

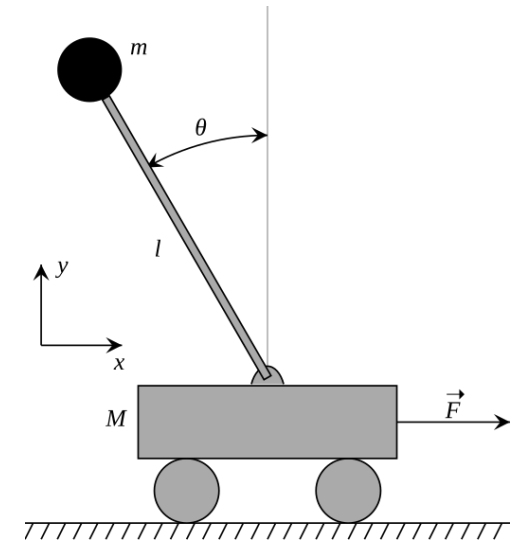
Application of Model Predictive Control for an Inverted Pendulum

Proseminar

Controlling unstable or nonlinear systems, such as an inverted pendulum, is a classical challenge in control engineering. The inverted pendulum serves as a benchmark problem for testing the capabilities of advanced control methods due to its inherent instability and nonlinear dynamics while being of manageable system size. Model predictive control (MPC) uses a mathematical description of the system dynamics to calculate the optimal input sequence to achieve a defined control objective. Hereby, MPC can explicitly consider system constraints and the future behavior of the system to compute optimal control actions in each time step.

Within the scope of this Proseminar, you will first conduct a literature review on the fundamental concepts of MPC, including its mathematical formulation and optimization principles. Based on this foundation, you will then explore existing approaches to apply MPC for controlling an inverted pendulum system. The objective is to gain a mathematical understanding of how MPC can be designed and implemented to control dynamic systems, in preparation for more advanced studies and research in the field of control engineering.

In order to learn scientific working, a written report (approx. ten pages) is to be handed in and a short scientific presentation (approx. ten minutes) is to be given. If you have any questions, feel free to contact us.



Source: <https://commons.wikimedia.org/wiki/File:Cart-pendulum.svg>

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