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MASTER'S THESIS
for
N.N.
Student ID XXXXXXXX, Degree EI

Information-constrained control of Euler-Lagrange systems

Problem description:

Most of the works that address information-constrained control of interconnected systems focus on linear system (see e.g. [1]), where the information constraints are induced by one-step delay between neighboring decision makers. Little focus has been given to nonlinear systems. This is of particular relevance when considering robot teams which can be modelled via Euler-Lagrange equations whose dynamics are highly nonlinear.

To this end, the potential lies in considering a hierarchical control scheme where first such nonlinear system is linearized via feedback linearization [2], and then an approach that handles information constraints is applied on top of it, as a function of the delay present between individual controllers.

Tasks:

- Literature research on team decision theory and Euler-Lagrange systems
- Design of a control architecture that guarantees optimality with respect to a cost function defined and satisfaction of information constraints induced by communication speed
- Experimental evaluation

Bibliography:

- [1] Andrew Lamperski and Laurent Lessard. Optimal decentralized state-feedback control with sparsity and delays. *Automatica*, 58:143–151, 2015.
- [2] Christian Ott, Ranjan Mukherjee, and Yoshihiko Nakamura. Unified impedance and admittance control. In *2010 IEEE International Conference on Robotics and Automation*, pages 554–561. IEEE, 2010.

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