Bresenham Line Algorithm (m<1, Dx>Dy)

1. Accept two end points from user, store first end point as (x0, y0) as starting point.
2. Plot the point (x0, y0)
3. Calculate all constants from two end points such as Dx, Dy, 2Dy, 2Dy – 2Dx and find the starting value for the G as G = 2Dy – Dx
4. For each column increment x and decide y value by checking G > 0 condition. If it is true then increment/decrement y value and add (2Dy – 2Dx) to current value of G, otherwise add 2Dy to G and don’t increment y value.
5. Repeat step 4 till Dx times.

Example 1:

A(4,9)=(x1,y1)

B(7,7)=(x2,y2)

Dx = |7 – 4| = 3

Dy = |7 – 9 |= 2

G = 2 Dy – Dx = 2(2) – 3 = 4 – 3 = 1, G>0

Plot (4, 9)

As Dx > Dy, G > 0

Increment x, x = x + 1 =4 + 1 = 5

Y1>y2,

G = G + 2(Dy-Dx) = 1 + 2 (2 – 3)= 1 + 2(-1) = 1 – 2 = -1

Plot (5, 8)

Iteration 1

Now G < 0

Increment x. x = x + 1 = 5 + 1 = 6

No change in y. y = 8

Update G. G = G + 2Dy = -1 + 2(2) = -1 + 4 = 3

Plot (6, 8)

Iteration 2

Here G > 0

Increment x. x = x + 1 = 6 + 1 = 7

Y1 > y2, decrement y. y = y – 1 = 8 – 1 = 7

Now we see x=7, y=7 which is destination point so algorithm stops here.

|  |  |  |
| --- | --- | --- |
| X | Y | (X,Y) |
| 4 | 9 | (4,9) |
| 5 | 8 | (5,8) |
| 6 | 8 | (6,8) |
| 7 | 7 | (7,7) |

Example 2:

A(10,10)= (x1,y1)

B(18,16) = (x2,y2)

Dx = |x2 – x1 |= |18 – 10 | = 8

Dy = | y2 – y1 | = | 16 – 10 | = 6

G = 2 Dy – Dx = 2 (6) – 8 = 12 – 8 = 4

Dx > Dy, G > 0, y1 < y2

Plot (10,10)

Iteration 1:

Increment x. x = x + 1 = 10 + 1 = 11

Increment y. y = y + 1 = 10 + 1 = 11

Update G. G = G + 2 (Dy – Dx) = 4 + 2 ( 6 – 8 ) =

4 + (-4) = 0

Plot (11, 11)

Iteration 2:

G=0,

Increment x. x = x + 1 = 11 + 1 = 12

Not changing y. So y =11

Update G. G = G + 2 Dy = 0 + 2 (6) = 12

Plot (12,11)

Iteration 3:

G>0, y1 < y2

Increment x. x = x + 1 = 12 + 1 = 13

Increment y. y = y + 1 = 11 + 1 = 12

Update G. G = G + 2 (Dy – Dx) = 12 + 2 (6 – 8) = 12 – 4 = 8

Plot (13, 12)

Iteration 4:

G>0, y1<y2

Increment x. x = 13 + 1 = 14

Increment y. y = 12 + 1 = 13

Update G. G = 8 + 2 (-2) = 4

Plot (14,13)

Iteration 5:

G>0, y1<y2

Increment x. x = x + 1 = 14 + 1 = 15

Increment y. y = y +1 = 13 + 1 = 14

Update G. G = 4 + 2 (-2) = 0

Plot (15,14)

Iteration 6:

G = 0, y1<y2

Increment x = x + 1 = 15 + 1 = 16

Not changing y. y = 14

Update G. G = G + 2Dy = 0 + 2(6) = 12

Plot (16,14)

Iteration 7:

G>0, y1<y2

Increment x. x = 16+1 = 17

Increment y. y = 14+1 = 15

Update G. G = 12 + 2(6-8) = 8

Plot (17,15)

Iteration 8:

G>0, y1<y2

Increment x. x=17+1=18

Increment y. y=15+1=16

Here we observe the point we got is (18,16) which is equal to our destination point. So algorithm stops here after plotting (18,16)

|  |  |  |
| --- | --- | --- |
| X | Y | (X,Y) |
| 10 | 10 | (10,10) |
| 11 | 11 | (11,11) |
| 12 | 11 | (12,11) |
| 13 | 12 | (13,12) |
| 14 | 13 | (14,13) |
| 15 | 14 | (15,14) |
| 16 | 14 | (16,14) |
| 17 | 15 | (17,15) |
| 18 | 16 | (18,16) |

Example 3:

A(5,8)= (x1,y1)

B(9,14) = (x2,y2)

Dx = |x2 – x1 |= |9 – 5 | = 4

Dy = | y2 – y1 | = | 14 – 8 | = 6

G = 2 Dy – Dx = 2 (6) – 4 = 12 – 4 = 8

Dy > Dx, G > 0, x1 < x2

Plot (5,8)

Iteration 1:

Increment y. y = y + 1 = 8 + 1 = 9

Increment x. x = x + 1 = 5 + 1 = 6

Update G. G = G + 2 (Dx – Dy) = 8 + 2 ( 4 – 6 ) =

8 - 4 = 4

Plot (6, 9)

Iteration 2:

G>0,

Increment y. y = y + 1 = 9 + 1 = 10

Increment x. x = x + 1 = 6 + 1 = 7

Update G. G = G + 2 (Dx – Dy) = 4 + 2 (-2) = 0

Plot (7,10)

Iteration 3:

G<=0, y1 < y2

Increment y. y = y + 1 = 10 + 1 = 11

No change in x. x = 7

Update G. G = G + 2Dx = 0 + 8 = 8

Plot (7, 11)

Iteration 4:

G>0, y1<y2

Increment y. y = 11 + 1 = 12

Increment x. x = 7 + 1 = 8

Update G. G = 8 + 2 (-2) = 4

Plot (8,12)

Iteration 5:

G>0, y1<y2

Increment y. y = y + 1 = 12 + 1 = 13

Increment x. x = x +1 = 8 + 1 = 9

Update G. G = 4 + 2 (-2) = 0

Plot (9,13)

Iteration 6:

G = 0, y1<y2

Increment y = y + 1 = 13 + 1 = 14

Not changing x. x = 9

Here we observe the point we got is (9,14) which is equal to our destination point. So algorithm stops here after plotting (9,14).

|  |  |  |
| --- | --- | --- |
| X | Y | (X,Y) |
| 5 | 8 | (5,8) |
| 6 | 9 | (6,9) |
| 7 | 10 | (7,10) |
| 7 | 11 | (7,11) |
| 8 | 12 | (8,12) |
| 9 | 13 | (9,13) |
| 9 | 14 | (9,14) |