Teaching materials

Guide notes 2. Velocity 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 second lecture for the competence ‘Control Engineering’ using the ‘DC-motor control platform’

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1 Objective

The main objective of this lesson is to tune a PID type controller for the velocity control of the output shaft of the DC-motor control platform. For this purpose, the identified transfer function of lesson 1 shall be used.

Let's assume the control scheme of Figure 1.

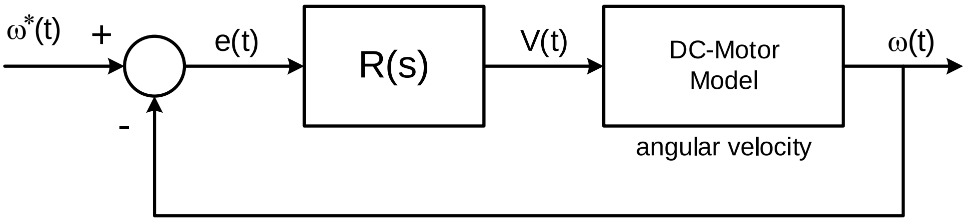

Figure 1. Control scheme: angular velocity

with the identified first order plant of the first practice lesson:

$$G_\omega(s) = \frac{K}{Ts+1} = \frac{A}{s+B} \tag{1}$$

2 PID controller (actions)

The PID controller in terms of its proportional, integral and derivative actions can be written as:

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

Controller (2) shall be tuned to satisfy the following control requirements:

- An established settling time, t_s.
- Overshoot, $M_p \approx 0\%$.
- Steady state error, $e_{ss} \approx 0$.

Please, detail here the tunning method for controller (2).

3 PID controller (zeros/poles)

The PID controller can be also written in terms of a set of zeros/poles as:

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

Controller (3) shall be tuned to satisfy the following control requirements:

- An established settling time, t_s.
- Overshoot, $M_p \approx 0\%$.
- Steady state error, $e_{ss} \approx 0$.

Please, detail here the tunning method for controller (3).