Optimizing Legged Locomotion Using Tunable Leg Stiffness

By

Kamruzzaman Rony

Stony Brook University, NY

Advisors:

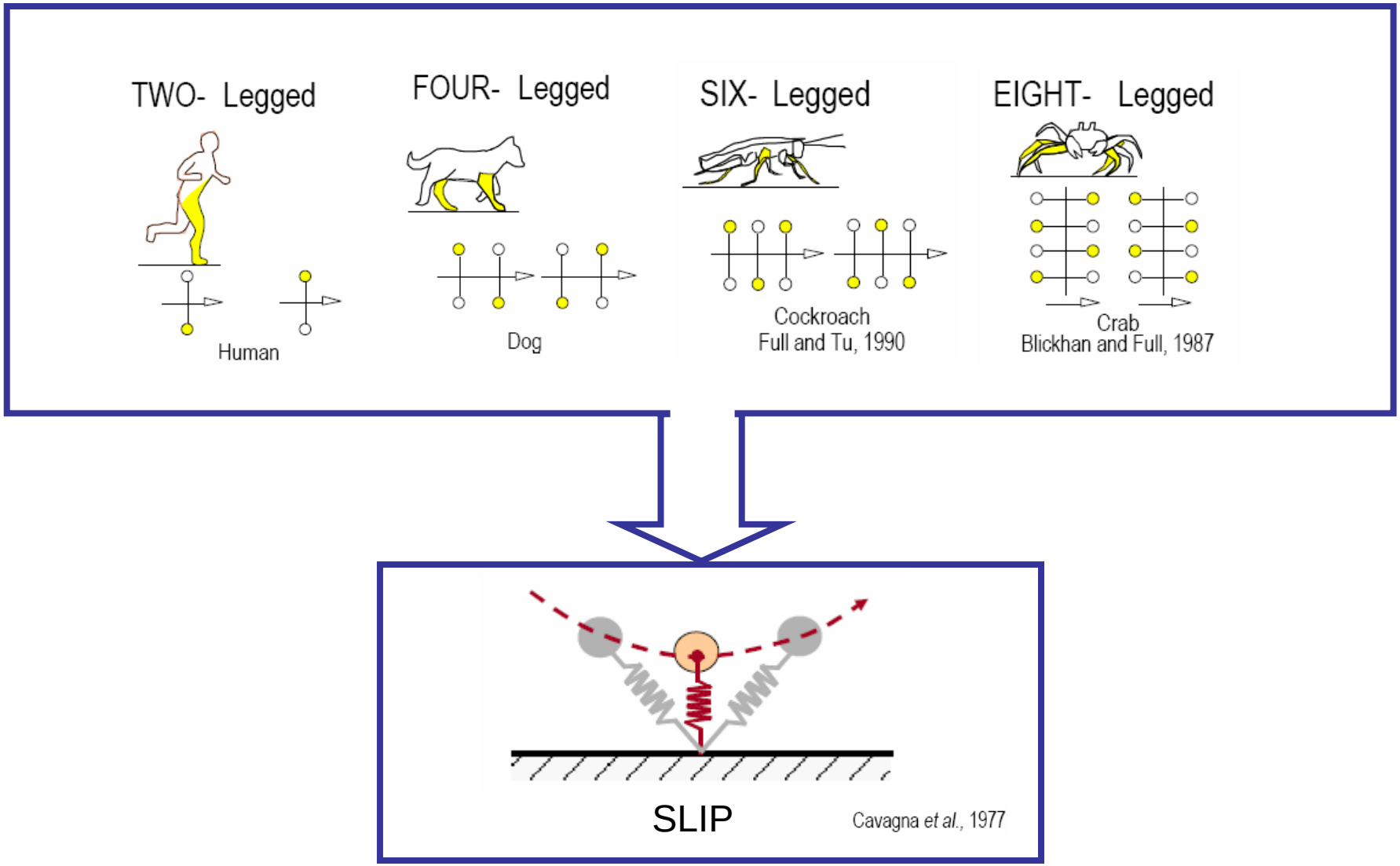
Dr. Daniel E. Koditschek

Kevin Galloway

Outline

- Background
- Video of Edubot/RHex
- Why tunable/variable stiffness leg?
- Research Project Objective
- Slider leg or variable compliance leg video
- Problem & Solution
- IR communication Video

Spring Loaded Inverted Pendulum (SLIP)



