Development of a platform with 2 DoF to assist the cooperation between grounded mobile robots and UAVs in landing operations

Presented by José Lima

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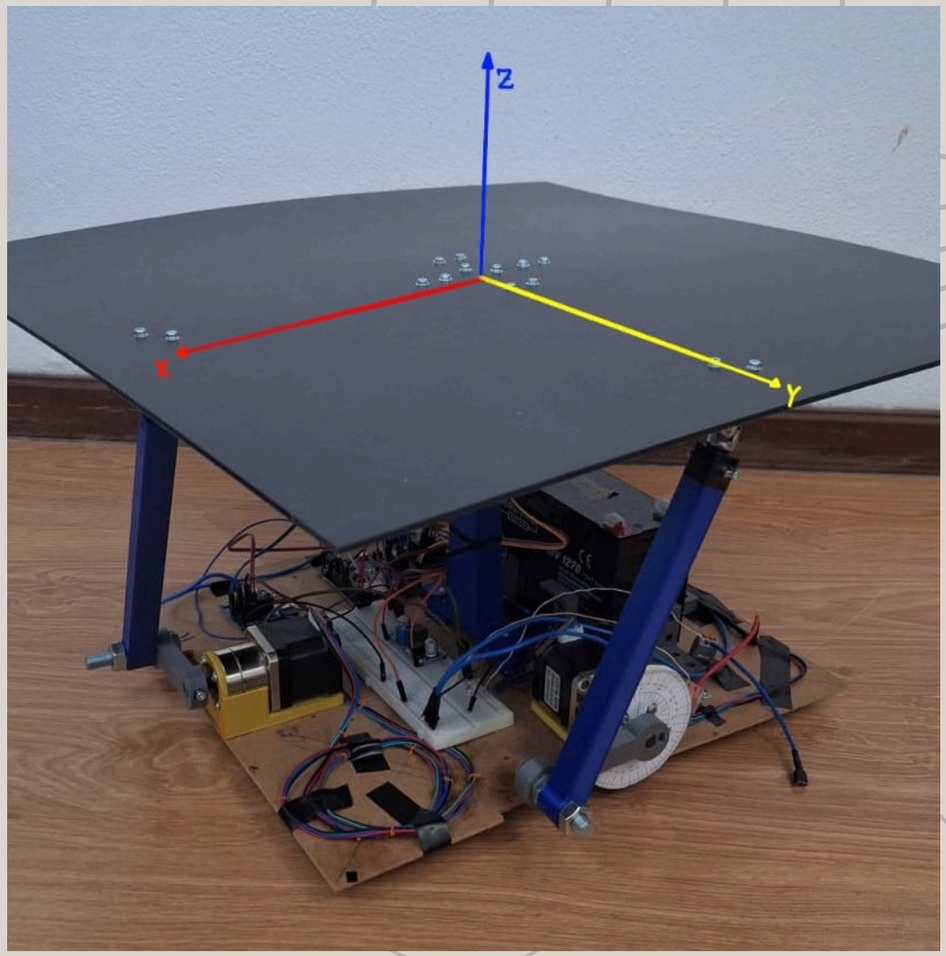
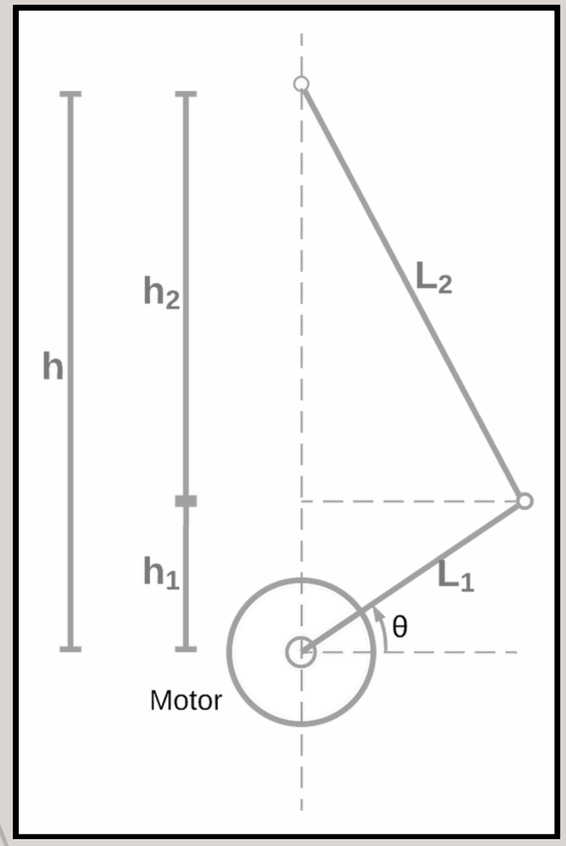
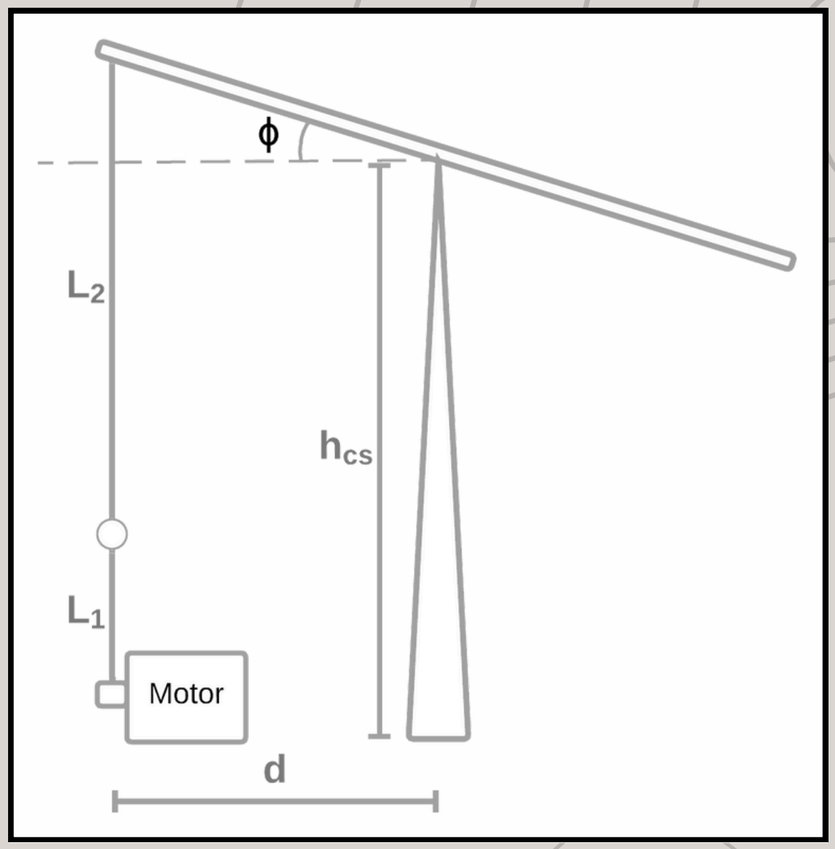
Prototype

