IEEE Control Systems Society Distinguished Lecture

Friday, March 2   **1 p.m.**   **3043 ECpE Building Addition**

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Compositional Certification of Stability, Performance and Safety for Interconnected Systems

ABSTRACT: A major problem for today's large-scale networked systems is to certify the required stability, performance, and safety properties using analytical and computational models. The existing methods for such certification are severely limited in their ability to cope with the number of physical components and the complexity of their interactions We address this problem with a compositional approach that derives network-level guarantees from key structural properties of the subsystems and their interactions, rather than tackle the system model as a whole. The foundational tool in our approach is the established dissipativity theory, enriched with modern computational techniques. Dissipativity properties serve as abstractions of the detailed dynamical models of the subsystems and allow us to decompose intractably large certification problems into subproblems of manageable size. We leverage large-scale optimization techniques to detect useful dissipativity properties and exploit interconnection symmetries for further computational savings. Case studies demonstrate the applicability of the methods to biological networks, vehicle platoons, and Internet congestion control.

BIO: Murat Arcak received the B.S. degree from the Bogazici University, Istanbul, Turkey (1996) and the M.S. and Ph.D. degrees from the University of California, Santa Barbara (1997 and 2000). His research is in dynamical systems and control theory with applications to synthetic biology, multi-agent systems, and transportation. Prior to joining Berkeley in 2008, he was a faculty member at the Rensselaer Polytechnic Institute. He received a CAREER Award from the National Science Foundation in 2003, the Donald P. Eckman Award from the American Automatic Control Council in 2006, the Control and Systems Theory Prize from the Society for Industrial and Applied Mathematics (SIAM) in 2007, and the Antonio Ruberti Young Researcher Prize from the IEEE Control Systems Society in 2014. He is a member of SIAM and a fellow of IEEE.

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