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MAE Control Systems and Dynamics Seminar

Date and Time: 09/24/2015 - 30:30pm - 4:30pm,

Location: Colloquia room in Engineering Hall (EH2430), #308 on the [UCI Campus Map](#)

Faculty Host: Faryar Jabbari and Solmaz S. Kia

Title: When Lyapunov meets Church, automated synthesis of complex systems emerges

Abstract: Software plays a crucial role in many everyday applications. Modern vehicles and airplanes, for instance, use interacting software and hardware components to control steering, fuel injection, and airbag deployment. These applications are examples of cyber-physical systems (CPS), where software components interact tightly with physical systems. Recent advances in device manufacturing, computation, storage, and networking have made tremendous advances in hardware and systems platforms for CPS. However, the development of core software controllers that run on these systems is still ad hoc and error-prone. Many CPS applications are safety-critical, and much of the engineering costs today are consumed with ensuring that software works correctly. In this talk, I will propose a transformative design process, in which the controller code is automatically synthesized from higher-level correctness requirements. Requirements for modern CPS applications go beyond conventional requirements in control theory (stability, synchronization, and tracking) and beyond traditional protocol design in computer science. Accordingly, I will propose unified methodologies for automatic controller synthesis by combining techniques from discrete systems theory from computer science with continuous dynamical systems from control theory. The proposed automated synthesis of correct-by-construction controllers holds the potential to develop complex yet reliable CPS applications while considerably reducing verification and validation costs.

Speaker's Bio: Majid Zamani is an assistant professor in the Department of Electrical and Computer Engineering at Technische Universität München where he leads the Hybrid Control Systems Group. He received a Ph.D. degree in Electrical Engineering and an MA degree in Mathematics both from University of California, Los Angeles in 2012, an M.Sc. degree in Electrical Engineering from Sharif University of Technology in 2007, and a B.Sc. degree in Electrical Engineering from Isfahan University of Technology in 2005. From September 2012 to December 2013, he was a postdoctoral researcher in the Delft Centre for Systems and Control at Delft University of Technology. Between December 2013 and May 2014, he was an assistant professor at Delft University of Technology. He is the Editor-in-Chief of the Springer journal Autonomous Robots.