

Directed random walk plants

idea from §12.2 of Pickover's
Computers, Pattern, Chaos and Beauty

Algorithm for a *single* stem

0) given the constants:

- α transmission probability [0.0.1.0]
- $\Delta\theta$ maximum change in rotation per step (in radians)
- Δr change in growth segment length per step (in "pixels")

1) initialize variables

- $\theta := \pi/2$ start growing "upwards"
- $r := 1.0$ growth segment length
- $x := \text{imageWidth} / 2$ grow from point (x,y)
- $y := \text{imageHeight} / 2$
- $\beta := (1.0 - \alpha)$ reflection probability [0.0.1.0]
- $\text{direction} := +1 \text{ or } -1$ direction to turn (+1 = left | -1 = right)

2) plot the initial segment

3) determine τ , the virtual coin's *bias*
 if the last turn was to the right
 $\tau := \alpha$
 else
 $\tau := \beta$

4) flip the *biased coin* to determine which direction to turn next
 if $\text{random}[0.0,1.0) > \tau$
 $\text{direction} := +1.0$
 else
 $\text{direction} := -1.0$

5) compute offset from end of the old growth segment to the end of the new one

$$(\mathbf{r}, \theta) := (\mathbf{r} + \Delta\mathbf{r}, \theta + (\Delta\theta * \text{random}[0.0,1.0) * \text{direction}))$$

6) draw a growth segment from the old position to the new position

7) if this stem hasn't finished growing, goto step 3