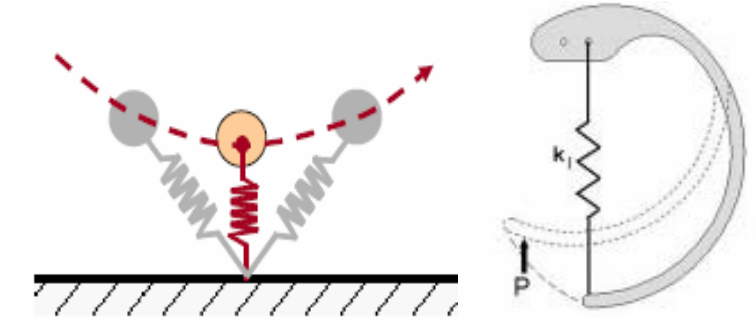
Why variable/tunable leg stiffness?

Animals can change their leg stiffness in real time to adapt to the changes in the environment during locomotion.

Robots need variable stiffness leg in order to minimize the performance gap of locomotion between them and animals.

Variable stiffness legs help to perform locomotion efficiently when:

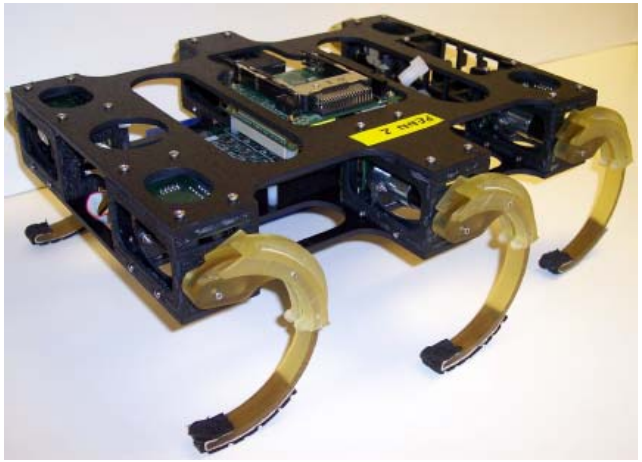
- ❑ terrain or ground stiffness changes
- ❑ the gravity or their payload changes
- ❑ change in speed is needed



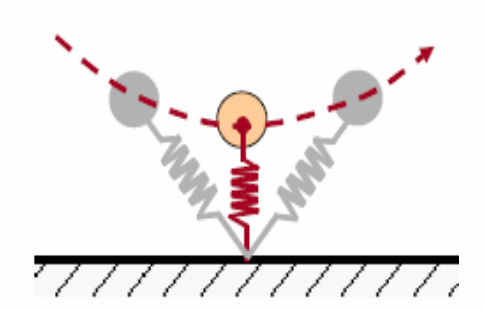
SLIP C-leg

Incorporating adjustable leg stiffness in the design of running robots is important if they are to match the speed and agility of animals on varied terrain.

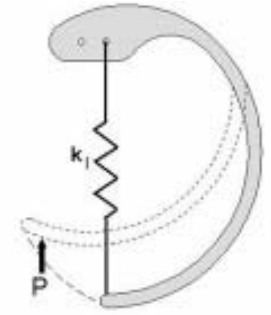
Edubot



Edubot, a six-legged robot, is the smaller version of RHex.
Its design is based on cockroach.

