EPITECH. TECHNOLOGY

Mathematics

B-MAT-100

Maths at Epitech ?

- No paper equations solving
- All formulas are given
- You only need to implement formulas !

Module presentation

- 5 mini-projects (B1)
- 2 weeks per project
- Groups of 1-2 people
- Free language ! (Everything on the dump)
- 2 Reviews (Boni, tests and organization)

What will you learn ?

- Linear algebra
- Geometry
- Non-linear equation solving

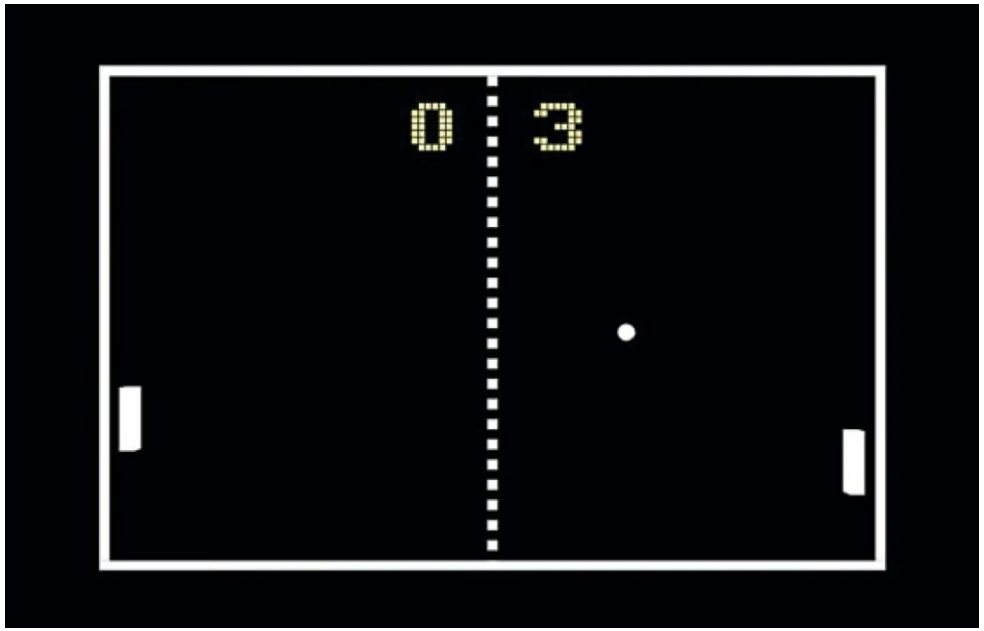
EPITECH. TECHNOLOGY

101pong

B-MAT-100

Pong

- Arcade: 1972
- 2 players



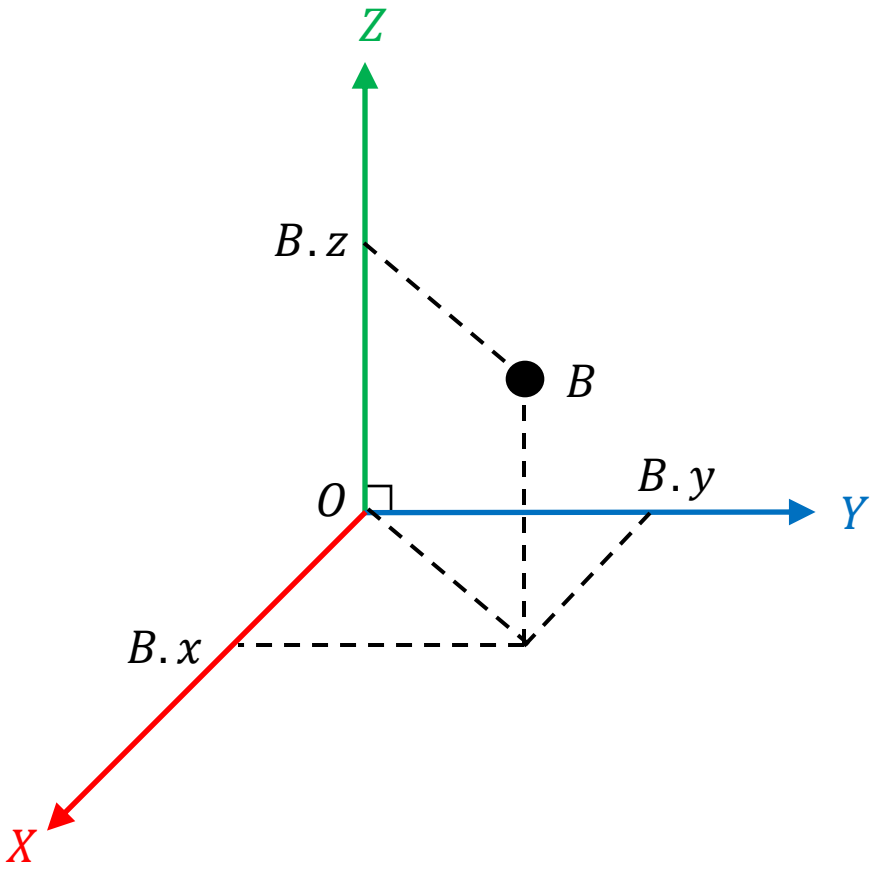
Project goal

- Infinite paddle
- Ball with velocity

Project goal

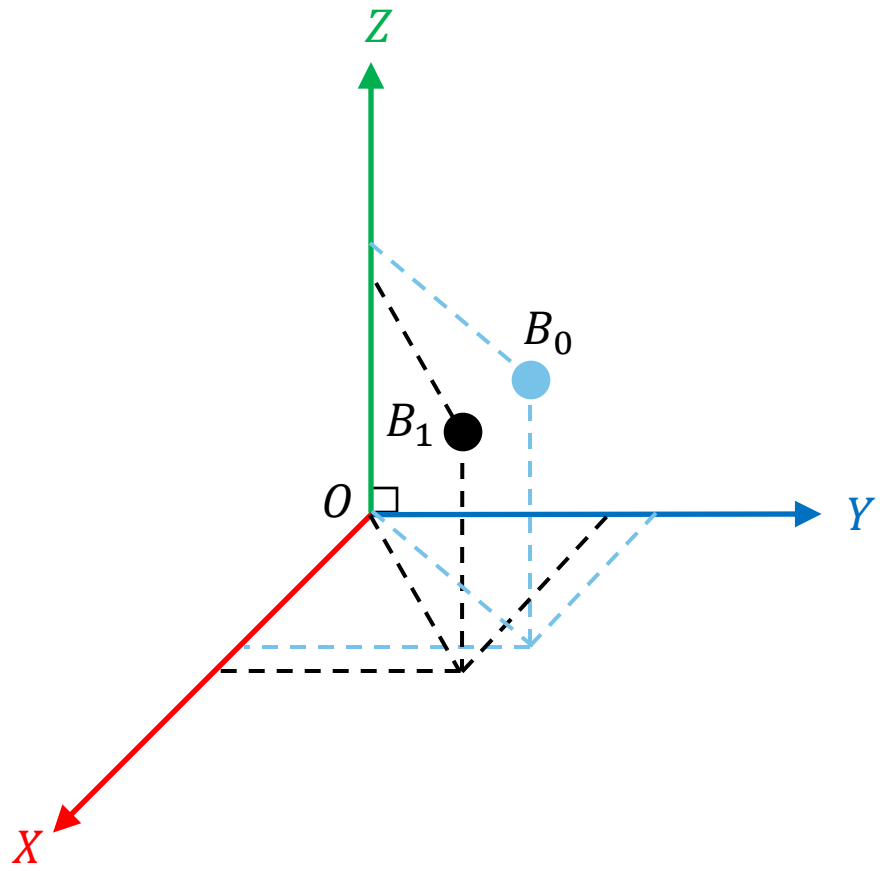
- Compute the velocity of the ball
- Move the ball
- Check for collision with the paddle
- Compute angle at which it hits the paddle

