

# From Sampled-Data to Event-Triggered Control

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Li Dak Sum Yip Yio Chin Acad Building

### Abstract

Traditional industrial facilities are monitored and controlled through industrial computers called distributed control systems (DCS) and supervisory control and data acquisition (SCADA) systems, in which time-triggered operations are the norm. Sampled-data control is the paradigm for the analysis and design of such time-triggered systems. This sampled-data paradigm uses a fundamental assumption that all signals and systems are sampled periodically in time; based on this assumption, sampled-data controllers can be designed directly, considering inter-sample behavior in continuous time. However, such a periodicity assumption is no longer valid in modern industrial systems for two reasons. First, integrating new communication and computing technologies generates a new class of systems called cyber-physical systems, in which network protocols and real-time computer algorithms evolve by events and are event-triggered. Second, most existing industrial processes are still operated by human operators through alarm monitoring systems. Could industrial plants be fully automated without the intervention of operators at all? This would require incorporating alarm systems with control systems; but alarm systems are event-triggered, violating the periodicity assumption.

This talk aims at presenting some basics and insights in sampled-data and event-triggered control systems, discussing their relative advantages and disadvantages, and providing the key ideas and mathematical tools used, with several illustrative design examples.

### Biography

Tongwen Chen is currently a Professor and Tier I Canada Research Chair in Intelligent Monitoring and Control at the University of Alberta, Canada. He received the BEng degree in Automation and Instrumentation from Tsinghua University, and the MSc and PhD degrees in Electrical Engineering from the University of Toronto. His research interests include computer- and network-based control systems, event-triggered control, advanced alarm management and design, and their applications to the process industry. He is a Fellow of IEEE, the International Federation of Automatic Control, the Royal Society of Canada, as well as the Canadian Academy of Engineering.

**All are welcome**

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