2021 NSF CYBER-PHYSICAL SYSTEMS PRINCIPAL INVESTIGATORS' MEETING

CPS: Medium: Resource-Aware Hierarchical Runtime Verification for Mixed-Abstraction-Level Systems of Systems

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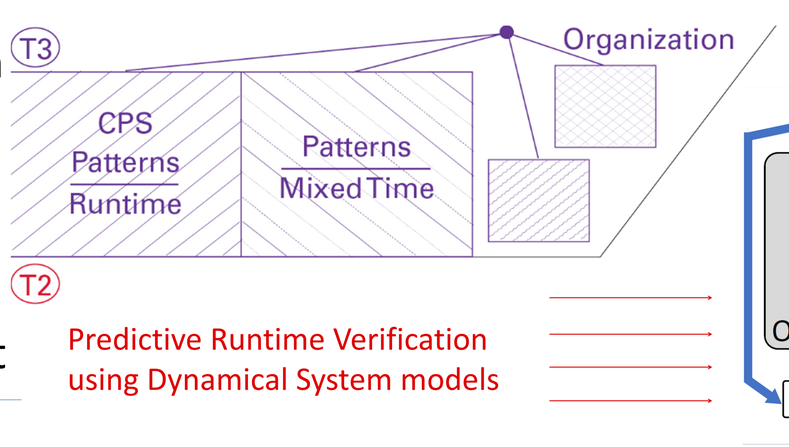
Challenge:

- Handling specifications with mixed-timescale granularity
- Building a hierarchical organization for specification extraction for more scalable and automated specification
- Enabling just-in-time mitigation triggering in a resource-aware environment



Solution: Highlight

- Develop a new specification language MLTLM (Mission-Time Linear Temporal Logic Mixed), allowing subformulas to be evaluated on different timescales and integrate this into an existing runtime verification tool R2U2

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Scientific Impact:

- Formalize reasoning across heterogeneous time scales
- Develop insight for temporal reasoning across discrete, and continuous system abstractions

Broader Impact:

- Make on-board, system-wide operational verification accessible to industrial design engineers
- Open-source tools and templates geared for use by practitioners for assured autonomy, mitigation triggering
- RV of useful specifications in tight resource bounds (e.g., < 200 KB)
- Responsive RV verdicts, including predictive mitigation triggering