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Design of Hybrid Systems with Applications

Abstract: A large class of dynamical systems has variable structures subject to deterministic or random changes, which may result from the abrupt phenomena such as component and interconnection failures, parameters shifting, tracking, and the time required to measure some of the variables at different stages. Systems with this character may be modelled as hybrid ones, that is, to the continuous state variable, a discrete variable called the mode, or operating form, is appended. The mode describes the changes or random jumps of the system parameters and the occurrence of discontinuities. On the other hand, in order to control the behaviour of a system, we should capture the system's salient features in a mathematical model. Indeed, any model of practical systems almost always contains some type of uncertainty. So the modelling and design should take into account the uncertainty inherent to a model of the system in order to maintain stability and performance specifications in the presence of these uncertainties. In this talk, the nature of hybrid dynamical systems will be explored, and some design techniques for such systems with uncertainties will be presented.