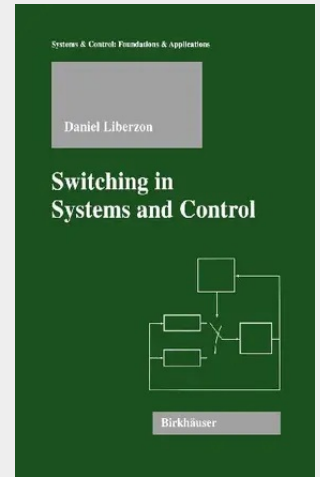


Switching in Systems and Control

Many systems encountered in practice involve a coupling between continuous dynamics and discrete events. Systems in which these two kinds of dynamics coexist and interact are usually called hybrid. For example, the following phenomena give rise to hybrid behavior: a valve or a power switch opening and closing; a thermostat turning the heat on and off; biological cells growing and dividing; a server switching between buffers in a queueing network; aircraft entering, crossing, and leaving an air traffic control region; dynamics of a car changing abruptly due to wheels locking and unlocking on ice. Hybrid systems constitute a relatively new and very active area of current research. They present interesting theoretical challenges and are important in many real-world problems. Due to its inherently interdisciplinary nature, the field has attracted the attention of people with diverse backgrounds, primarily computer scientists, applied mathematicians, and engineers. Researchers with a background and interest in continuous-time systems and control theory are concerned primarily with properties of the continuous dynamics, such as Lyapunov stability. A detailed investigation of the discrete behavior, on the other hand, is usually not a goal in itself. In fact, rather than dealing with specifics of the discrete dynamics, it is often useful to describe and analyze a more general category of systems which is known to contain a particular model of interest.

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