Calculate the points between the starting point (7,1) and ending point (14, 3). and plot the line using the below algorithms ( show the calculations and attach the code as zipped files )

1. Xiaolin Wu's line algorithm
2. Gupta-Sproull algorithm
3. Bresenham’s Line-Drawing Algorithm

Starting coordinates = (X0, Y0) = (7,1)

Ending coordinates = (Xn, Yn) = (14, 3)

**Step1:**

Calculate ΔX and ΔY from the given input.

ΔX = Xn – X0 = 14 – 7 = 7

ΔY =Yn – Y0 = 3 – 1 = 2

**Step2:**

Calculate the decision parameter.

Pk

= 2ΔY – ΔX

= 2 x 2 – 7

= -3

So, decision parameter Pk = -3

**Step 3:**

Since Pk < 0, so case1 is satisfied.

Thus,

* Pk+1 = Pk + 2ΔY = -3 + (2 x 2) = 1
* Xk+1 = Xk + 1 = 7+ 1 = 8
* Yk+1 = Yk = 1

Similarly, Step 3 is executed until the end point is reached or number of iterations equals to 6 times.

(Number of iterations = ΔX – 1, which is 7 – 1 = 6)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **Pk** | | |  | | --- | | **Pk+1** | | |  | | --- | | **Xk+1** | | |  | | --- | | **Yk+1** | |
| -3 | 1 | 8 | 1 |
| 1 | 5 | 9 | 1 |
| 5 | 9 | 10 | 1 |
| 9 | 13 | 11 | 1 |
| 13 | 17 | 12 | 1 |
| 17 | 21 | 13 | 1 |
| 21 | 25 | 14 | 1 |

1. Midpoint Line-Drawing Algorithm

Starting coordinates = (X0, Y0) = (7, 1)

Ending coordinates = (Xn, Yn) = (14, 3)

Step 1:

Calculate ΔX and ΔY from the given input.

ΔX = Xn – X0 = 14 - 7 = 7

ΔY =Yn – Y0 = 3 – 1 = 2

Step 2:

Calculate Dinitial and ΔD -

Dinitial = 2ΔY – ΔX = 2 x 2 – 7 = -3

ΔD = 2(ΔY – ΔX) = 2 x (2 – 7) = -10

Step 3:

Since Dinitial < 0, so case 1 is satisfied.

Thus,

Xk+1 = Xk +1= 7 + 1 = 8

Yk+1 = Yk = 1

Dnew = Dinitial + 2ΔY = -3 + 2\*2 = 1

Similarly, Step 3 is executed until the end point is reached.

|  |  |  |  |
| --- | --- | --- | --- |
| Dinitial | Dnew | Xk+1 | Yk+1 |
| -3 | 1 | 7 | 1 |
| 1 | 5 | 8 | 1 |
| 5 | 9 | 9 | 1 |
| 9 | 13 | 10 | 1 |
| 13 | 17 | 11 | 1 |
| 17 | 21 | 12 | 1 |
| 21 | 25 | 13 | 1 |
| 25 | 29 | 14 | 1 |

1. DDA line drawing Algorithm

Starting point = (X0, Y0) = (7,1)

Ending point = (Xn, Yn) = (14, 3)

Step 1:

Calculate ΔX, ΔY and M from the given input.

ΔX = Xn – X0 = 14-7 = 7

ΔY =Yn – Y0 = 3– 1= 2

M = ΔY / ΔX = 2/7 = 0.286

Step 2:

Calculate the number of steps.

As |ΔX| > |ΔY| = 7 > 2, so number of steps = ΔX = 7

Step 3:

As M < 1, so case-01 is satisfied.

Now, Step 3 is executed until Step 4 is satisfied.

|  |
| --- |
|  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Xp | Yp | Xp+1 | Yp+1 | Round off (Xp+1, Yp+1) |
| 7 | 1 | 7 | 1.286 | (7,1) |
|  |  | 8 | 1.571 | (8,2) |
|  |  | 9 | 1.857 | (9,2) |
|  |  | 10 | 2.142 | (10,2) |
|  |  | 11 | 2.428 | (11,2) |
|  |  | 12 | 2.714 | (12.3) |
|  |  | 13 | 2.999 | (13,3) |