Teaching materials
Deliverable 3. Position control

MISCE project

Mechatronics for Improving and Standardizing Competences in Engineering

Competence: Control Engineering

Workgroup: Universidad de Castilla-La Mancha
Universitat Politècnica de València

This document corresponds to the third deliverable for the competence ‘Control Engineering’ using the ‘DC-motor control platform’

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Index of contents

1 PID controller (actions)

Please, write the angular position transfer function identified in the previous lesson:

$$G(s) = \frac{\Theta(s)}{V(s)} = \frac{K}{s(Ts+1)} = \frac{A}{s(s+B)} = \quad (1)$$

Please, write the tuned PID controller:

$$R(s) = K_p + K_i \cdot \frac{1}{s} + K_d \cdot s = \quad (2)$$

For an input reference of $\theta^* = 1.5708$ rad, please compare the simulated and experimental results, including:

- The reference tracking: $\theta^*(t)$ and $\theta(t)$, simulated and experimental ones.
- The control signals: $V(t)$, simulated and experimental ones.

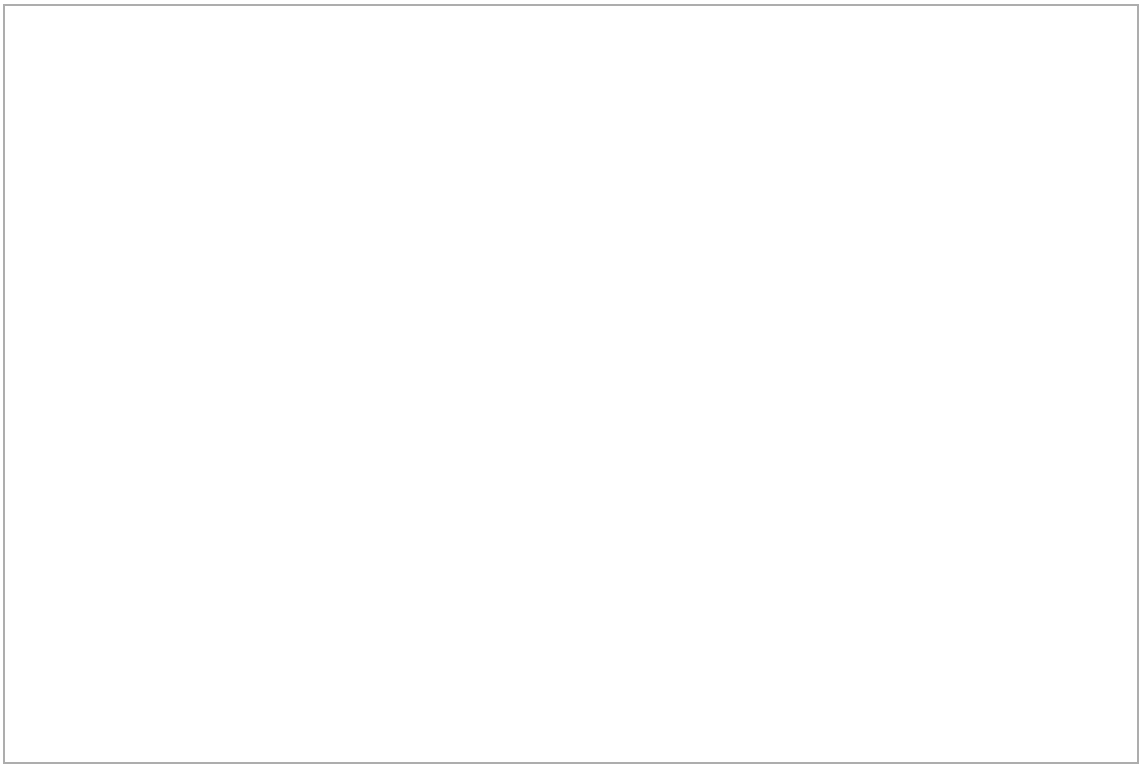

Figure 1. Graphic representation of the reference tracking: $\theta^*(t)$ vs. $\theta(t)$, both simulations and experiments

