

MCA Part II

Paper X: Computer Graphics and Multimedia

Topic: Line Generation Algorithms

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A line connects two points. It is a basic element in graphics. To draw a line, you need two points between which you can draw a line.

DDA Algorithm

Digital Differential Analyzer DDADDA algorithm is the simple line generation algorithm which is explained step by step here.

Step 1 – Get the input of two end points (X₀,Y₀) and (X₁,Y₁).

Step 2 – Calculate the difference between two end points.

$$dx = X_1 - X_0$$

$$dy = Y_1 - Y_0$$

Step 3 – Based on the calculated difference in step-2, you need to identify the number of steps to put pixel. If $dx > dy$, then you need more steps in x coordinate; otherwise in y coordinate.

```
if (absolute(dx) > absolute(dy))
    Steps = absolute(dx);
else
    Steps = absolute(dy);
```

Step 4 – Calculate the increment in x coordinate and y coordinate.

$$X_{\text{increment}} = dx / (\text{float}) \text{ steps};$$

$$Y_{\text{increment}} = dy / (\text{float}) \text{ steps};$$

Step 5 – Put the pixel by successfully incrementing x and y coordinates accordingly and complete the drawing of the line.

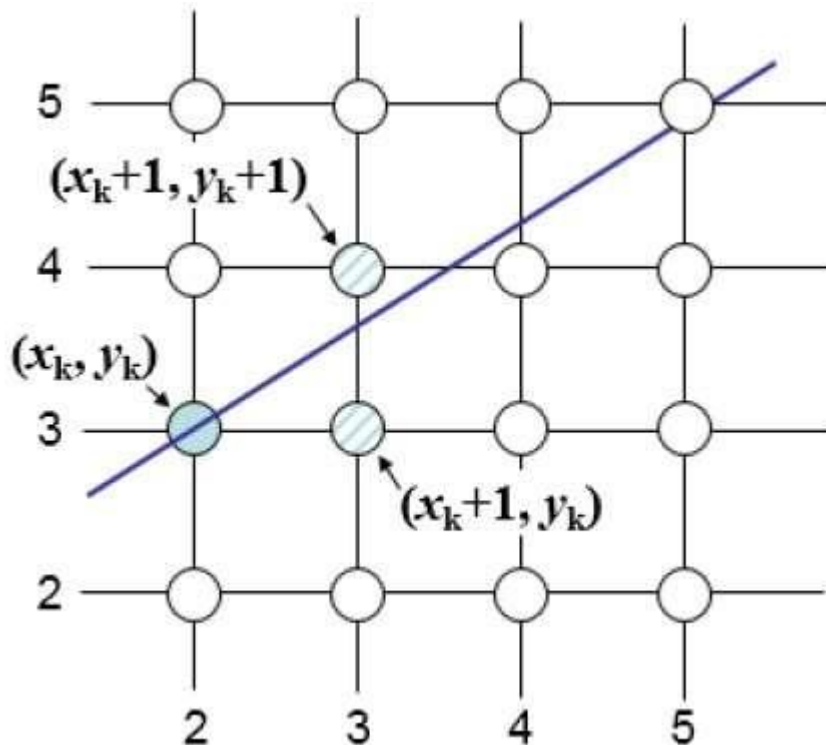
```
for(int v=0; v < Steps; v++)
{
    x = x + Xincrement;
```

```
y = y + Yincrement;  
putpixel(Round(x), Round(y));  
}
```

Bresenham's Line Generation

The Bresenham algorithm is another incremental scan conversion algorithm. The big advantage of this algorithm is that, it uses only integer calculations. Moving across the x axis in unit intervals and at each step choose between two different y coordinates.

For example, as shown in the following illustration, from position 2,3 you need to choose between 3,3 and 3,4. You would like the point that is closer to the original line.



At sample position x_{k+1} , the vertical separations from the mathematical line are labelled as d_{upper} and d_{lower} .

