

Two-degrees-of-freedom (2DOF) Controller for Speed Regulation of a DC Motor

Bachelor's Thesis (Earliest start date: Beginning of 2024)

Traditional PID controllers map the deviation of a system output (or controlled variable) from a given reference value to a system input (or manipulated variable). Usually, a trade-off between reference tracking and disturbance rejection needs to be made, since only one of these goals can be achieved by the classical formulation of PID controllers. By introducing feedforward control into the setup (see block diagram on the right), another degree of freedom can be added to the control configuration. This is referred to as two-degrees-of-freedom (2DOF) control. With the right tuning a 2DOF controller is able to track a reference and reject disturbances simultaneously. In this work, a 2DOF PID controller shall be designed and ultimately used to control the speed of a DC motor via an Arduino microcontroller.

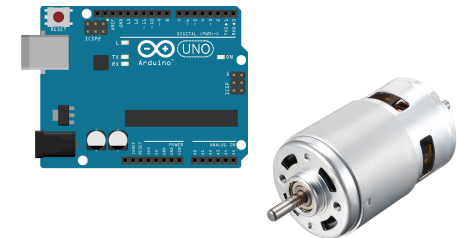
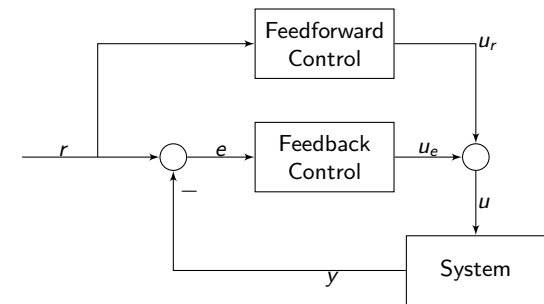
Your tasks will be:

1. Literature review on 2DOF PID control
2. Implementation of 2DOF PID control in Python (preferably HILO-MPC¹)
3. Experimental comparison to other control configurations using the example of a DC motor

Experience with /
knowledge about: Control theory, electrical engineering

Programming skills: Python (good to very good skills required), Arduino (basics)

Language: English (thesis and presentation), German



Arduino schematics taken from <https://arduino.cc>
and DC motor taken from <https://walmart.com>

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¹ https://www.ccps.tu-darmstadt.de/research_ccps/hilo_mpc/index.en.jsp