

Formal Synthesis of Control Strategies for Dynamical Systems (Invited Talk)

Calin Belta

Boston University

In control theory, complex models of physical processes, such as systems of differential equations, are analyzed or controlled from simple specifications, such as stability and set invariance. In formal methods, rich specifications, such as formulae of temporal logics, are checked against simple models of software programs and digital circuits, such as finite transition systems. With the development and integration of cyber physical and safety critical systems, there is an increasing need for computational tools for verification and control of complex systems from rich, temporal logic specifications. In this talk, I will discuss a set of approaches to formal synthesis of control strategies for dynamical systems from temporal logic specifications. I will first show how automata games for finite systems can be extended to obtain conservative control strategies for low dimensional linear and multilinear dynamical systems. I will then present several methods to reduce conservativeness and improve the scalability of the control synthesis algorithms for more general classes of dynamics. I will illustrate the usefulness of these approaches with examples from robotics and traffic control.