

Using Functional Mock-up Units for Nonlinear Model Predictive Control

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A software framework for prototyping of Nonlinear Model Predictive Control (NMPC) loops is presented that is based on the standardized model exchange format FMI (Functional Mock-up Interface). Arising optimal control problems are solved by an efficient implementation of the direct multiple shooting method, which is especially suitable for nonlinear and stiff system models. Using co-simulation, an optimizer, plant, and estimator can be coupled to a closed NMPC loop. Several stages of a typical control design process are supported, ranging from virtual simulation experiments to real plants with prototype NMPC controllers. Energy efficient control of vapor compression cycles is presented as example application of the proposed methods.

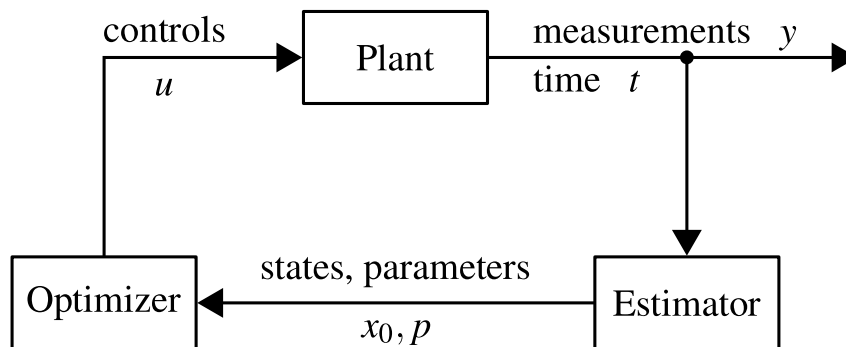


Figure 1: Signal flow diagram of closed NMPC loop.