

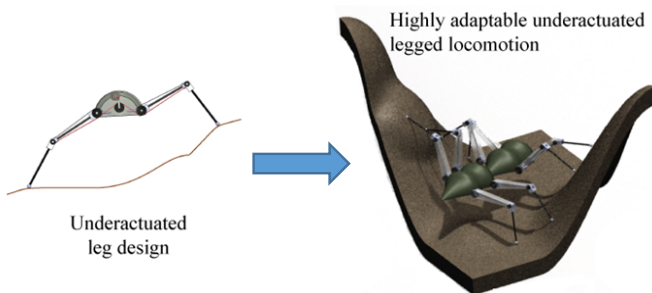


# Rethinking Multi-Legged Robots: Passive Terrain Adaptability through Underactuated Mechanisms and Exactly-Constrained Kinematics

NRI Small (IIS-1637647), October 2016

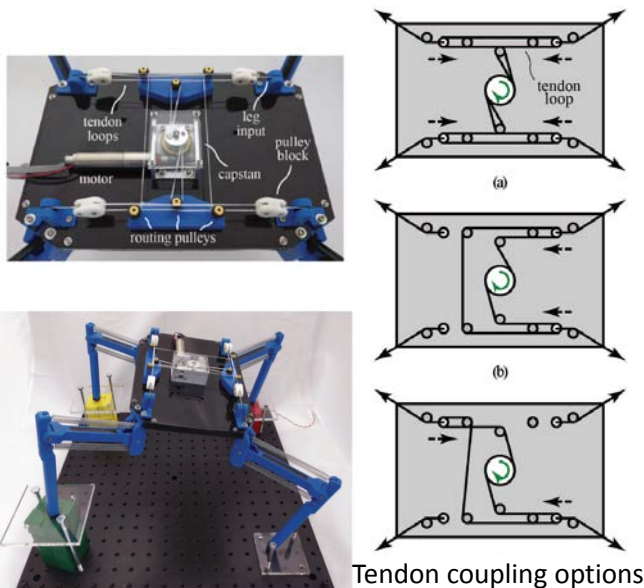
This project seeks to thoroughly examine underactuated mechanisms in multi-legged robots for rough terrain, working towards drastic performance improvements by parting with over-constrained kinematics and complicated redundant control schemes in favor of designs that are passively stabilized due to their large-scale mechanical adaptability and exactly constrained kinematics.

*In essence, we would like to try to use underactuated mechanisms to do for multi-legged robots what they have done for robotic hands.*



## Progress: Rotational joint legs

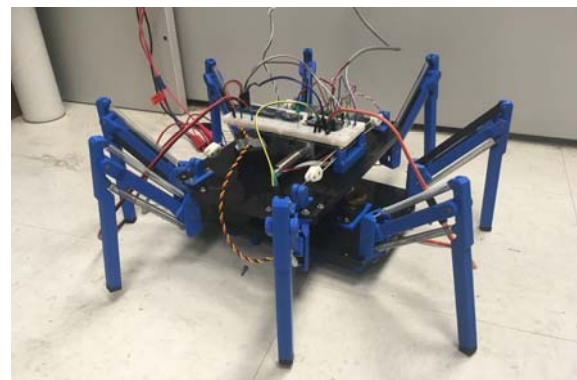
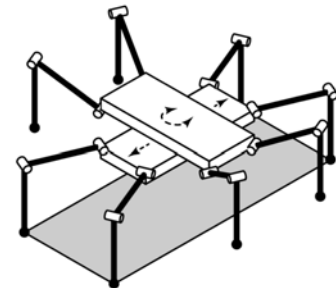
- Have done thorough examination of two-joint rotational leg design
- Have produced multiple preliminary prototypes with this architecture
- Near to final design



## Specific aims:

- Examine the requirements for stable locomotion, how those relate to exact constraint design, and synthesize and analyze legged robot designs that effectively incorporate underactuated mechanisms
- Work towards a simplified 3DOF legged robot, examining the design of individual underactuated legs, the coupling between legs, and the propulsion and steering mechanism
- Examine a robot with greater mobility (5DOF) that will incorporate a more complex parallel architecture

## 3DOF Platform Concept:



## Progress: Prismatic joint legs

- Beginning to look at prismatic joints for the legs
- Will direct motion purely downwards, which is one of the goals
- Have completed a test prototype of this concept

