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

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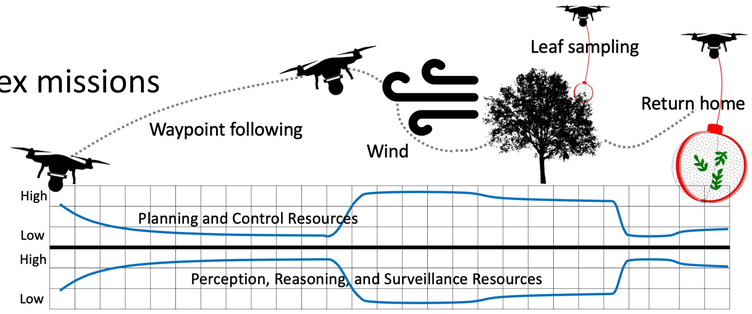
Challenge:

- UAS (drones) have complex missions in complex environments
- Requires UAS capable of adjusting resources and performance to adapt
- Problem more severe in multi-agent systems

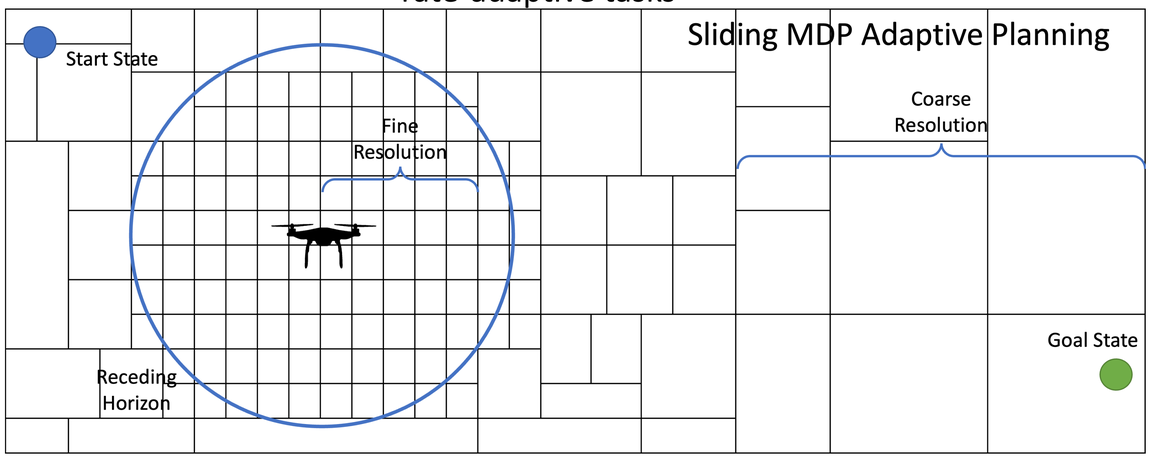


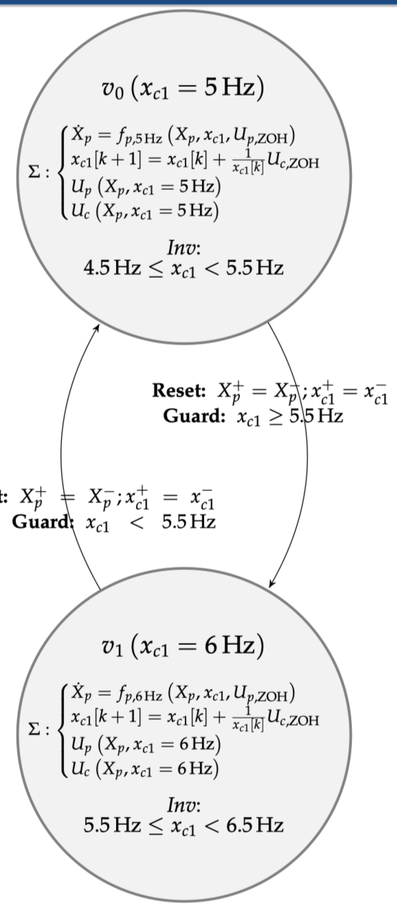
Solution:

- Design new class of autonomy algorithms (e.g., co-regulated controllers/planners) that adjust performance and resources at runtime
- Build RTS schedulers to reallocate resources based on performance demands

Scientific Impact:

- Mathematical foundation for design and performance guarantees of co-regulated controllers
- Novel "sliding" Markov Decision Processes for online robotic planning and decision-making
- Real-time computing schedules for set of rate-adaptive tasks



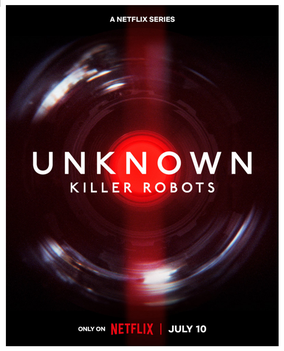


Impact on Society:

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

Education and Outreach:

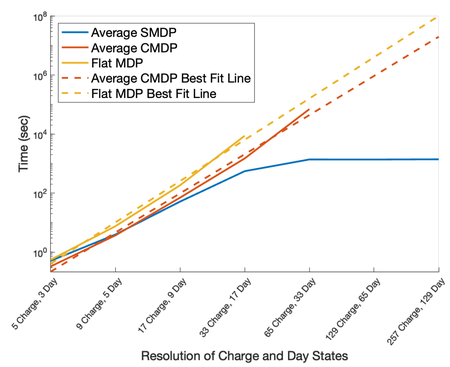
- Innovative Learning Program for students in rural Nebraska

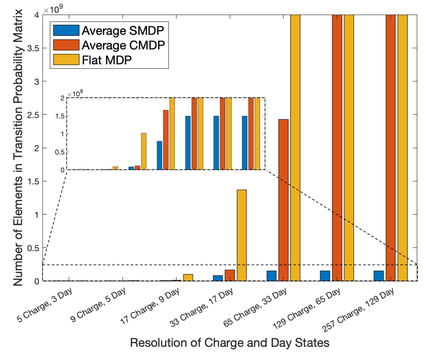


- Featured in Netflix "Unknown: Killer Robots"

Quantified Impact:

- Decision-making improvements: Can recursively solve **any** MDP at runtime, producing a recursively optimal policy.





Award ID#: CNS-2047971