- Bidirectional platform
- 2 Degrees of Freedom
- Hardware: ESP32
- Motors: NEMA17 with gear box
- Sensor: ADXL345 Accelerometer



Kinematics analisys

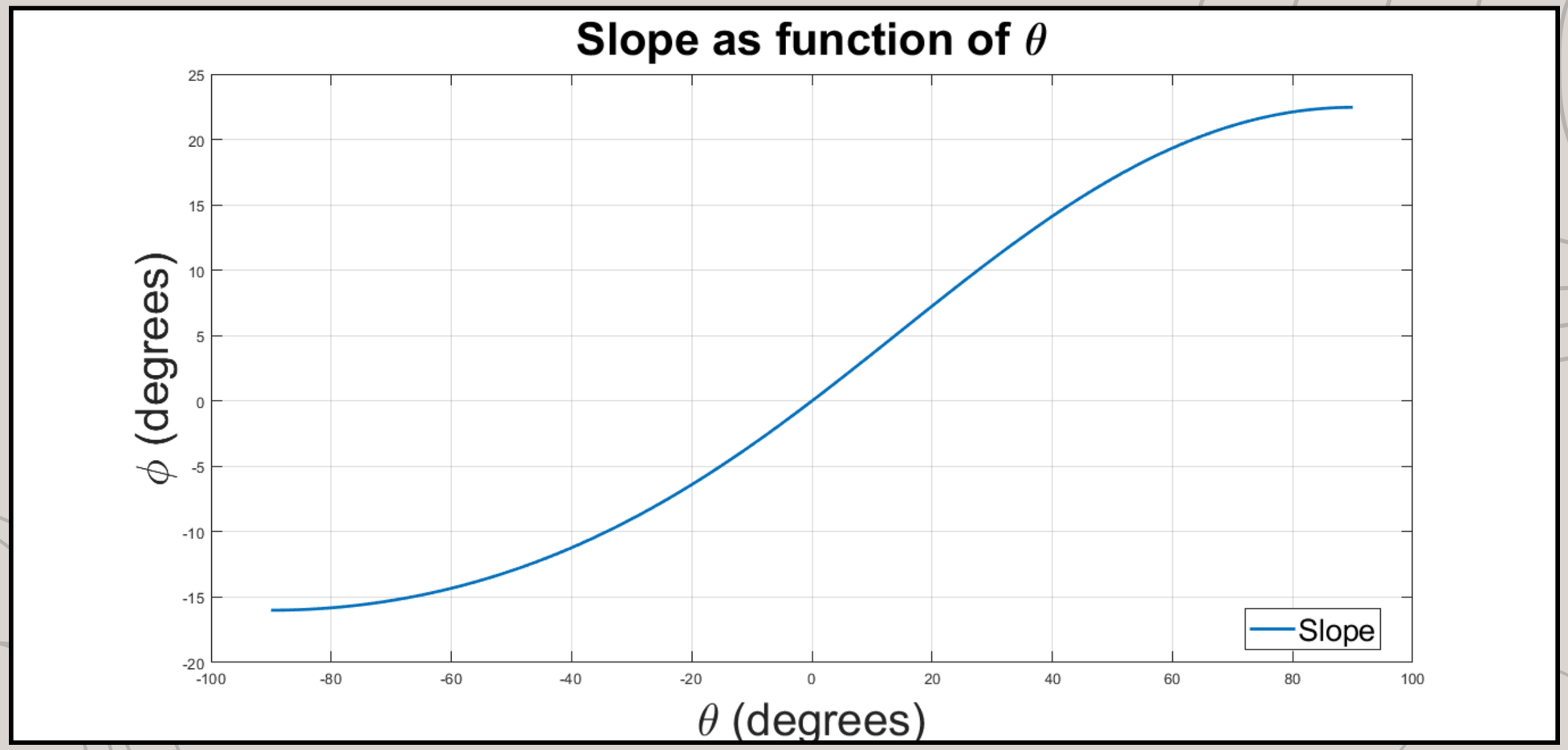




$$h(\theta) = L_1 * \sin(\theta) + \sqrt{L_2^2 - (L_1 * \cos(\theta))^2}$$

$$\phi(\theta) = \arctan \frac{h(\theta) - h_{cs}}{d}$$

Kinematics Analisys



Minimum Angle: -16

