

Integration Project Systems and Control (SC42035)

Flexible link Experiment

Description

The 'flexible link' setup consists of two DC motors with vertical disks with pulleys connected by a thin elastic belt. One of the motors is used to drive the belt, while the angle of the other motor is the controlled variable. The other motor can serve either as a passive load or it can be used to actively impose disturbances (for a short time duration only!). Figure 1 shows the system, including a schematic with the relevant variables.

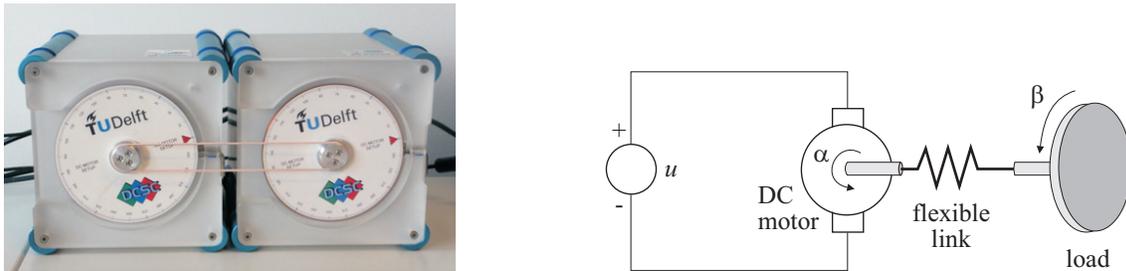


Figure 1: Left: a photograph of the flexible link setup. Right: a schematic drawing.

This system has one control input u , which is the voltage applied to the driving motor. This input is commanded from the computer and is scaled between -1 and +1. There are two measured outputs: α – the angle of the driving motor shaft, and β – the angle of the load. Both angles are measured in radians.

Control Objective

Design a controller that makes the load angle β follow a specified reference trajectory. The controlled system should have zero steady-state error and adequate disturbance rejection properties, i.e., it should be able to recover from disturbances. As an intermediate step you could first control the angular velocity of the second motor.

Simulink Template

A Simulink template `flextemplate.mdl` contains the necessary real-time interface blocks and some scopes. Make your own copy of this file (and other files in the same directory) and use it as a starting point for your experiments. Before starting the first simulation, define the sampling period h as a variable in the MATLAB workspace.