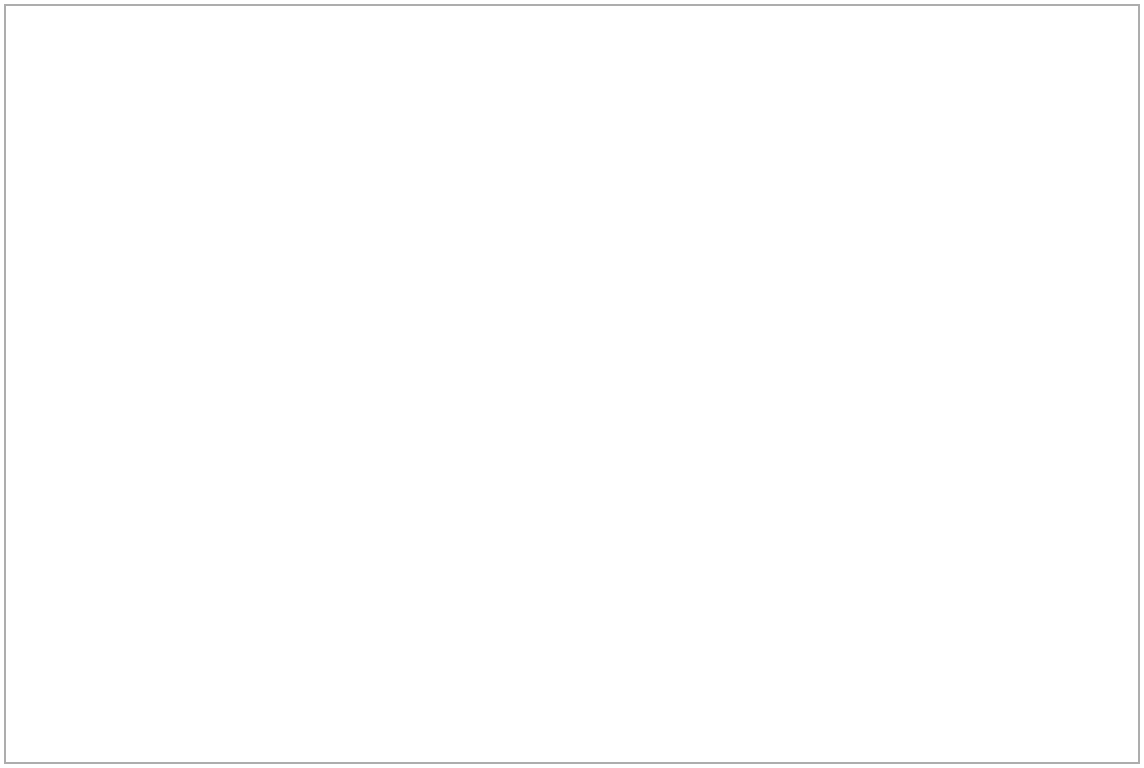

Figure 2. Graphic representation of the control signal: V(t), both simulations and experiments

Repeat for an input reference of $\theta^* = 6.2832$ rad/s, comparing the simulated and experimental results. Introduce an output disturbance at the end of the experiment moving manually the dial.

