Dr. Humberto Gonzalez  
Assistant Professor  
Preston M. Green Department of Electrical & Systems Engineering

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Green Hall, Room 0120  
1:30 PM

Simulation of Dynamic Interactions  
Using Hybrid Models

Interactions between dynamical systems and the environment often lead to non-smooth transitions. Indeed, impacts between robotic platforms and objects in the environment introduce discontinuities in the momentum of the system, or failures in the electric grid lead to instantaneous transitions in the flow of power, among many other examples. Many heuristics exist in the literature to identify these types of transitions and produce adequate responses to them. But these heuristics are not suitable for applications that require high levels of reliability, since they usually do not have theoretical guarantees for their performance.

In this talk I will show how non-smooth transitions in dynamic systems can be naturally described using hybrid models. Then, I will present a new technique for the simulation of hybrid models based on the traditional Forward Euler Integration scheme, with strong theoretical guarantees of performance. Moreover, I will show how the development of this new simulation technique sheds light on the challenges that non-smooth dynamic transitions introduce on a practical and theoretical level.