

DIPLOMA THESIS

Model predictive control of cultivations in the bioreactor

Content:

This master's thesis focuses on the development and validation of a cutting-edge control strategy for bioreactors. To control growth and product formation of microorganisms efficiently and safely, a dynamic model of the bioreactor shall be derived to accurately capture key biological and chemical processes. Next, state observers will be designed and implemented to estimate unmeasured variables, enabling robust feedback control. Building on these foundations, a Model Predictive Control (MPC) approach will be tested, aiming to optimize process performance while ensuring stability and safety. Finally, the entire concept will be validated at an industrial facility, bridging the gap between theory and practice and demonstrating the potential of advanced control techniques to increase productivity, reduce costs, and enhance sustainability in large-scale bioprocesses.

Tasks:

- Mathematical modelling of a bioprocess in the bioreactor
- Implementation and comparison of state observers
- Development of an MPC control strategy
- Implementation and testing of the algorithms on a testbed

Requirements:

- Be willing to work and deepen your knowledge in Python and C++.
- Have some control theory knowledge in control theory and are willing to deepen it.
- Independent way of working

The work can be written in German or English.

If you are interested or have any questions, please do not hesitate to contact.

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