

Spiking Control Systems

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Abstract:

Spikes and rhythms organize control and communication in the animal world, in contrast to the bits and clocks of digital technology. As continuous-time signals that can be counted, spikes have a mixed nature. This talk reviews ongoing efforts to develop a control theory of spiking systems. The central thesis is that the mixed nature of spiking results from a mixed feedback principle, and that a control theory of mixed feedback can be grounded in the operator theoretic concept of maximal monotonicity. As a nonlinear generalization of passivity, maximal monotonicity acknowledges at once the physics of electrical circuits, the algorithmic tractability of convex optimization, and the feedback control theory of incremental passivity. We discuss the relevance of a theory of spiking control systems in the emerging age of event-based technology.