Maximum Angle: 22.45

Data Filtering

Exponential moving average filter

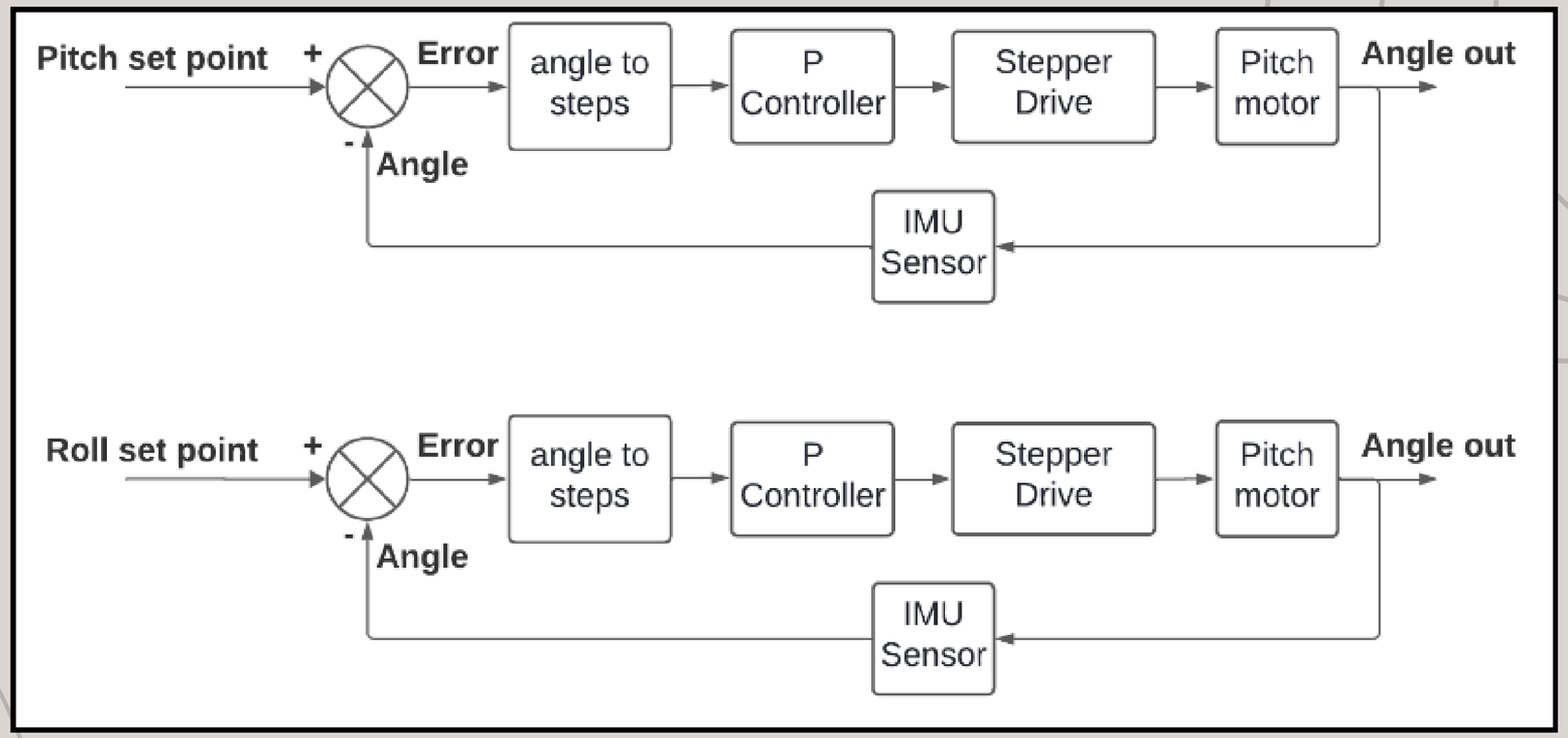
$$y[0] = \frac{y[-1] * N + x[0]}{N + 1}$$

Applying over the 3 accelerations measured to calculate Pitch and Roll

$$Pitch = \arctan(\frac{a_y}{\sqrt{a_x^2 + a_z^2}})$$

$$Roll = \arctan(\frac{-a_x}{a_z})$$

Control Diagram



Step Response

Kp: 0.8