

1. Character Movement (Points and Vectors)

$$\odot \xrightarrow{\vec{v}} \vec{v} = (0, 1) \quad \uparrow$$

$$\vec{v} = (x, y) \quad \text{GAMES}$$

$$\text{Position} \quad P = (x, y) \quad P' = P + V$$

$$P' = (P_x + \vec{V}_x, P_y + \vec{V}_y)$$

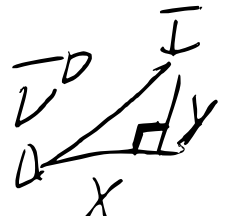
2. Character Movement (Subtracting Vectors)

P
I Vector which moves
I to P

$$\Rightarrow \vec{v} = P - I$$

$$\vec{v} = (P_x - I_x, P_y - I_y)$$

3. Character Movement (Vector Length)



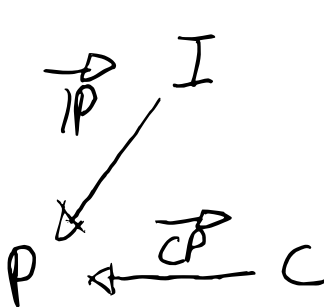
$$\vec{V} = (0, L) = (x, y)$$

$\rho \quad a^2 = b^2 + c^2 \quad |\vec{V}|$

$$|\vec{V}| = \sqrt{\vec{V}_x^2 + \vec{V}_y^2}$$

$$|\vec{V}| = \sqrt{x^2 + y^2}$$

4. Fast Distance Comparison Trick



$$|\vec{CP}|$$

$$|\vec{IP}|$$

4. Character Movement 4 (Vector Scaling)

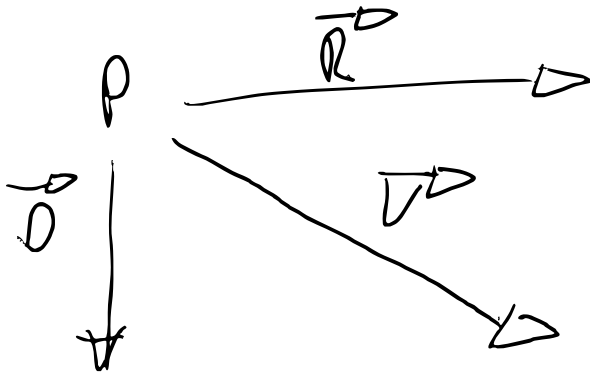
$$\vec{v} \rightarrow 2\vec{v} = (\vec{v}_x * 2, \vec{v}_y * 2)$$

$$\frac{\vec{v}}{2} = \left(\frac{\vec{v}_x}{2}, \frac{\vec{v}_y}{2} \right)$$

5. Character Movement (Unit-Length Vectors)

$$\begin{array}{l} \vec{p} \xrightarrow{|\vec{p}|} \vec{1} \quad |\vec{p}| = 1 = \vec{p} \\ \vec{p} \downarrow \\ \triangle \end{array} \quad \hat{p} = \frac{\vec{p}}{|\vec{p}|}$$

Character Movement 6 (Adding Vectors)

