

UTC Institute for Advanced Systems Engineering Distinguished Lecture Series



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Modeling Cyber-Physical Systems: Challenges and Recent Advances

Tuesday March 3, 2015 10:00 a.m. – 12:00 p.m. Storrs Campus, Dodd Center, Konover Auditorium

Abstract: Cyber-physical systems integrate physics with computation and communication so that the resulting system is more than the sum of its parts. These systems offer unique capabilities that are not possible to reach through a solely physical implementation. To give an example for a cyber-physical systems consider a vehicle with a hybrid drivetrain where an embedded controller continuously manages and optimizes power flows while maintaining the stability of the vehicle on an icy road. Such systems necessitate integrated modeling that covers both the physical and ‘cyber’ aspects of the system. As the computational system interacts with the physical system its dynamics (due to the execution and communication platform used) becomes important.

The talk will focus on the challenges in such integrated modeling. We will review the main ideas for physical system modeling (that is typically acausal), for modeling computations and communication (that is typically causal), for modeling the platform (that establishes the connection between the physical world and the model of computation), and the model integration problem. We will discuss interesting research challenges as well as recent advances and tools that show promise in addressing these problems.

Biography: Dr. Gabor Karsai is a Professor of Electrical Engineering and Computer Science at Vanderbilt University, and Senior Research Scientist at the Institute for Software-Integrated Systems. He conducts research in the design and implementation of cyber-physical systems, in programming tools for model-driven development environments, in the theory and practice of model-integrated computing, and in real-time fault diagnostics. He received his B.Sc., M.Sc., and Dr. Techn degrees from the Technical University of Budapest, Hungary, in 1982, 1984 and 1988, respectively, and his PhD from Vanderbilt University in 1988. Dr. Karsai has worked several large DARPA projects in the recent past: advanced scheduling and resource management algorithms, fault-adaptive control technology that has been transitioned into aerospace programs, and model-based integration of embedded systems whose resulting tools are being used in embedded software development tool chains.