



Seminar



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Interplay between integral feedback and discontinuous Coulomb friction: novel sliding-mode based solution for old control engineering problem

April 14th, h. 11:00 am

Seminar room, Polo Ferrari 2, Via Sommarive 5, Trento

Speaker

Michael Ruderman, University of Agder, Norway

Stick-slip behavior, known as a noticeable phenomenon in control practice and studied for a long time, is often caused by using integral action in feedback control systems with Coulomb friction. The convergence of such closed-loop dynamics to a set reference point is not trivial and requires a coherent distinction of motion trajectories between alternating sticking and slipping phases. A novel solution to analyze the convergence of feedback-controlled systems with Coulomb friction was proposed in § based on standard first-order sliding modes. Such an approach can describe, in a closed manner, the entering in and escape from the sticking phases, assuming the simplest but also most common Coulomb friction law with discontinuity at zero-velocity crossing. The talk will also focus on the largest invariant set of equilibrium points around zero equilibrium and demonstrate possible convergence scenarios, showing an unavoidable emergence of stick-slip cycles. Several numerical examples as well as the published motivating experimental observations of different researchers will accompany the presented analysis.

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