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Speaker: Amélia C.D. Caldeira

Title: Model Predictive Control for path-following and vehicle formations

Abstract:

In this presentation we discuss the use of Model Predictive Control (MPC) to address the problem of path-following of nonholonomic systems and vehicle formation. We address the path-following problem by converting it into a trajectory-tracking problem and deter mine the speed profile at which the path is followed inside the optimization problems solved in the MPC algorithm.

We propose also a two-layer scheme to control a set of vehicles moving in a formation. The first layer, the trajectory controller, is a nonlinear controller since most vehicles are nonholonomic systems and require a nonlinear, even discontinuous, feedback to stabilize them.

The trajectory controller, a model predictive controller, computes control law and only a small set of parameters needs to be transmitted to each vehicle at each iteration. The second layer, the formation controller, aims to compensate for small changes around a nominal trajectory maintaining the relative positions between vehicles. MPC was shown to be an adequate tool to solve the problem of path-following of nonholonomic systems in an effective and relatively easy way and for control of vehicles in a formation.

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