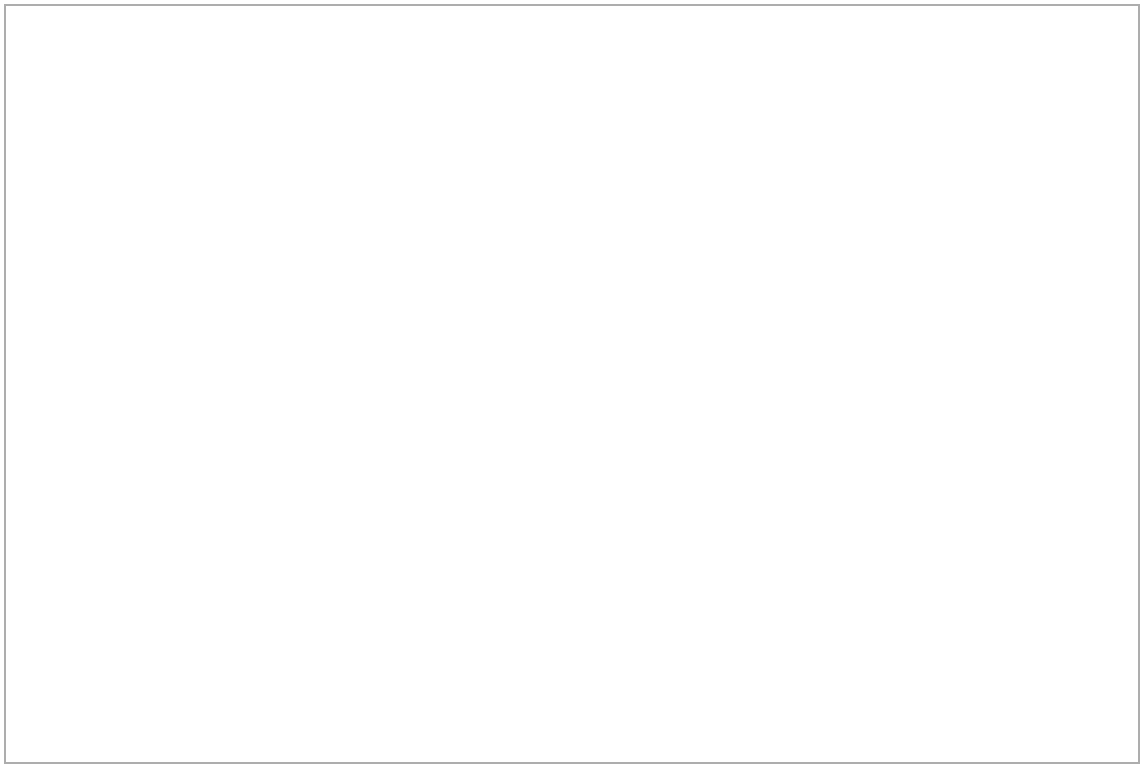

Figure 3. Graphic representation of the reference tracking: $\theta^*(t)$ vs. $\theta(t)$, both simulations and experiments

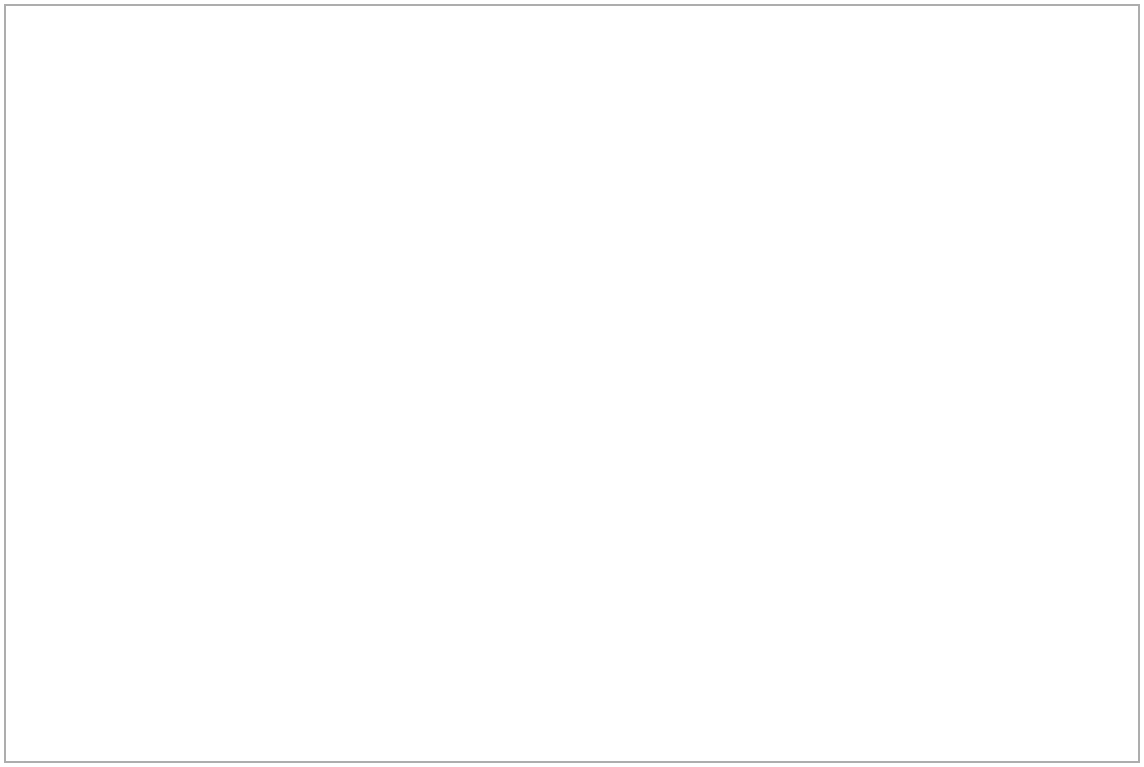

Figure 4. Graphic representation of the control signal: V(t), both simulations and experiments

Comment the obtained results and the relevant differences between simulations and experiments.