Coordinate system



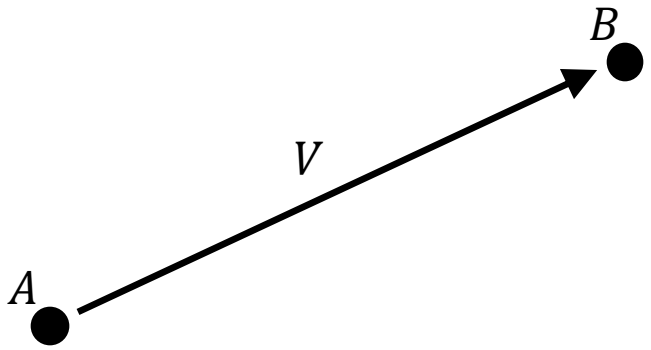
$$B(x, y, z)$$

Coordinate system



$$B_0(x_0, y_0, z_0)$$
$$B_1(x_1, y_1, z_1)$$

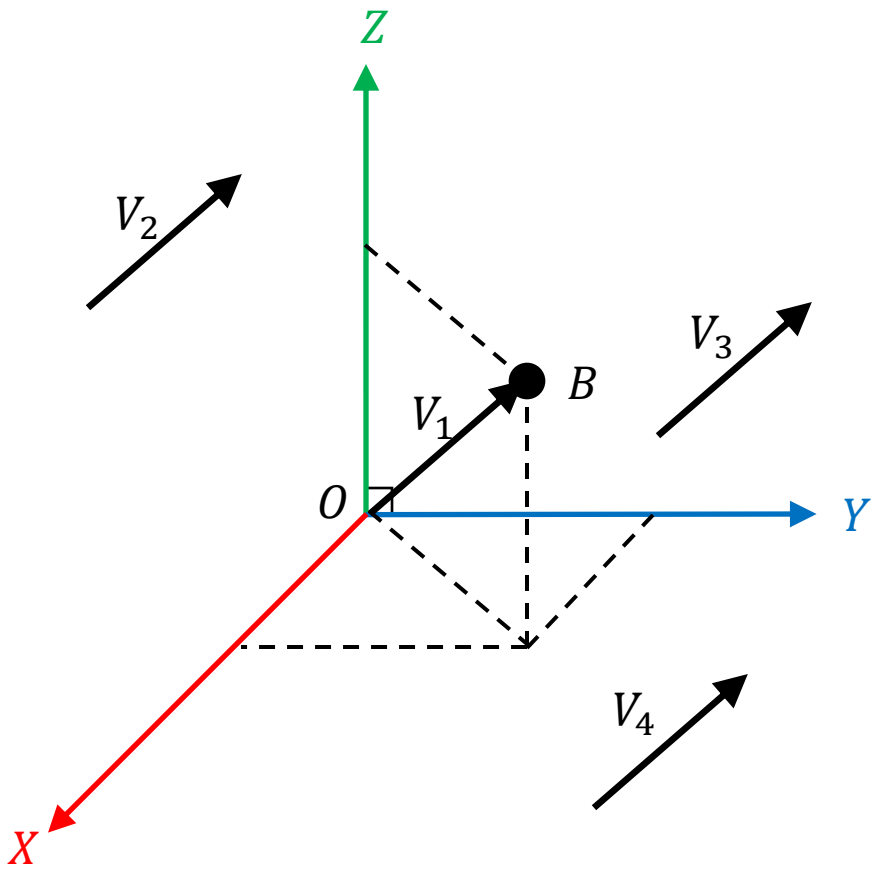
Vectors



$$A(x_A, y_A, z_A)$$
$$B(x_B, y_B, z_B)$$

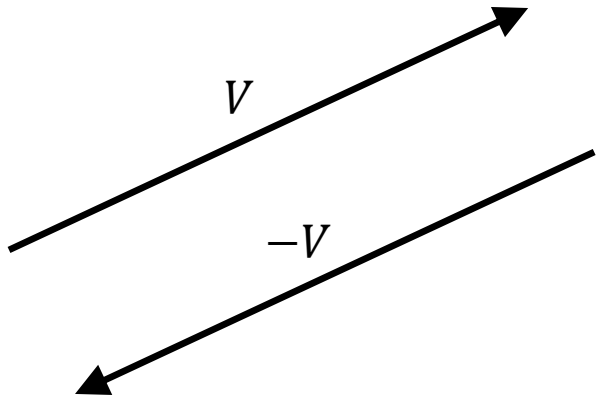
$$V = B - A$$
$$V = (x_B - x_A, y_B - y_A, z_B - z_A)$$

