



CPS: Breakthrough: Compositional Modeling of Cyber-Physical Systems

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Description

Goal

Theory of composition for cyber-physical systems

Motivation

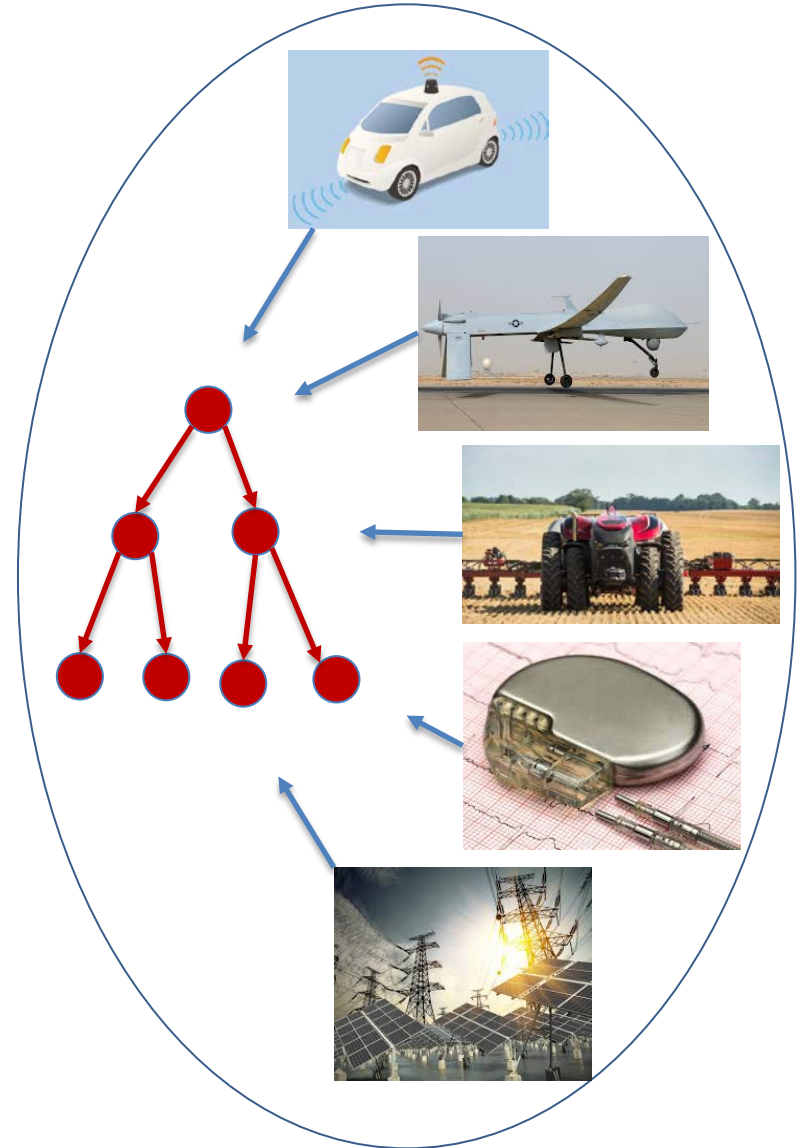
- Model re-use
- System analysis via subsystems
- Cross-cutting principles

Challenge

Uniform model for continuous, discrete dynamics

Approach Algebra!

- Systems as mathematical objects
- Composition via functions



Findings

- **Generalized synchronization trees (GSTs)** as CPS model
 - Uniformly encodes discrete, continuous behavior
 - Conservatively extends existing models of discrete systems
- **Encoding of existing models** in GSTs
- **Notions of semantic equivalence based on bisimulation** that uniformly extends existing discrete notions
- **Logical characterizations** of bisimulation