2 PID controller (zeros/poles)

Please, write the tuned PID controller:

$$R(s) = k \cdot \frac{s+c}{s+p} \cdot \frac{s+c_i}{s+p_i} = \quad (3)$$

For an input reference of $\theta^* = 1.5708$ rad/s, please compare the simulated and experimental results, including:

- The reference tracking: $\theta^*(t)$ and $\theta(t)$, simulated and experimental ones.
- The control signals: $V(t)$, simulated and experimental ones.

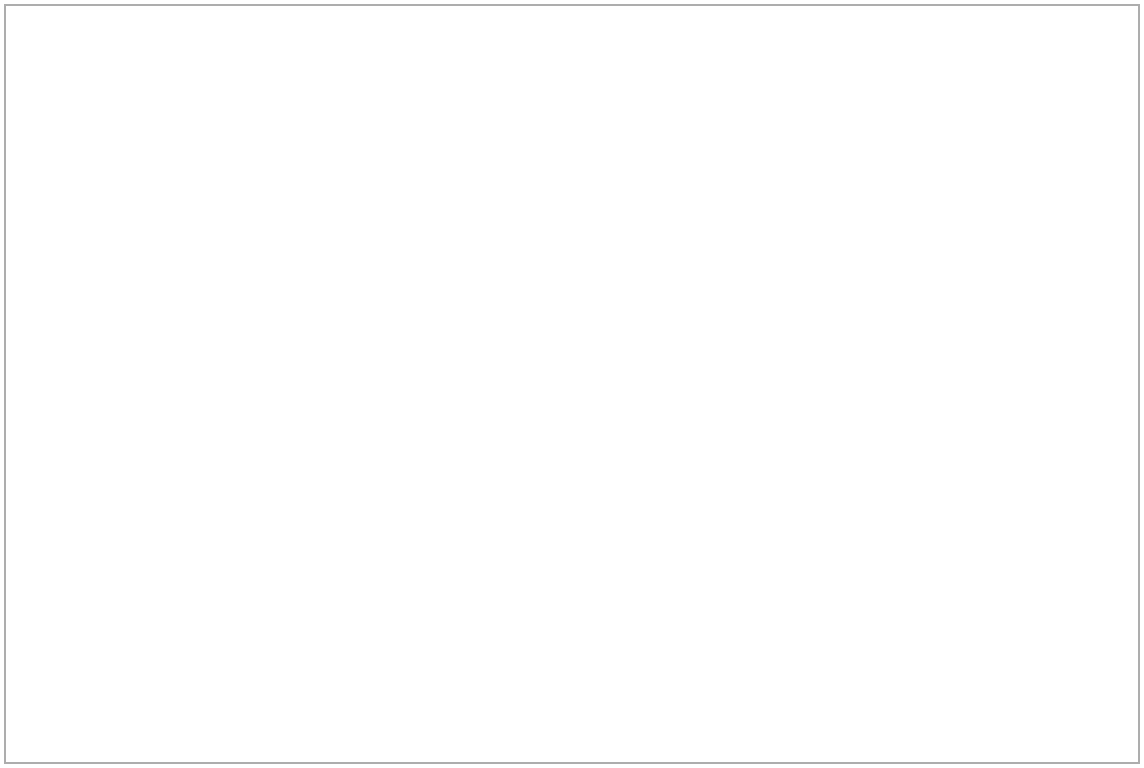

Figure 5. Graphic representation of the reference tracking: $\theta^*(t)$ vs. $\theta(t)$, both simulations and experiments

