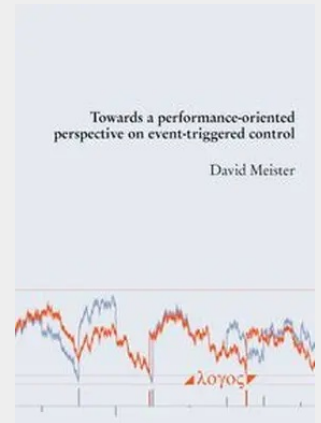


Towards a performance-oriented perspective on event-triggered control

In many modern control systems, sampling utilizes a limited resource. Examples include networked control systems, involving transmissions over a limited network resource, or energy-constrained systems, where sampling depletes a limited energy storage. It is thus relevant to improve sampling efficiency in control systems while still achieving control objectives such as control performance. This is possible by moving from periodic to aperiodic sampling techniques. While sampled-data control traditionally treats aperiodicity as a disturbance, the advent of Event-Triggered Control (ETC) marks a turning point in this paradigm. In ETC, a triggering scheme determines sampling instants based on system information at runtime, closing the loop only when needed. A core question is how to design triggering schemes and controllers which together provide advantages over periodic control in terms of resource and control objectives. In fact, examples have shown that these advantages cannot be taken for granted. However, the key factors influencing if an ETC scheme outperforms periodic control in terms of control performance and triggering rate are still poorly understood. In this thesis, we therefore develop rigorous concepts for comparing triggering schemes and identify such key factors by revealing fundamental setups in which an ETC scheme fails to deliver the desired advantages. Thereby, we unveil new insights into the underlying mechanisms rendering ETC performant and sampling efficient.

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