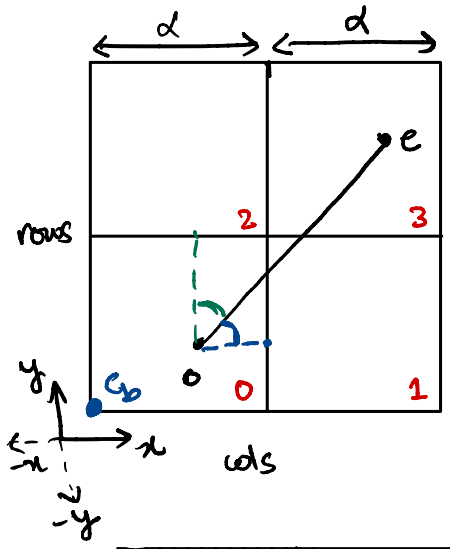


Correct Output: [0, 1, 3]

INITIALIZATION

$d = (e - o)/\|e - o\| \rightarrow d_x, d_y$

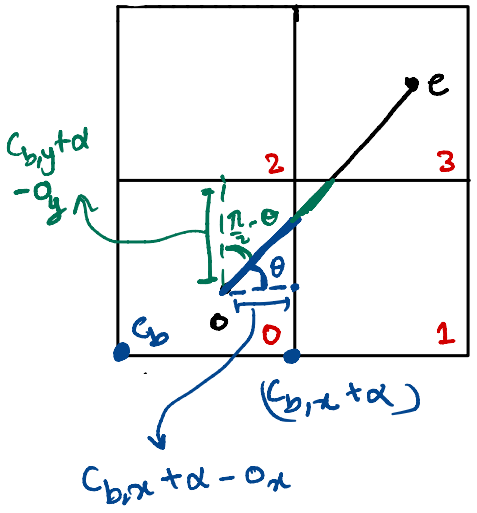
any point on ray along x: $o_x + t\,d_x$
any point on ray along y: $o_y + t\,d_y$

if $d_x > 0$:
  step_col = 1
else if $d_x = 0$:
  step_col = 0
else:
  step_col = -1

if $d_y > 0$:
  step_row = 1
else if $d_y = 0$:
  step_row = 0
else:
  step_row = -1

step_row = 1
step_col = 1

when to step along row?
when along col?



o_x, o_y → lower left hand corners

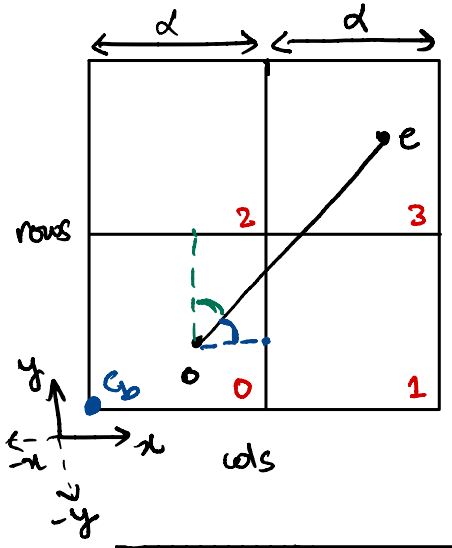
$C_b \rightarrow C_{b,x}, C_{b,y}$

$$\tan\theta = \frac{d_y}{d_x} = \frac{\sin\theta}{\cos\theta}$$

$$\cos\theta = \frac{C_{b,x} + \alpha - o_x}{tMaxX}$$

$$tMaxX = \frac{(C_{b,x} + \alpha - o_x)}{d_x}$$

$$tMaxY = \frac{(C_{b,y} + \alpha - o_y)}{d_y}$$



UPDATE LOOP

if tMaxX < tMaxY:

① step along col

② update tMaxX

else:

① step along row

② update tMaxY

$$tMaxX = tMaxX + \frac{\alpha\,(step\_col)}{d_x}$$

$$tMaxY = tMaxY + \frac{\alpha\,(step\_row)}{d_y}$$

$$\frac{(C_{b,x} + \alpha - O_x)}{d_x}$$

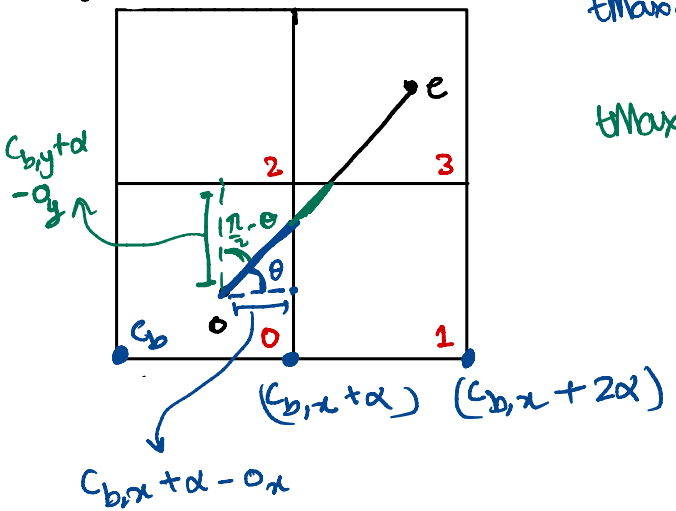
tMaxX

$$\frac{(C_{b,y} + \alpha - O_y)}{d_y}$$

tMaxY

step_col

step_row



UPDATE LOOP

if tMaxX < tMaxY:

① step along col

② update tMaxX

else:

① step along row

② update tMaxY

$$tMaxX = tMaxX + \frac{\alpha\,(step\_col)}{d_x}$$

$$tMaxY = tMaxY + \frac{\alpha\,(step\_row)}{d_y}$$

step_col

step_row

$$\frac{(C_{b,x} + \alpha - O_x)}{d_x} \quad tMaxX$$

$$\frac{(C_{b,y} + \alpha - O_y)}{d_y} \quad tMaxY$$

Numerical example

$\alpha = 0.5$ O_x O_y

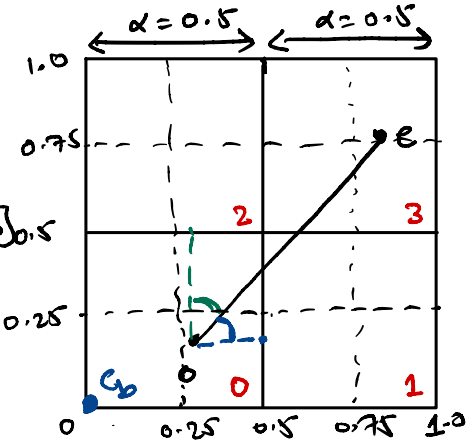
$O = [0.27, 0.13]^T$

$e = [0.8, 0.75]^T$

$e - O = [0.8 - 0.27, 0.75 - 0.13] = [0.53, 0.62]$

$d_x = 0.65$ $dy = 0.76$

$C_b = [0.0, 0.0]$ ($C_{b,x}$, $C_{b,y}$)



cell 0

$tMaxX = 0.35$

$tMaxY = 0.49$

→ go to cell 1

cell 1 updated $tMaxX = 1.12$

$tMaxY = 0.49$

→ go to cell 3

detect you are in "end" cell → exit.

return [0, 1, 3]