Institut für Kommunikations-Technik

Leibniz Universität Hannover

Bachelor or Master Thesis:

Implementation and Analysis the Application of Controlling a Robot Arm Using Model Predictive Control

Networked control systems are the feedback control systems with connection of system components (sensors, controllers, and actuators) distributed at different locations through a communication network. As a result of traffic congestion in network connection and the limitation of bandwidth and packet size, there will usually be some constraints including network-induced delay, packet loss, packet reordering, jitter, signal sampling, and quantization errors. Due to the existence of such constraints in communication networks, the analysis and design of an NCS is complex and can degrade the performance and even destabilize the system. To overcome the adverse effect of these communication constraints, various approaches have been developed, among which a representative one is model predictive control (MPC). The basic idea in this approach is to use a model of the process or system (to be controlled) in order to predict and optimize future process behavior. This approach proposes a controller, which compensates for the network time delay and packet loss actively.

Tasks:

- Implementation of model predictive controller
- Performance analysis of the designed software with the implemented MPC
- Analysis of the system despite a high delay and a considerable packet loss
- Compare the implemented MPC with other controllers

Requirements:

- Programming experience in C++ or Python
- Good knowledge in control theory (Model Predictive Control)
- Knowledge in communication network
- Considerable motivation and ambitiousness

If you are interested, please contact:

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