

# Non-linear Model Predictive Control and State Estimation in a Continuous Polymerization Reactor

## Abstract:

Thanks to the astonishing progress in the computer hardware and optimizing algorithms, optimization-based controllers have found industrial applications. In order to fulfil various quality, environmental or economic constraints, many applications need to use the non-linear model of system.

A case study of such applications is the implementation of a non-linear model predictive control (NMPC) in a tubular polymerization reactor. The first goal of this study is to design a NMPC scheme which implements the optimization problem in a simultaneous approach. The advantage of this approach is that the derivatives of the cost function and constraints can be computed analytically which could reduce the computation time of the optimal inputs.

State estimation in distributed systems is a difficult task because the number the measurements compared to the number of the states is scare. As the second goal of this thesis, an extended Kalman filter (EKF) will be designed which is used to reproduce the system states and some of its important parameters.

