

Physics and geometry for 2D games

Move

new_position = old_position + distance

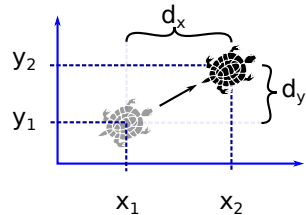
$$x_2 = x_1 + d_x$$

$$y_2 = y_1 + d_y$$

distance = speed * time

$$d_x = s_x * t$$

$$d_y = s_y * t$$



Goniometry

Turtle moves a distance d in direction α .

How to convert it into x , y coordinates (and back)?

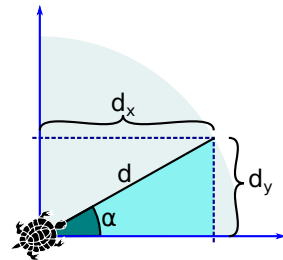
from math import (sin, cos, atan2, sqrt)

$$d_x = d * \cos(\alpha)$$

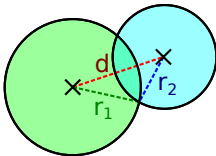
$$d_y = d * \sin(\alpha)$$

$$\alpha = \text{atan2}(d_y, d_x)$$

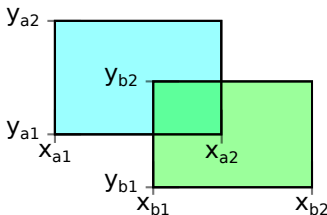
$$d = \text{sqrt}(d_x^2 + d_y^2)$$



Intersection



Circles are intersecting if: $d^2 \leq r_1^2 + r_2^2$



Rectangles are more difficult:

not ($x_{a2} < x_{b1}$ or $x_{b2} < x_{a1}$ or $y_{a2} < y_{b1}$ or $y_{b2} < y_{a1}$)