, y_p) - F(m)$~~

~~$= Ax_p + By_p + C - \{A(x_p - \frac{1}{2}) + B(y_p + 1) + C\}$~~

~~$= Ax_p - By_p + C - Ax_p + \frac{A}{2} - By_p - B - C$~~

$d_{init} = F(m) - F(x_p, y_p)$

$= A(x_p - \frac{1}{2}) + B(y_p + 1) + C - Ax_p - By_p - C$

$= Ax_p - \frac{A}{2} + By_p + B + C - Ax_p - By_p - C$

$= -\frac{A}{2} + B$

$= B - \frac{A}{2}$

$= -dx - \frac{dy}{2}$ $\quad [\because A = dy, B = -dx]$

and,

$d_N = F(N) - F(m)$

$= A(x_p - \frac{1}{2}) + B(y_p + 2) + C - \{A(x_p - \frac{1}{2}) + B(y_p + 1) + C\}$

$= A(x_p - \frac{1}{2}) + By_p + 2B + C - A(x_p - \frac{1}{2}) - By_p - B - C$

$= B$

$= -dx \quad (\because B = -dx)$

and,

$$d_{NW} = F(NW) - F(M)$$

$$= A\left(x_p - 1 - \frac{1}{2}\right) + B\left(y_p + 2\right) + C - \left\{A\left(x_p - \frac{1}{2}\right) + B\left(y_p + 1\right) + C\right\}$$

$$= A x_p - A - \frac{1}{2}A + B y_p + 2B + C - A x_p + \frac{1}{2}A - B y_p + B - C$$

$$= -A + B$$

$$= -dy - dx \quad [\because A = dy,\ B = -dx$$

There are fraction, so we have to remove fraction by multiply by 2.

$$d_{init} = -2dx - dy$$

$$d_N = -2dx$$

$$d_{NW} = -2dy - 2dx$$

```
void midpointLine(int x0, int y0, int x1, int y1, int color)
{
    int dx = x1 - x0, dy = y1 - y0;
    int dinit = -dy - 2*dx;
    int dNW = -2*dx;
    int dNW = -2*dy - 2*dx
    int x = x0, y = y0
    writePixel(x, y, color);
    while(y < y1)
    {
        if(dinit < 0){ dinit += dN; }

        else{ dinit += dNW, x-- }

        y++;
        writePixel(x, y, color);
    }
}
```