

Report Assignment 2: Velocity control of the cart

Academic year 2021 – 2022

Matthias Derez, Toon Servaes

1 Introduction

In this report, two velocity controllers for DC motors are designed, using frequency response methods. The main criterion states that the velocity controller yields a zero steady-state error on a constant velocity reference.

2 Design of the controller

2.1 Type of the controller

To satisfy the criterion of zero steady-state error, multiple controllers can be used. A PI, PID and feedforward controller can all yield a zero steady-state error. The feedforward controller can be especially useful for tracking. However, as the controller must yield a zero steady-state error on a constant velocity reference and deal with errors caused by disturbances, the feedforward controller will not be used. Since a large bandwidth yields a fast responding system, a high bandwidth seems advantageous. If the bandwidth is too high though, the high frequency noise has more influence. A trade-off between the two has to be chosen. Generally the sampling frequency has to be at least 10-20 times larger than bandwidth (REFERENTIE C8 S82). Because of this, the PI controller is chosen, as the extra bandwidth delivered by the PID part is unnecessary.

2.2 Design parameters

2.3 Limitations on bandwidth

3 Validation of the controller