CAREER: Foundations for a Resource-Aware, Cyber-Physical Vehicle Autonomy

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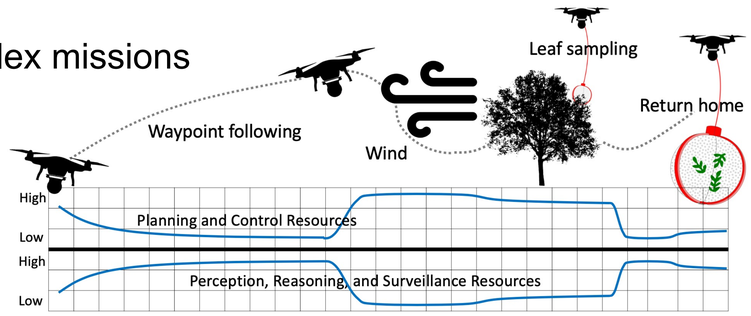
Challenge:

- UAS (drones) have complex missions in complex environments
- Requires UAS capable of adjusting resources and performance to adapt
- Problem more severe under learning-based control



Solution:

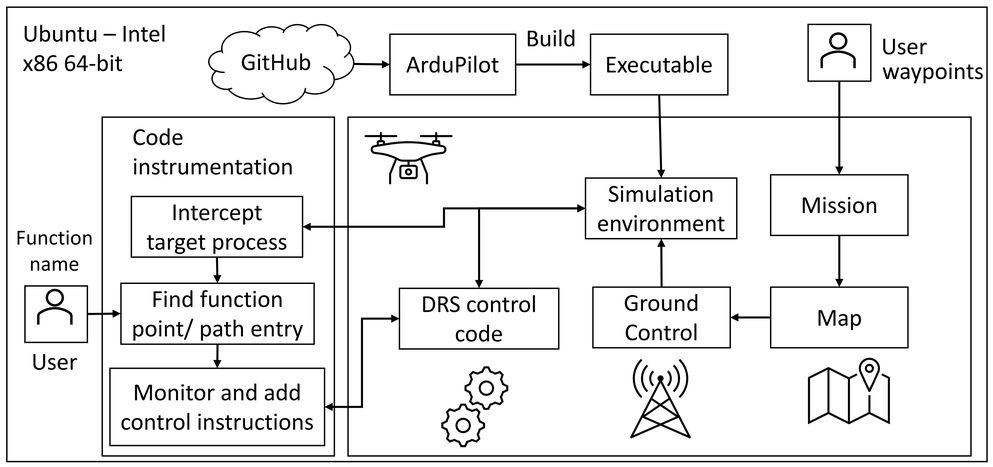
- Design new class of autonomy algorithms (e.g., co-regulated controllers/planners) that adjust performance and resources at runtime
- Develop tools to identify, interrupt, and replace control tasks at runtime to reallocate resources and enable safe control

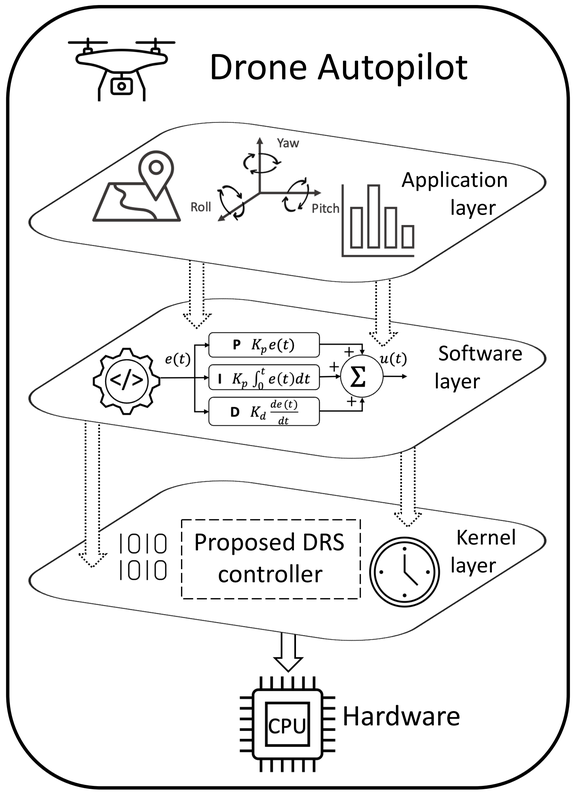
Impact on Society:

- Holistic improvements: safer autonomous vehicles that perceive, and learn more, reason better, and adapt to uncertainty in environments
- Improve UAS swarm performance
- Maintain U.S. air superiority goals

Scientific Impact:

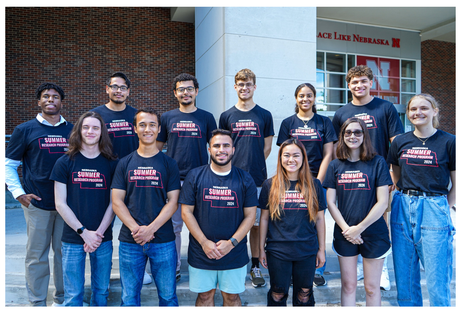
- Mathematical foundation for design of co-regulated controllers
- Performance guarantees for co-regulated controllers
- Instrumentation of kernel-based control task interrupt and replacement with safe controller





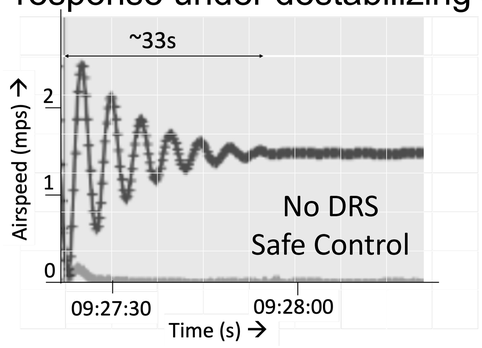
Education and Outreach:

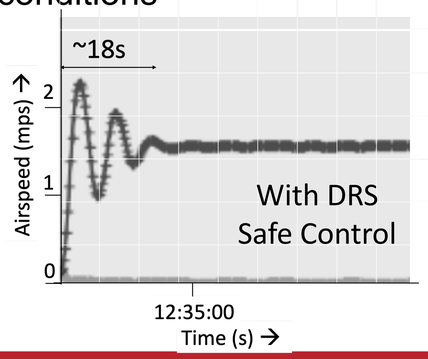
- REU summer experience
- Featured in Netflix “Unknown: Killer Robots”



Quantified Impact:

- Inserted DRS safe controllers provide improved control response under destabilizing conditions





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