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U.S. ARMY RDECOM

Mobility and Manipulation for Next-Generation Unmanned Systems

open campus

S&T Campaign: Sciences for Maneuver
Platform Mechanics and Platform Intelligence

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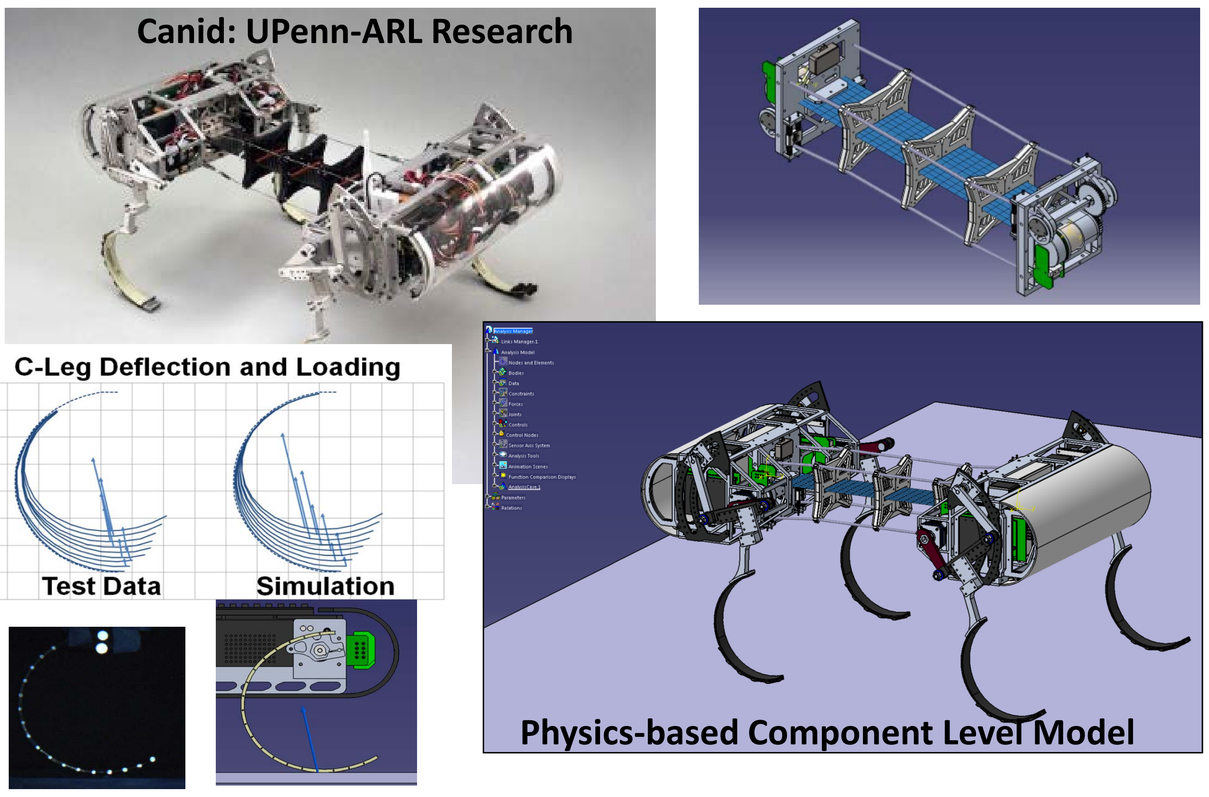
Research Objective