Vector



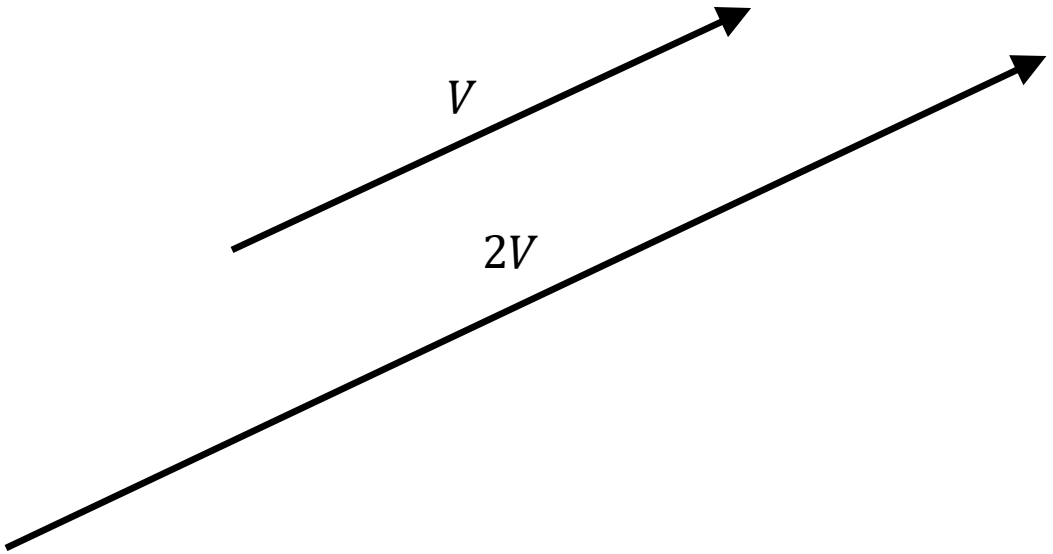
$$B = V_1 = V_2 = V_3 = V_4$$

Operations on vector



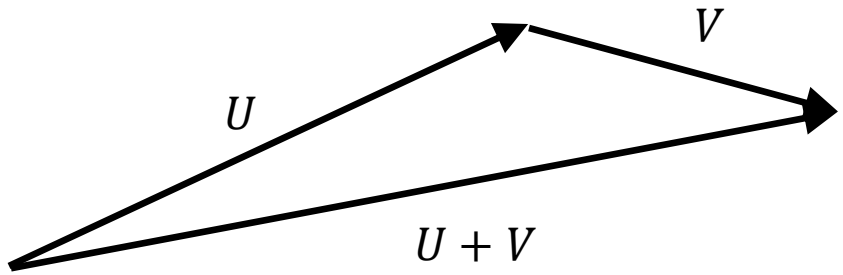
$$V = (x, y, z)$$
$$-V = (-x, -y, -z)$$

Operations on vector



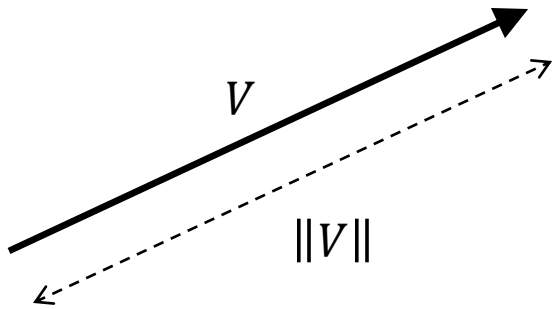
$$V = (x, y, z)$$
$$2V = (2x, 2y, 2z)$$

Operations on vector



$$U(x_U, y_U, z_U)$$
$$V(x_V, y_V, z_V)$$
$$U + V = (x_U + x_V, y_U + y_V, z_U + z_V)$$

Operations on vector

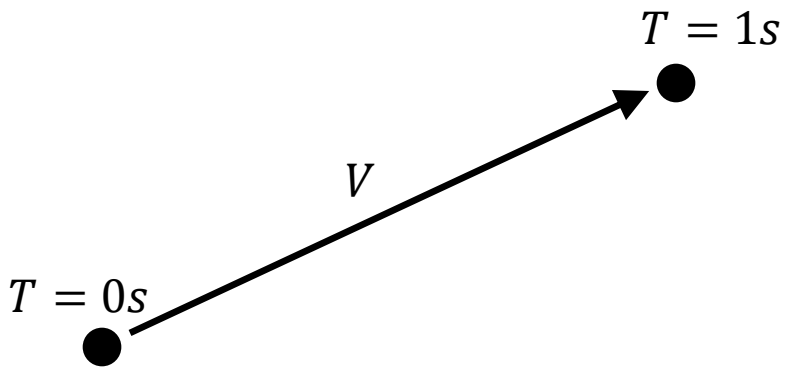


$$V(x, y, z)$$

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

Velocity

- Speed = Distance / Time
- Velocity is speed and direction
- Velocity is a vector !



