MECHANICAL ENGINEERING PhD SEMINAR

Wednesday, March 26 2025 at 13:30, D. Dan and Betty Kahn Building, Room 217
Online: https://technion.zoom.us/j/94950742949

Exploiting the Interplay Between Spatial and Temporal Constraints in the Control of Multi-Agent Systems

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Over the last two decades, significant scholarly work in systems and control has focused on networked multi-agent systems, where the central challenge lies in designing controllers under communication constraints such as transmission delays, sampled communication, and information exchange topologies. Traditional approaches often prioritize distributed architectures over sampling and transmission constraints. This has led to reliance on conservative robustness arguments in sampled-data distributed control.

In our work, we advocate a different approach—directly designing distributed sampled-data controllers. By exploiting the inherent structure of the control objective and the interplay between temporal (sampling) and spatial (distributed) communication constraints, our method simplifies the design process even in highly constrained scenarios. Focusing on the fundamental "agreement problem" with asynchronous sampling, we will demonstrate that treating these constraints simultaneously leads to tractable and simple solutions that do not require a priori knowledge of the spatial graph or the sampling sequence.

Furthermore, our exploration of this sampled-data control structure prompts a reevaluation of the standard distributed control architecture, namely diffusive coupling, through the lens of classical control. This investigation reveals fundamental limitations in terms of internal stability and disturbance rejection, while also inspiring novel architectures that connect consensus protocols with classical servo concepts.

Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Shmuel Gal.