Department of Mechanical, Materials and Manufacturing Engineering

The University of Nottingham

Computer Engineering and Mechatronics MM3CEM MECH/3038/01

Exercise Sheet 8: The Bresenham Algorithm

1. A line is to be drawn between the points (5,5) and (18,16) using stepper motors. Use the Bresenham algorithm to identify the (x,y) points forming the intermediate points. The Bresenham algorithm for positive movments in x and y and with the x axis dominant can be stated as follows (Wikipedia):

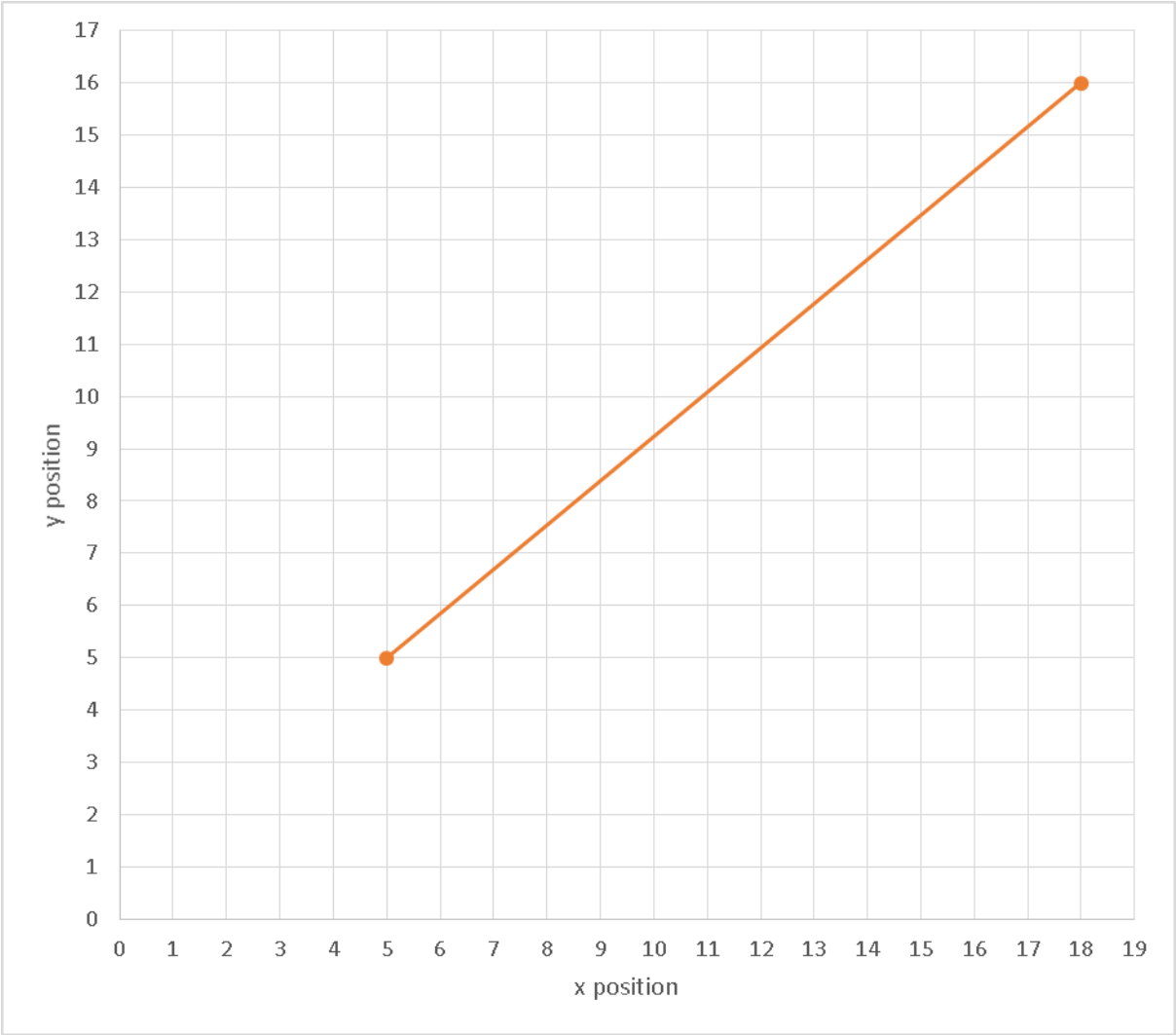
```
dx = x1 - x0
dy = y1 - y0
D = 2*dy - dx
y = y0

for x from x0 to x1
  moveto(x,y)
  if D > 0
    y = y + 1
    D = D - 2*dx
  end if
  D = D + 2*dy
```

Use the following table to help you complete the movements. The first two rows are completed for you. (You may find it easiest to code the algorithm up in Excel). First you will need to calculate dx, dy and the initial value of D.

X	y (before updating)	D (before updating)	y (after updating)	D (after first update)	D (after second update)
5	5	9	6	-17	5
6	6	5	7	-21	1

Etc. etc.

