State Estimation of Hybrid Dynamic Systems by Monte Carlo – Based (Particle) Filtering

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Abstract

The dynamics of many engineered systems is characterized by transitions among discrete modes of operation, each one giving rise to a specific evolution in time. The estimation of the state of these hybrid dynamic systems requires keeping track of the transitions among the multiple modes of system dynamics. In this paper, a Monte Carlo-based estimation method is illustrated with an application to a case study of literature which consists of a tank filled with liquid, whose level is autonomously maintained between two thresholds. The system behaviour is controlled by discrete mode actuators, whose states are estimated by a Monte Carlo-based particle filter on the basis of noisy level and temperature measurements.

Keywords: *Hybrid dynamic systems, system behaviour, state estimation, Monte Carlo method, particle filter.*