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

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

Goals and Scientific Impact

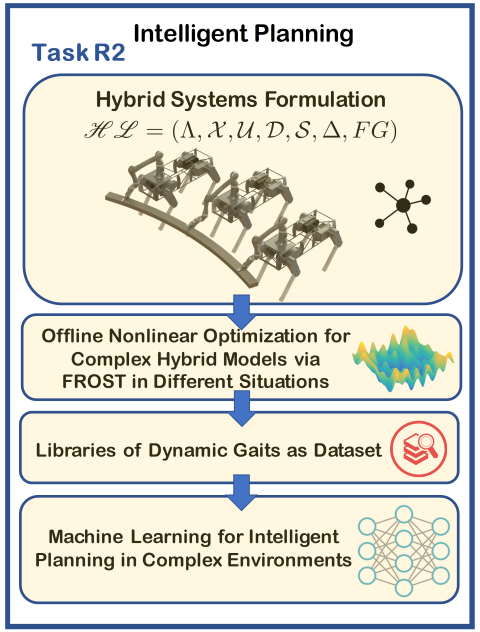
To establish a formal foundation that develops distributed and hierarchical control algorithms for safe motion control of cooperative legged robots to achieve a wide variety of tasks in complex environments

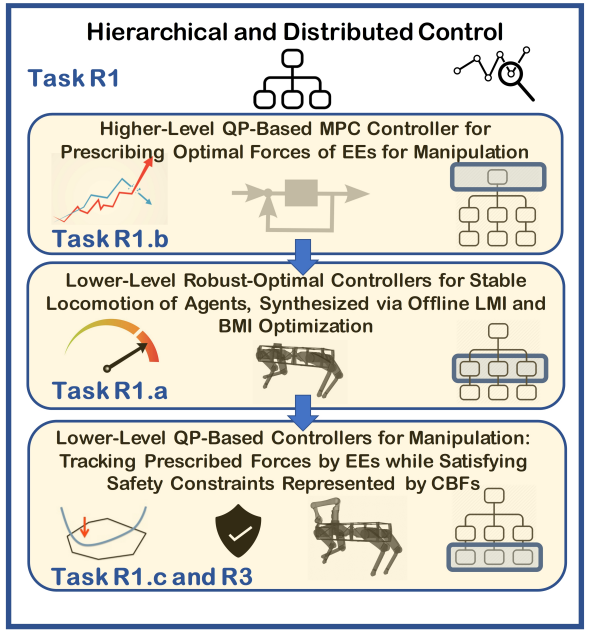
Challenges

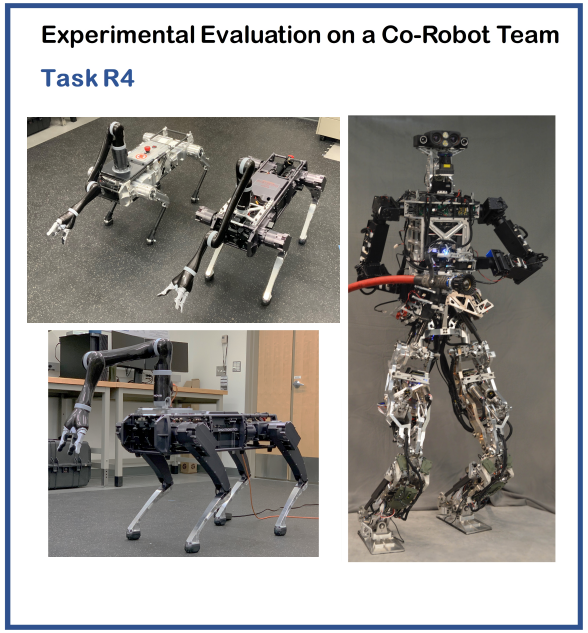
- High-dimensional and large-scale complex dynamical systems for collaborative manipulation and locomotion
- State-of-the-art techniques for distributed control of multi-agent systems are tailored to wheeled robots and UAVs, but *not* cooperative legged robots.

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
- Transferring the theoretical innovations into practice