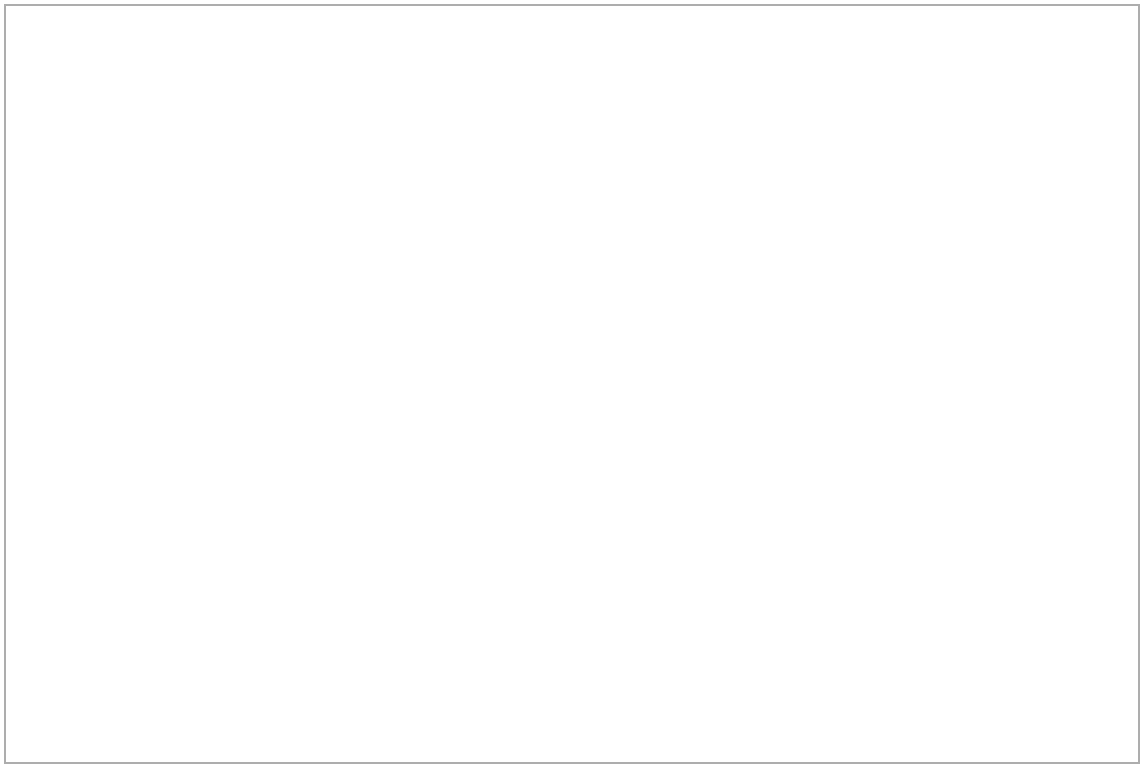

Figure 6. Graphic representation of the control signal: V(t), both simulations and experiments

Repeat for an input reference of $\theta^* = 6.2832$ rad/s, comparing the simulated and experimental results. Introduce an output disturbance at the end of the experiment moving manually the dial.