$$\text{Speed} = \|V\|$$

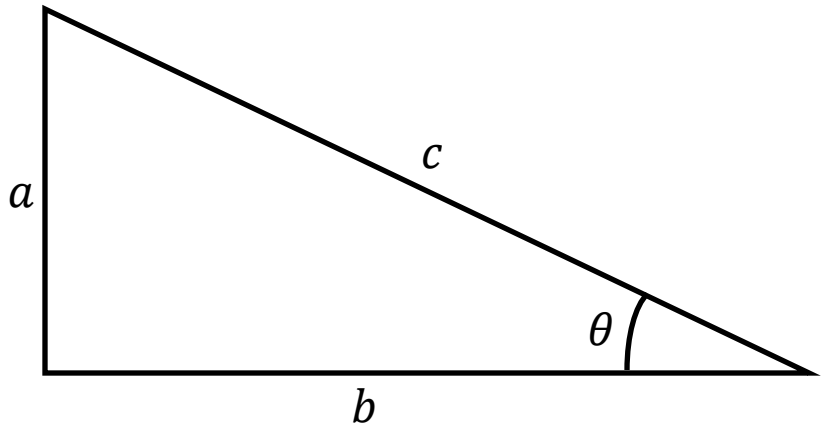
Angles: degrees vs radians

Angle	Degrees	Radians
Zero angle	$0°$	0
Right angle	$90°$	$\pi/2$
Straight angle	$180°$	π
Full angle	$360°$	2π

$$r = \left(\frac{\pi}{180}\right) d$$

$$d = \left(\frac{180}{\pi}\right) r$$

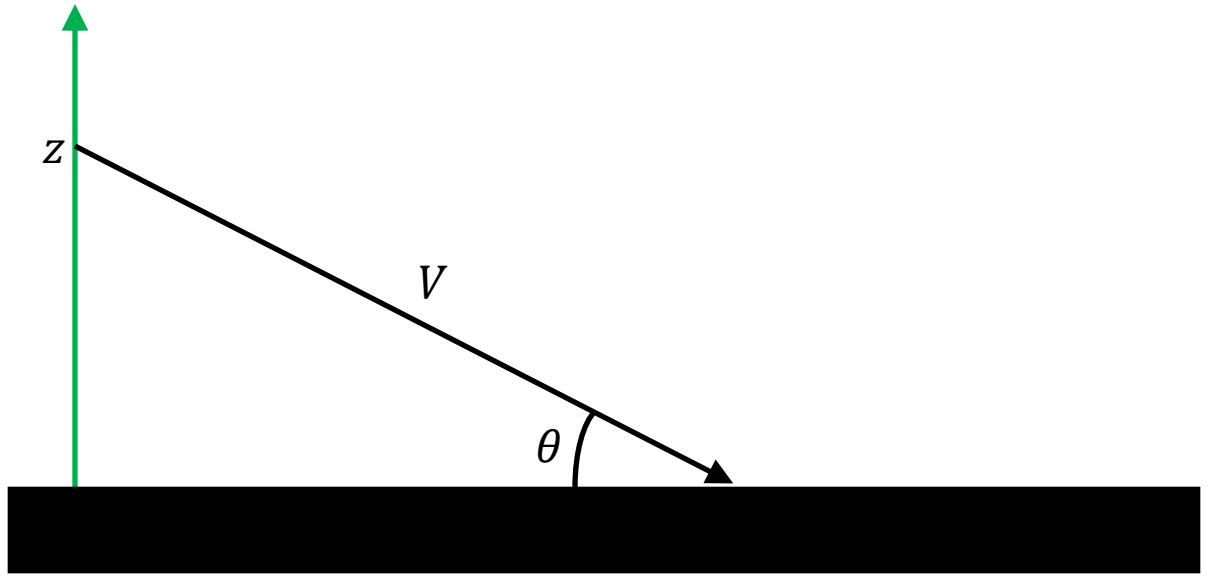
Trigonometry



$$\sin\theta = \frac{a}{c} \quad \Rightarrow \quad \theta = \arcsin\frac{a}{c}$$

$$\cos\theta = \frac{b}{c} \quad \Rightarrow \quad \theta = \arccos\frac{b}{c}$$

Trigonometry



$$\theta = \arcsin\left(\frac{z}{\|V\|}\right)$$

Boni ideas

- Compute acceleration
- Graphical interface
- Full game…