

# Redundancy Analysis and Control Design for a Glucose Separation Process

## Project Seminar (2-3 people)

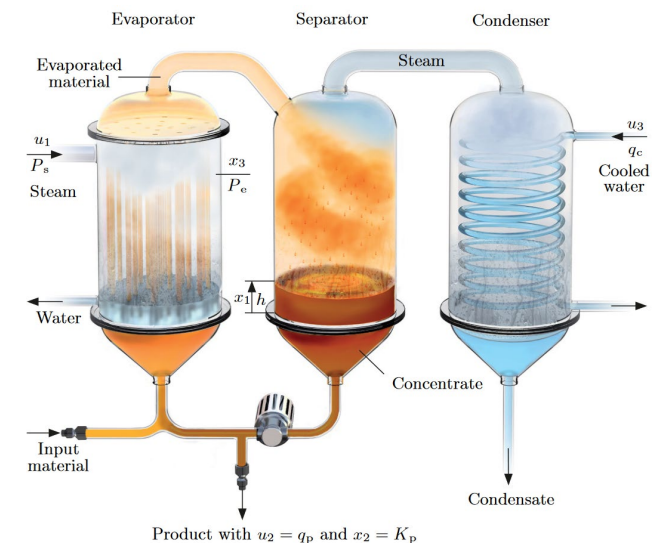
Many industrial control systems have a multitude of actuators mounted at different positions in the plant. This situation can cause advantageous redundancy structures to be present in the system. However, these structures may be difficult to identify. In this project, the concept developed in [1] for analyzing redundancy structures in dynamic systems is to be examined for a Glucose Separation Process (GSP) as it shown in the picture. This includes the following tasks:

- Thorough familiarization with reachability techniques for dynamic systems
- Application of [1] to a linearized model of the GSP
- Development and validation of a new strategy for including nonlinearities/nonlinear systems with application to the GSP
- Implementation of a generic analysis framework that is ready for parallel-computing and that displays the results in an intuitive manner.
- Integration of the redundancy properties into control design with a comparison to [2]

Prerequisites: Motivation, creativity, strong programming skills, a strong understanding of mathematics and nonlinear control systems

[1] Schaub, P., „Actuator Redundancy and Safe Operation Abilities of Nonlinear Systems“, IFAC World Congress, 2023

[2] Paulson, J.A. et. al. „Fault-tolerant tube-based robust nonlinear model predictive control“. American Control Conference, 2019.



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