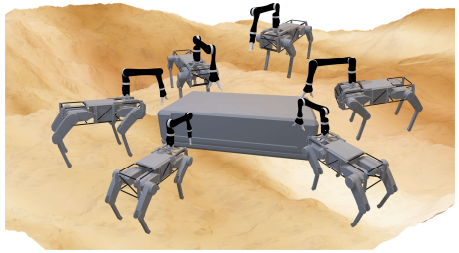
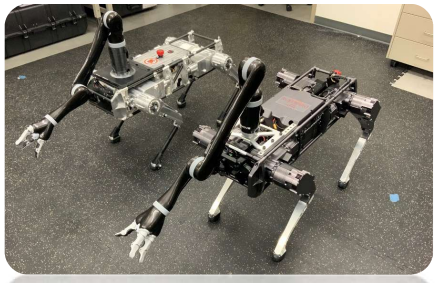
NRI: FND: COLLAB: Hierarchical, Safe, and Distributed Feedback Control of Multiagent Legged Robots for Cooperative Locomotion and Manipulation

Kaveh Akbari Hamed, Virginia Tech PI, and Aaron D. Ames, Caltech PI

Goals and Scientific Impact

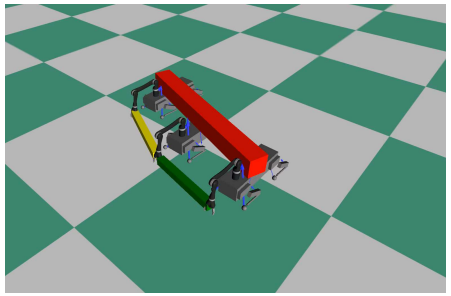
To establish a formal foundation that develops distributed and hierarchical control algorithms for safe motion control of cooperative legged robots to achieve a wide variety of tasks in complex environments

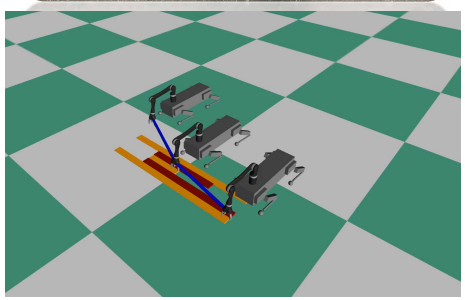




Challenges

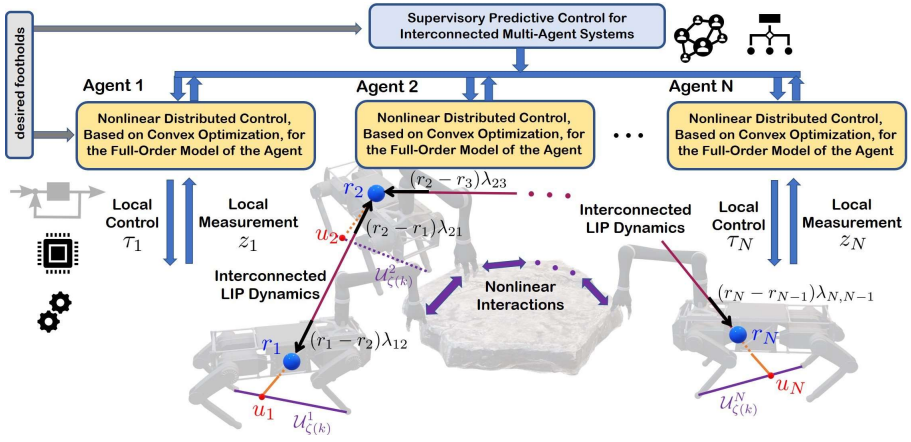
High-dimensional and large-scale complex dynamical systems for collaborative manipulation and locomotion





Technical Approach and Innovations

- Creation of intelligent motion planning algorithms for cooperative locomotion and manipulation
- Creation of safe, distributed, and hierarchical control algorithms for coordination of multi-agent legged robots



2021 NRI & FRR Principal Investigators' Meeting
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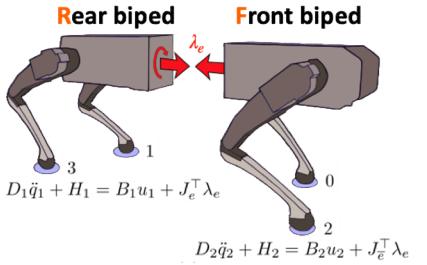
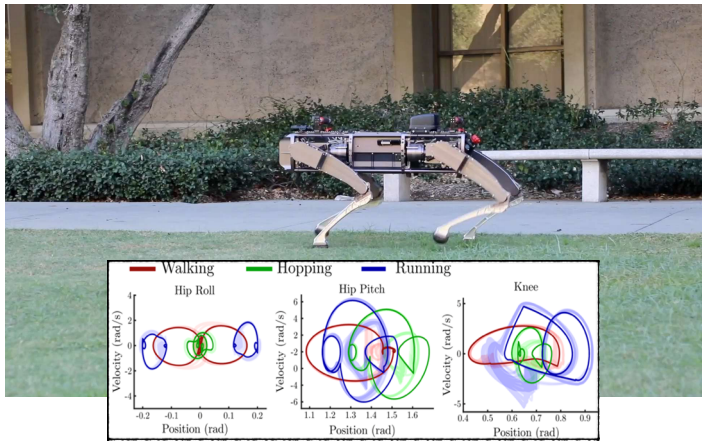
Coupled Control Lyapunov Functions (C-CLFs) for Strongly Interconnected Systems

Decomposition into simpler systems

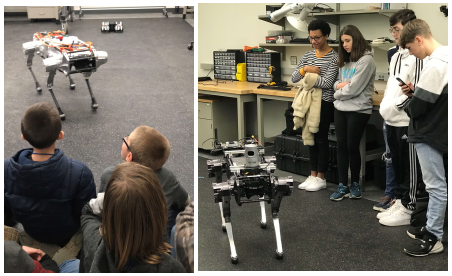


The decomposition of a quadrupedal robot into bipedal subsystems



Broader Impacts on Society

Deploying networks of legged co-robot teams that cooperatively work with each for a variety of tasks in different aspects of human society such as labor-intensive tasks, manufacturing, and disaster response



Education and Outreach

Designing a new course on dynamic legged locomotion, Partnership with VT and Caltech diversity programs, and Engagement of undergraduate students in research

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