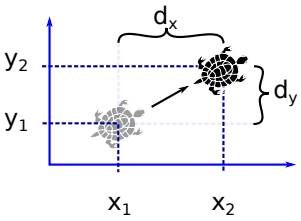
Physics and geometry for 2D games

Move

new_position = old_position + distance
$x2 = x1 + d_x$
$y2 = y1 + d_y$

distance = speed * time
$d_x = s_x * t$
$d_y = s_y * t$

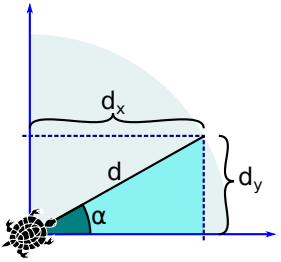


Goniometry

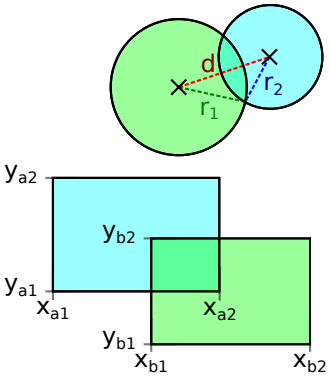
Turtle moves a distance d in direction α.
How to convert it into x, y coordinates (and back?

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: $d^2 \leq r_1^2 + r_2^2$

Rectanfles are more difficult:
not ($x_{a2}<x_{b1}$ or $x_{b2}<x_{a1}$ or $y_{a2}<y_{b1}$ or $y_{b2}<y_{a1}$)