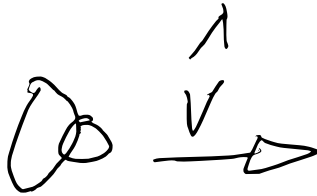


$$\vec{V} = \vec{R} + \vec{D}$$

9. Backstabbing



R



B

$$\hat{B}\vec{R} = \frac{\vec{R} - \vec{B}}{|\vec{R} - \vec{B}|}$$

DOT PRODUCT

$$|\vec{a}| \cdot |\vec{b}| \cdot \cos(\theta)$$

Math / Physics

$$\vec{a}_x \vec{b}_x + \vec{a}_y \vec{b}_y$$

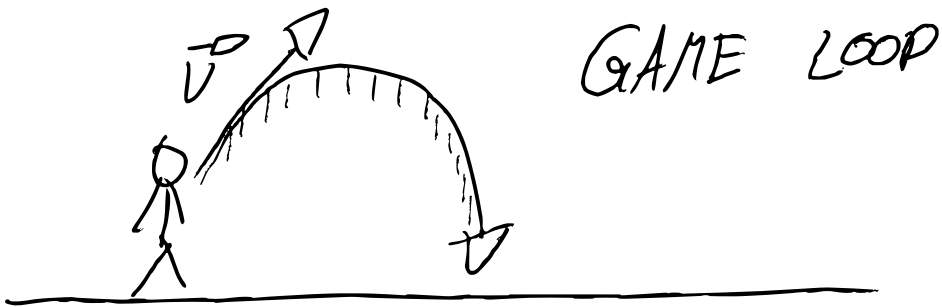
GAMES / ENG

$$\vec{v} = 1$$

$$= 0$$

$$= -1$$

M. Math for Game Developers - Jumping and Gravity (Time Delta, Game Loop)



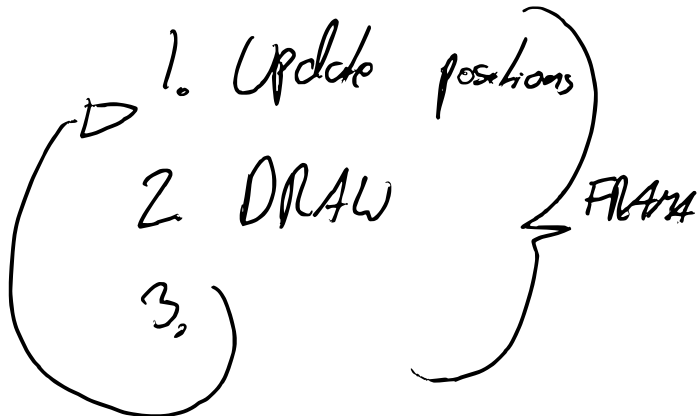
GAME LOOP



$$\Delta t = t' - t$$

$$30 \text{ FPS } \frac{1}{60} = .01\overline{6}$$

$$60 \text{ FPS } \frac{1}{60} = .01\overline{6}$$



$$m' = m + \Delta t \vec{v}$$

$$\vec{v} + \vec{v} + \Delta t \vec{g}$$

Mario. position = Point (0,0)

Mario. velocity = Vector (2,2)

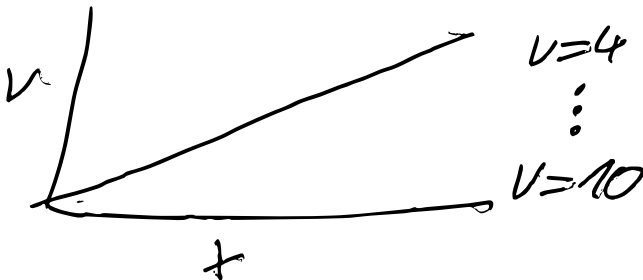
Mario. gravity = Vector (0,-2)

2. Math for Game Developers

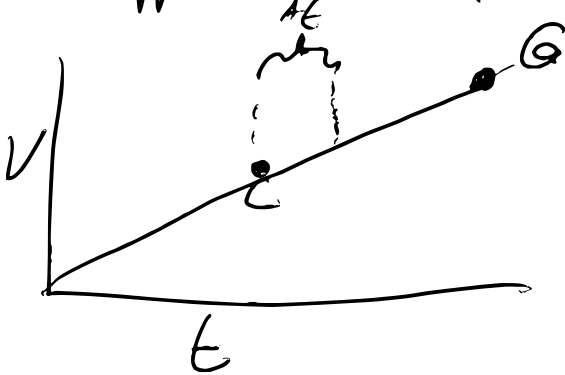
Smooth Movement (Linear Interpolation)



Interpolate
(Lerp)



Approach $(G, C, \Delta t)$



IF $C \leq G$
Return $C + \Delta t$

ELSE
Return G

(12) - Important

(13) Math for Game Devs - Mouse Control (Euler Angles)

Pitch \updownarrow

Yaw $\leftarrow \rightarrow$

Roll $\curvearrowright \curvearrowleft$

(P, Y, R)

$\rightarrow (x, y, z)$

