2021 NSF CYBER-PHYSICAL SYSTEMS PRINCIPAL INVESTIGATORS' MEETING

CPS: Breakthrough: A Meta-Game Theoretic Approach to Cyber-Physical Co-Design of Secure and Resilient Control Systems

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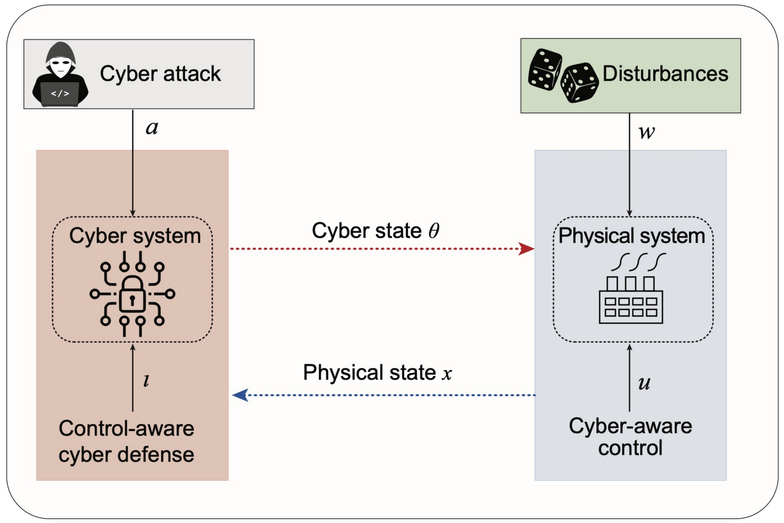
Challenge:

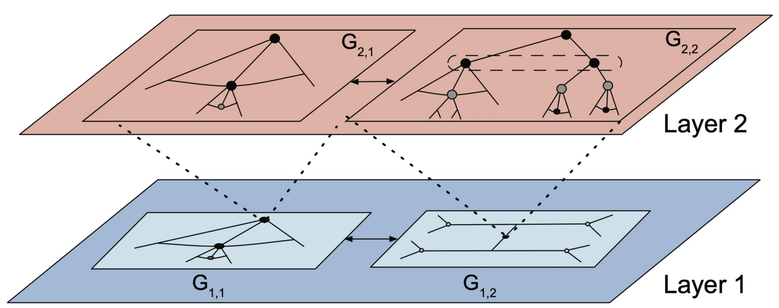
- Multi-layer modeling and decentralized cyber-physical control design.
- Holistic design of CPS security and resilience.

Goals & Solution:

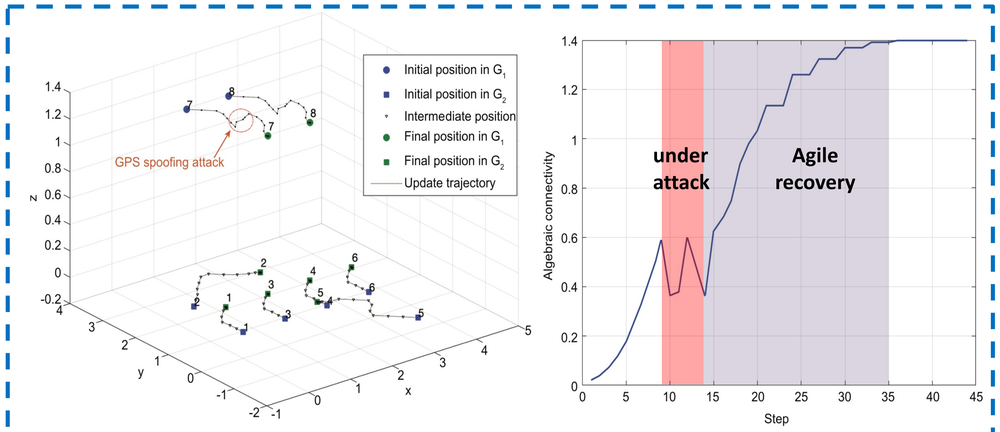
- Developing impact-aware proactive cyber defense mechanisms & security-aware robust and resilient physical controller.
- Proposed a games-in-games approach for CPS cross-layer integration and analysis.
- Offered a scalable mechanism for achieving system robustness, security and resiliency.



Cyber-physical cross-layer model



Games-in-games framework



Secure and resilient control of a two-layer robotic network under cyberattack.

Scientific Impact:

- A system co-design foundation for achieving cyber-physical security and resiliency.
- Applications: Unmanned vehicles, industrial control systems, manufacturing robots, IoT.

Broader Impact:

- Protect nation's critical infrastructures by safeguarding cyber & control systems.
- Training next-generation workforce on trustworthy CPS discipline.