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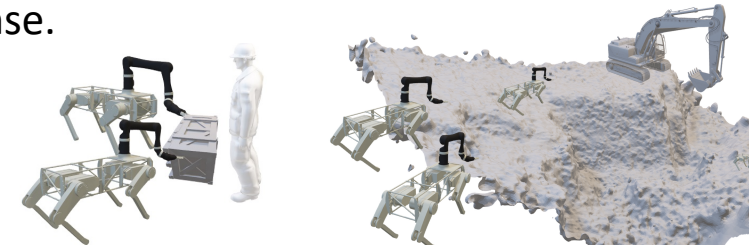
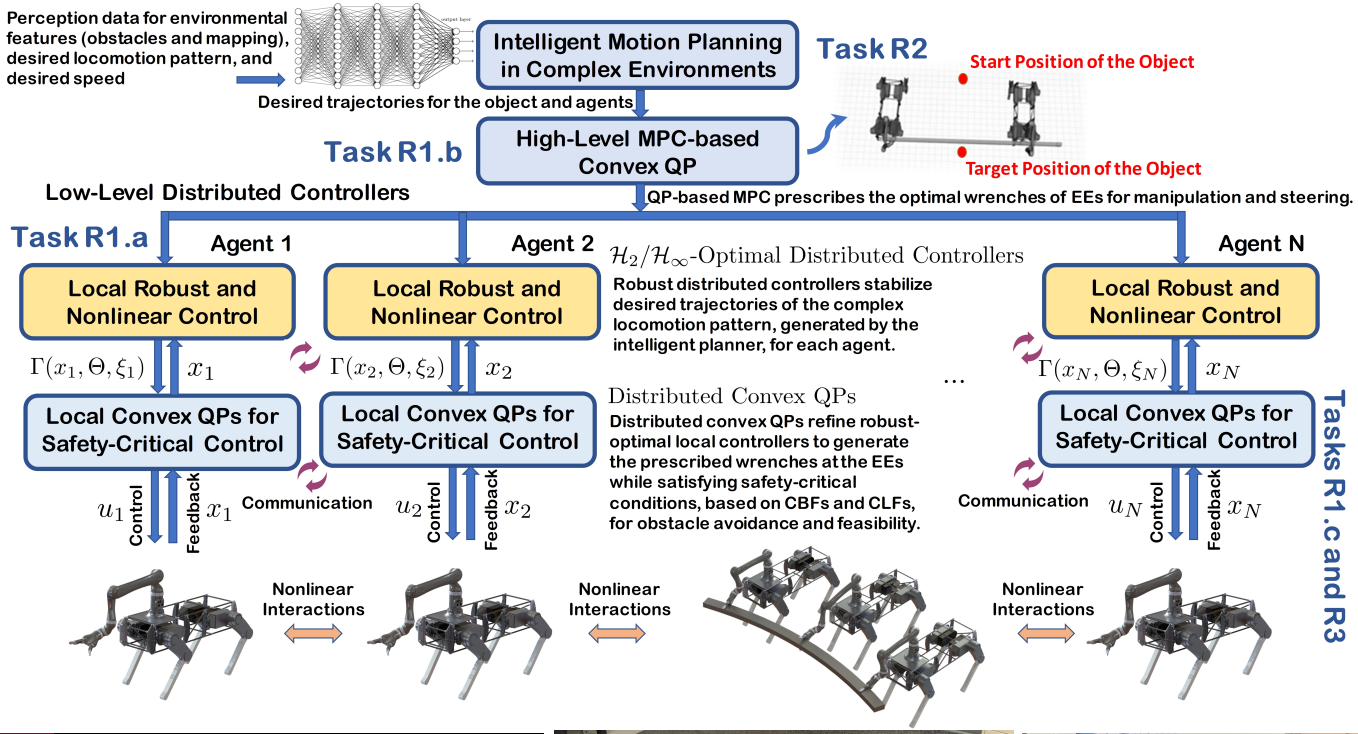
VT Caltech

Broader Impacts on Society

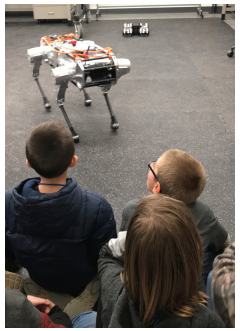
- The proposed approach can address complex and agile locomotion of legged co-robot teams that dexterously manipulate objects in a safe manner in complex environments.
- Deploying legged co-robots that cooperatively work with each for a variety of tasks in different aspects of human society such as labor-intensive tasks, manufacturing, and disaster response.

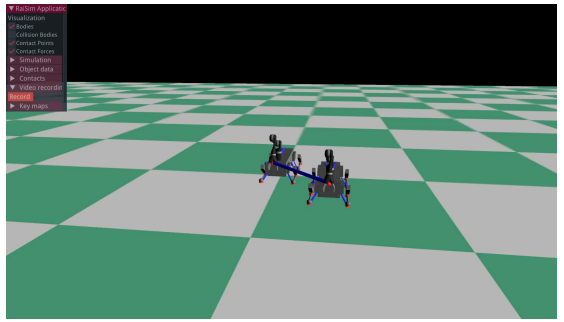


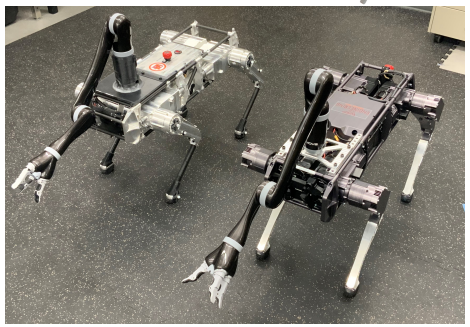


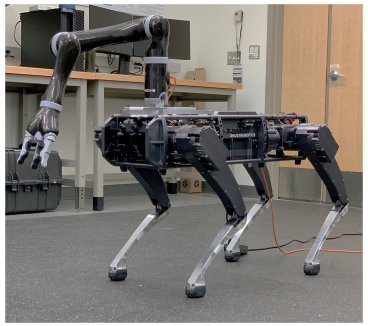
Education and Outreach

- Designing a new course on dynamic legged locomotion, Partnership with VT and Caltech diversity programs (CEED and CCD), and Engagement of undergraduate students in research.









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