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Title. Distributed output-feedback observer-less consensus control of nonholonomic systems over networks with communication delays

Abstract. Nonholonomic systems cannot be asymptotically stabilized to a point via smooth time-invariant feedback. This is due to a structural obstruction than cannot be overcome via feedback. In this talk, we will present the so-called delta-persistently-exciting controllers. They rely on a time-varying function that excites the system's modes while the stabilization error persists and vanishes with the error trajectories, uniformly and asymptotically. Then, we address the formation consensus problem for swarms of nonholonomic systems. Consensus formation is inherently a set-point stabilization problem since it consists in the robots acquiring a formation fixed on the plane at a set-point that is not specified a priori. The consensus-formation problem inherits the difficulties of set-point stabilization and consensus control. The controllers are distributed since, for each robot, they depend on local coordinates and measurements received from close-by neighbours. It is assumed, however, that the robots do not possess velocity sensors and communicate over a wifi network. The latter induces time-varying delays. The controllers are delta-persistently-exciting and they rely on passive filters whose outputs are used in place of the unavailable velocities. These filters, however, are not state estimators. Thus, at least in the present context of output-feedback control, our results obviate the need for distributed state estimation. Work carried out in collaboration with E. Nuño and E. Panteley.