

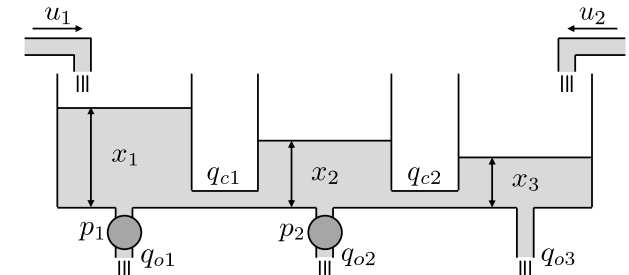
Optimization-based Two-Degree of Freedom Controller for a Three-Tank System

Bachelor's Thesis

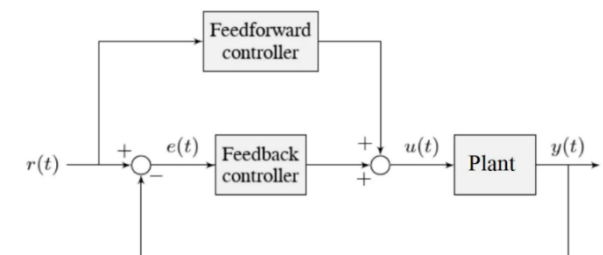
Many processes, such as the height control of a three-tank system, require tracking a time-varying reference signal as close as possible during operation. As part of the research in our department, an optimization-based two-degree of freedom controller was developed for such a scenario [1]. Under the assumption that no complete physical system model is available, a data-based surrogate model is required for the controller. To ensure high control performance, this surrogate model must approximate the real system sufficiently accurately.

Within the scope of this bachelor's thesis, you will further investigate the idea of combining a two-degree of freedom control structure with elements of optimization-based or adaptive approaches. Hereby, you will first conduct a literature review concerning optimization-based and adaptive approaches for reference tracking problems. As an example process, an interconnected three-tank system will be used. You will then use the control structure outlined in [1] to control the three-tank system in a simulation environment. Once this is accomplished, two research directions are possible. First, you can move from the simulation environment to an experimental setup of the three-tank system to test the real-world control performance. Or second, you stay in the simulation environment to test out different variations of the control structure and compare their control performances.

For this bachelor's thesis, basic knowledge in the area of control engineering, especially with two-degree of freedom control structures is required. Furthermore, knowledge in system modeling and programming with Matlab/Simulink would be desirable. If you are interested or have any questions, feel free to contact me.



[1] Häusser et al., „Data-driven adaptive two-degree of freedom control of interconnected systems for reference tracking“, 2023, Accepted



Source:

<https://docs.wpilib.org/en/stable/docs/software/advanced-controls/introduction/tuning-flywheel.html>

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