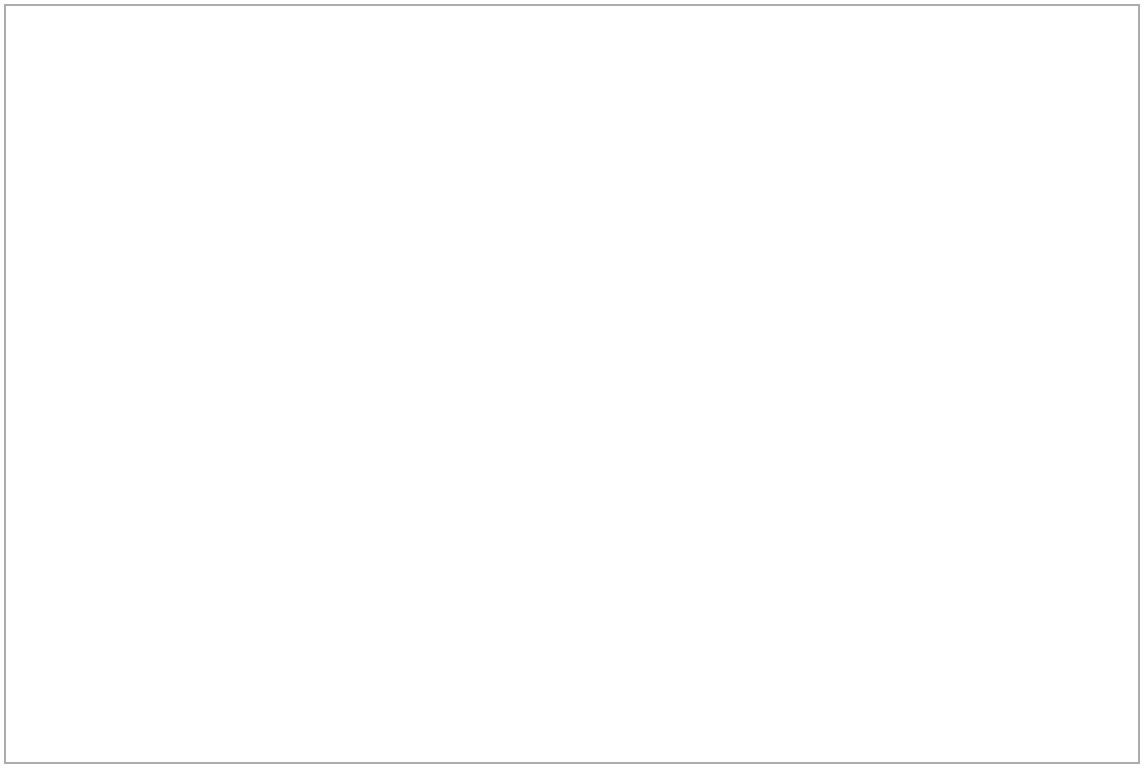

Figure 7. Graphic representation of the reference tracking: $\theta^*(t)$ vs. $\theta(t)$, both simulations and experiments

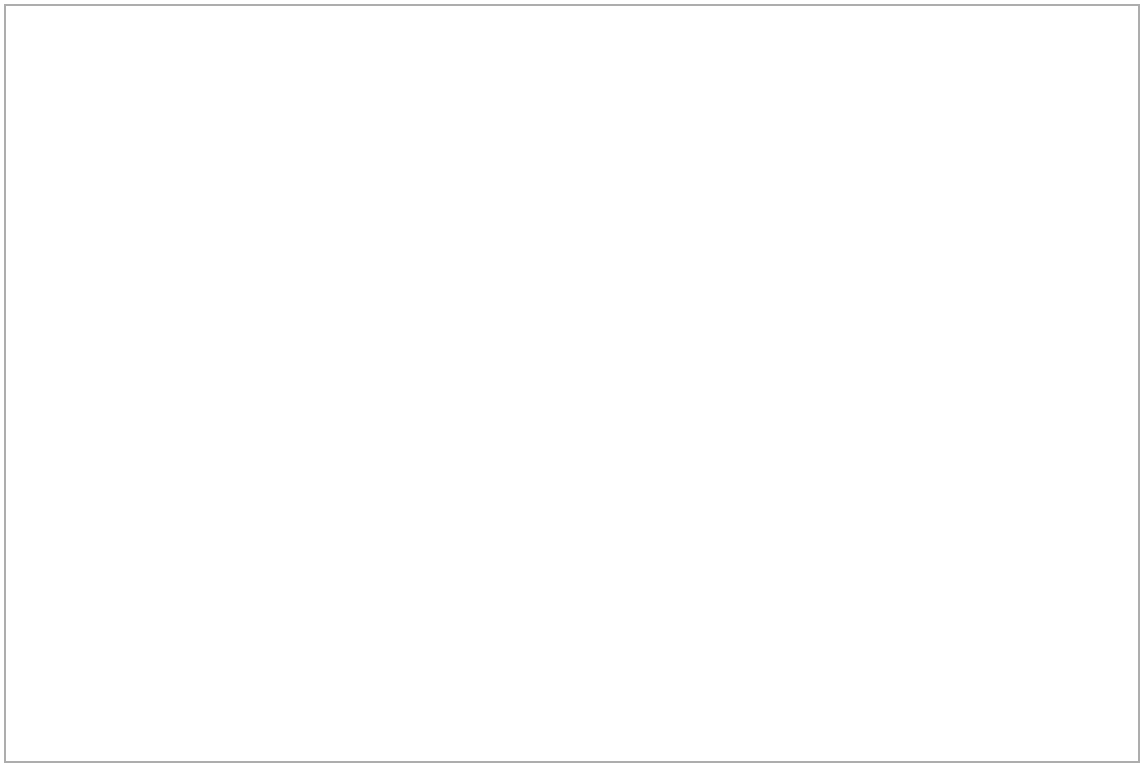

Figure 8. Graphic representation of the control signal: V(t), both simulations and experiments

Comment the obtained results and the relevant differences between simulations and experiments.