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Modeling and Control of a Cube-Shaped Reaction Wheel-Based Inverted Pendulum

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Abstract:

About ten years ago, a research group from ETH Zurich introduced the Cubli, a robotic cube that is able to balance on its edge or corner and to jump from lying flat to its corner by suddenly braking its reaction wheel. Thanks to their inspiration, the problem of modelling and control of a robotic cube as well as its various modifications, has become popular but also challenging task, which is not only visually attractive but also has real-life engineering applications. The student should mathematically model the dynamics of a cubical robot, and construct a functional prototype (with at least one reaction wheel). Subsequently, the student should design a control system for self-bouncing and self-balancing of a cube robot on its edge. It is supposed that several control approaches will be tested and the obtained results (even though the negative ones) will be compared and discussed.

Literature:

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