

CAREER: Morphological Computation for Resilient Dynamic Locomotion of Compliant Legged Robots with Application to Precision Agriculture

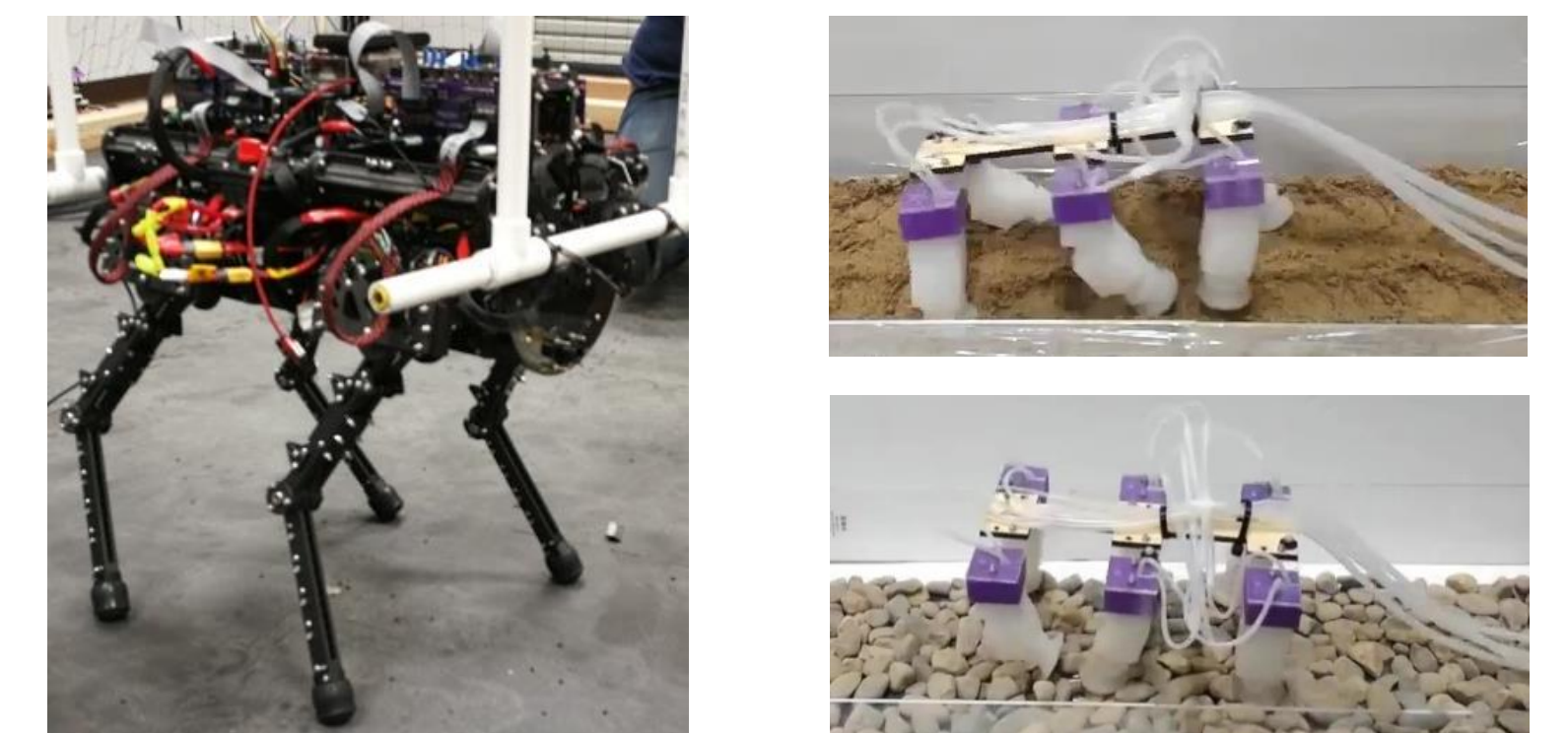
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The Problem

- Unprecedented challenges to meeting the continuously growing demand for food globally
- Need to sustain or improve current productivity with fewer inputs and at more harsh conditions

Significance and Goal of this Project

- Efficient and resilient robotic legged locomotion can transform precision agriculture outcomes
- Develop and validate experimentally a theoretical and computational framework for compliant and soft legged robots to navigate over natural terrain while harnessing compliance to improve efficiency of locomotion and resilience to perturbations



Aims of this Project

1. Finite DoF Compliant Dynamic Legged Locomotion (Yrs 1-3)
2. Infinite DoF Compliant (Soft) Legged Locomotion (Yrs 2-5)
3. Autonomous Locomotion in Agricultural Fields (Yrs 3-5)

Intellectual Merit

- Compliant legged robot design and modeling principles
- Locomotion controllers harnessing robot compliance
- Compliance-aware planning and navigation strategies

Ongoing Investigations

- Development of baseline articulated compliant and soft legged robots
- Investigation of effect of waist joint compliance to articulated compliant quadruped gait stabilization
- Feedforward control for soft legged robot navigation across natural type of terrains

Integration of Research and Education & Broader Impacts

- Robotics Makerspace Program for UCR Undergraduates, which extends beyond engineering students
- UCR – Redlands USD Robotics Summer Academy Camp for 8th grade female students of diverse socio-economic status
- Shaping the theory and practice of compliant legged locomotion to enable deployment of legged robots in precision agriculture