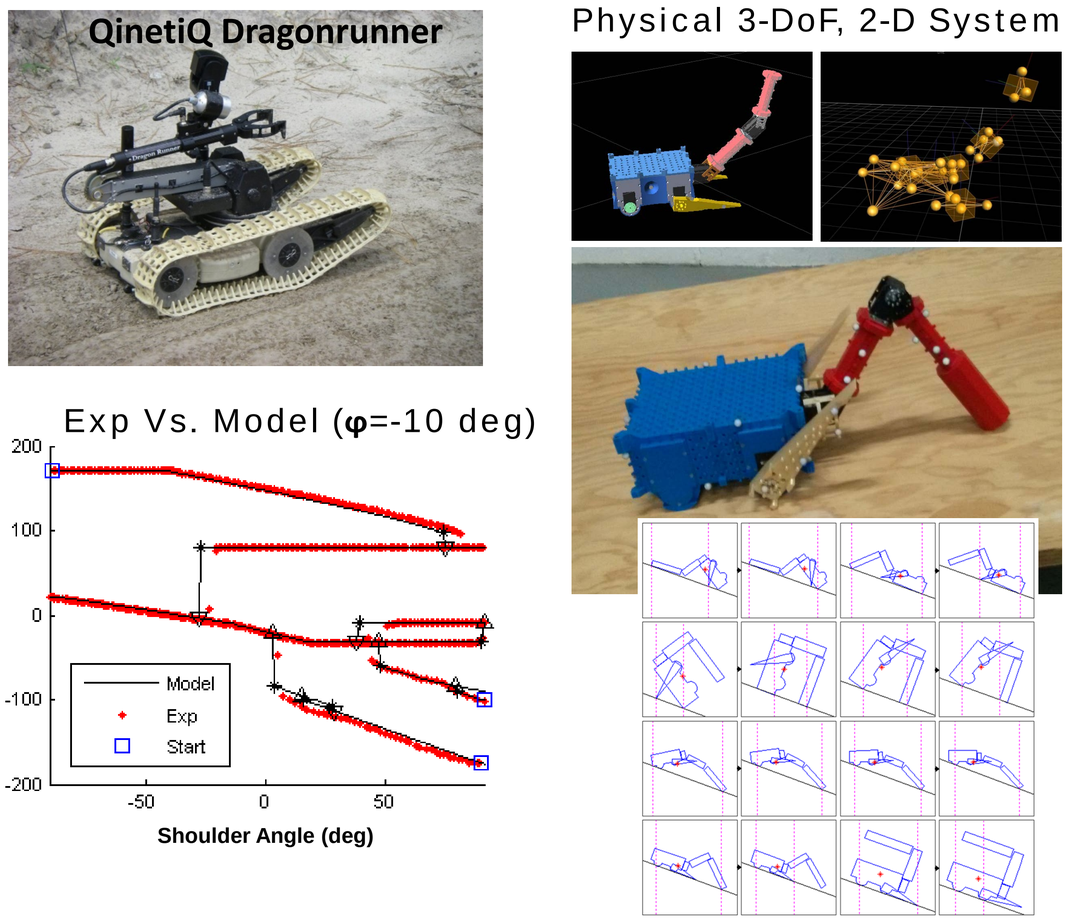
To develop theory, controls, and mechanisms (morphology, actuation, propulsion, etc.) to provide unmanned systems with the physical capabilities required to efficiently navigate and perform work in dynamic 3-D environments as an integral part of missions in which they are teamed with Soldiers.



ARL-University of Pennsylvania Collaborative Locomotion Research

Challenges

There is a significant gap between the current physical capabilities of robots that can act as tools versus ones that a Soldier may actually trust and accept as a teammate. This gap will be addressed through robotic platform research in advanced control algorithms for mobility and manipulation; actuation and power train systems; and locomotion and flight mechanics.



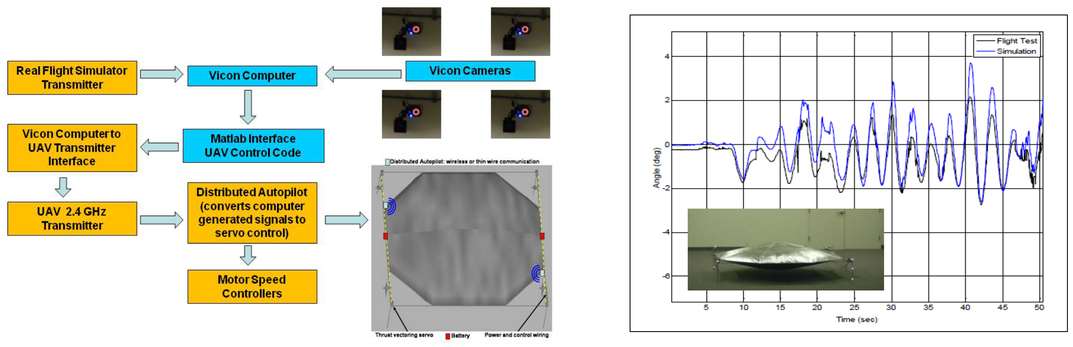
Autonomous Self-Righting Research

ARL Facilities and Capabilities Available to Support Collaborative Research

- Spesutie Island outdoor flight area and landing strip (APG)
- Large open indoor motion capture volume (30'W x 50'L x 20'H) with ability to perform motion capture outdoors
- Fortified hover chamber with stand to measure rotor-based propulsion forces
- Techniques for building physics-based component-level dynamics models of robotic and other multibody systems
- Custom design and fabrication of robotic systems for experiments and validation of theory
- Arriving in winter 2016: JPL RoboSimian robot and humanoid torso based on RoboSimian components

Motion Capture Facility at APG, MD

RoboSimian: Arriving Winter 2016



Thrust Vectoring Controls Research

Complementary Expertise/Facilities/ Capabilities Sought in Collaboration

ARL is part of two robotics collaborative technology alliances that cover micro- to vehicle-scale robotics. ARL seeks collaborative research with control algorithms and component technologies to enable dynamic and efficient mobility and manipulation of next-gen and gen-after-next systems. Following are areas of interest:

- New and more efficient forms of actuation and associated powertrains suitable for limbed systems
- Multifunctional structures (tunable compliance, energy storage and controlled release, *etc.*)
- Optimization of materials, structures, and novel morphologies to enable specific performance goals
- Coupling aspects of embodied intelligence and cognitive intelligence
- Suggestions for innovative research approaches to address stated research objectives

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