

A Convex Framework for Control of Interconnected Systems over Delayed Networks Award ID#: CNS-1739990, Award Date: 9/1/2018 **Challenge:** PI: Matthew M. Peet (Arizona State University) **PIETOOLS 2021:**

- Information is not static. New information is better than old.
- •How to represent the flow of information in a network of systems?
- •lt's algebraic!

Solution:

- •A unified network representation
- Identify minimal information flows
- •Model state as CHANGES in information transmitted
- •The Partial Integral (PI) Algebra
- Partial Integral Equations (PIEs)



Broader Impact:

- information
- representations

•MATLAB GUI and user interface for representation of network dynamics

•New algebraic MATLAB

structure for representation of PI objects

Optimization of PI variables

•Optimal Estimation and

Control Functions

• We standardize the representation of

 Channels for: Sensors, Commands, Disturbances, States

• PIETOOLS: Converts between network representations and constructs minimal

 Integrates Stability, Optimal Estimation, Optimal Control, etc.

• Order of Magnitude improvement: Control Networks with 50+ latent communication channels