Then plot the final (x,y) coordinates on a graph using the axes overleaf, or using Excel or otherwise, and see how well the points approximate to the ideal line shown.



Original reference: J. E. Bresenham, Algorithm For Computer Control Of A Digital Plotter. IBM Systems Journal, Vol. 4, No. 1 . 1965, pp 25-30. Downloadable from https://www.cse.iitb.ac.in/~paragc/teaching/2011/cs475/papers/bresenham_line.pdf

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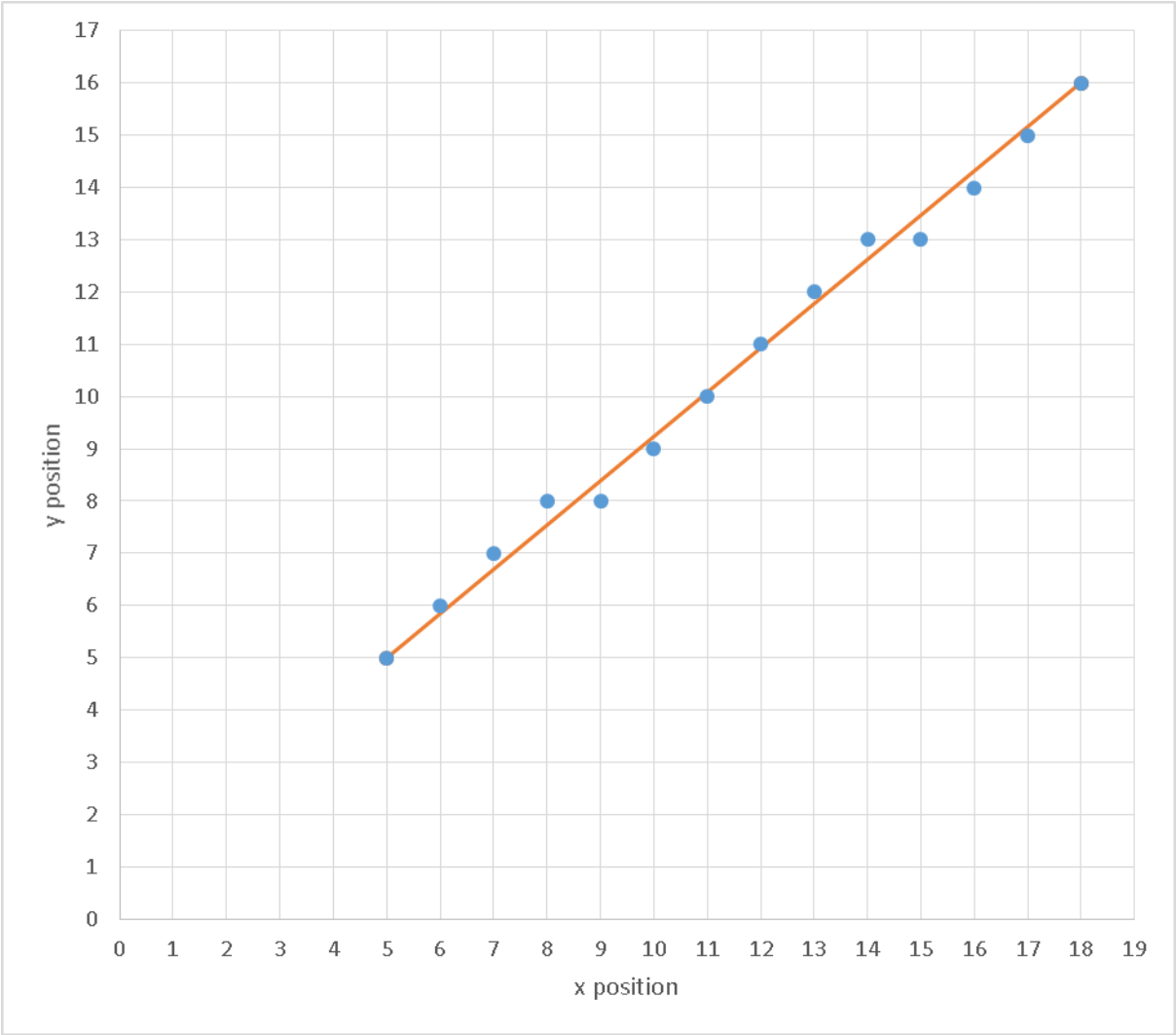
Solution Sheet 8: The Bresenham Algorithm

x	y (before updating)	D (before updating)	y (after updating)	D (after first update)	D (after second update)
5	5	9	6	-17	5
6	6	5	7	-21	1
7	7	1	8	-25	-3
8	8	-3	8	-3	19
9	8	19	9	-7	15
10	9	15	10	-11	11
11	10	11	11	-15	7
12	11	7	12	-19	3
13	12	3	13	-23	-1
14	13	-1	13	-1	21
15	13	21	14	-5	17
16	14	17	15	-9	13
17	15	13	16	-13	9
18	16				


y position
x position
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19