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M A S T E R ' S T H E S I S
for
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Simulation study on control concepts for a floating platform manipulation

Problem description:

Mobility can be provided to the robots by, for example, legs (two, four, or more), wheels, and wings. In this project, we propose a wire-suspended floating platform on which robotic manipulator is mounted to perform an arbitrary task. The robotic system can achieve mobility by changing the length of the wire. The platform can be easily stabilized if we attach enough number of wires [3], [2], but the complexity will be significantly increased, so the resulting system may become less practical. For simpler setup, we mainly tackle the single-wire configuration in which the platform may suffer from the counter-movement caused by manipulation tasks. To overcome this, a model predictive control will be considered because it allows us to easily incorporate constraints in the formulation [1] . In this project, we expect that we can provide a new direction of imparting mobility to robotic manipulators.
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Tasks:

- Investigate possible hardware configurations, and suggest the best one (or pros and cons of each configurations) to the research community
- Propose control methods (e.g. model predictive control) that compensate the counter-movement caused by the manipulation task
- Provide validity of the approach by simulation studies

Bibliography:

[1] Burhanettin Durmuş, Hasan Temurtaş, and Yumuşak. A study on industrial robotic manipulator model using model based predictive controls. *Journal of intelligent manufacturing*, pages 233–241, 2009.
[2] Jonghoon Park, Wan-Kyun Chung, and Wonkyu Moon. Wire-suspended dynamical system: stability analysis by tension-closure. *IEEE transactions on robotics*, pages 298–308, 2015.
[3] Philipp Tempel, Philipp Miermeister, Armin Lechler, and Andreas Pott. Modelling of kinematics and dynamics of the ipanema 3 cable robot for simulative analysis. pages 419–426, 2015.

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