CGIP

2001 p4q10 Solution Notes

p11q10 NAD

(a) The line starts at integer co-ordinates $(x0, y0)$ and ends at $(x1, y1)$, $x1 > x0$

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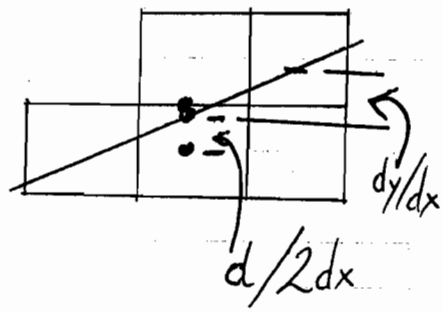
dx = x1 - x0
dy = y1 - y0
x = x0
y = y0
d = 0

'setpixel (x, y)

while ( x < x1 ) do {
    x = x + 1
    if ( d ≥ dx ) then {
        d = d - 2*dx
        y = y + 1 }
    setpixel (x, y)
    d = d + 2 * dy
}
```



Start at $(x0, y0)$. At each step increment x and increment d by $\frac{dy}{dx}$, if d is greater than ½, increment y and decrement d by 1.

To do this in integer arithmetic, multiply all operations involving d by $2dx$.

D&P's algorithm involves finding the farthest point in the line chain from the line joining the two end points.

So: loop through all points, find distance from each point to the line segment joining the end points, find the maximum of these, if the maximum is less than some tolerance then draw the line segment, otherwise subdivide at the maximal point.

Quirks: to find the distance, take the perpendicular distance to the line. If this intersects the line outside the line segment then take the distance to the nearest end point.

When sensible to use? Two criteria: (1) lots of segments $\ll$ a pixel in length & (2) will be drawing the reduced version multiple times.