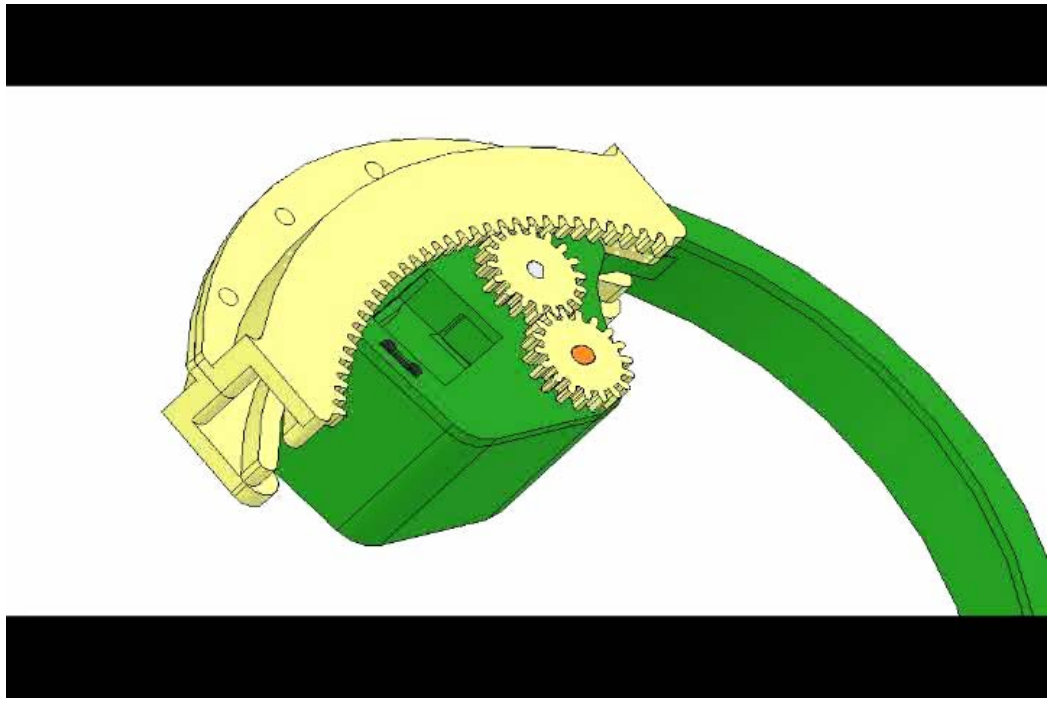


SLIP



C-leg

Research Project Objective



Designing the electrical control circuitry for the variable stiffness leg (shown above) to optimize locomotion.

Problem & Solution

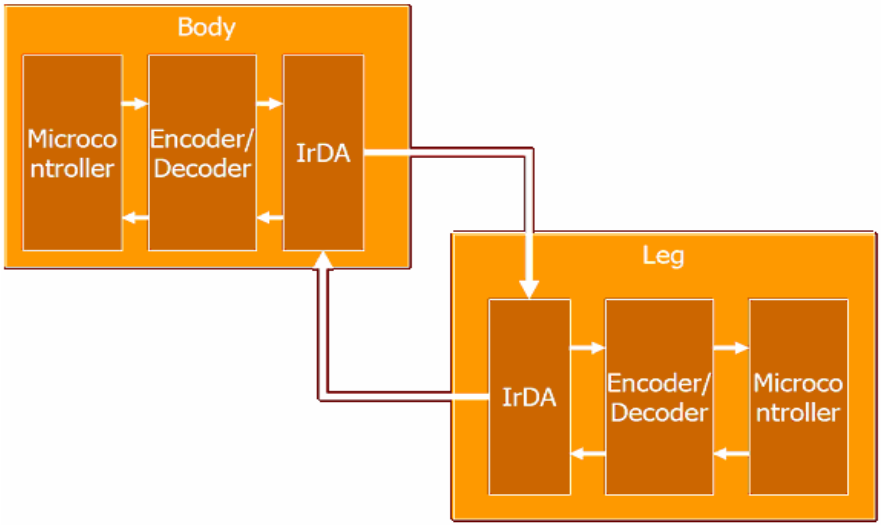
Problem

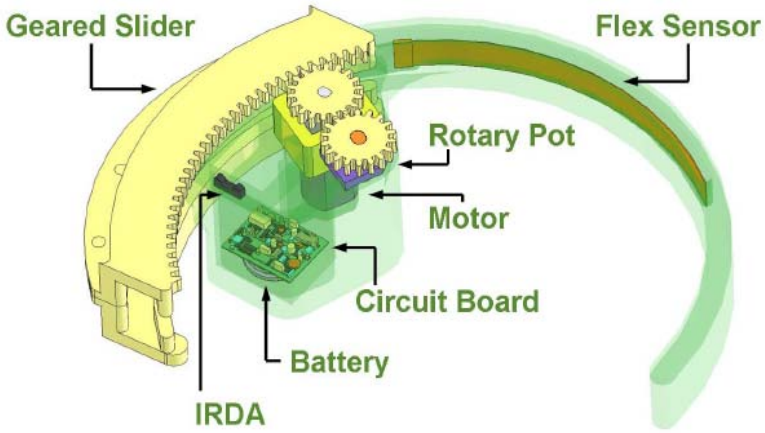
Two Parts:

1. Implementing robot-to-leg ‘communication’ scheme

2. Controlling the slider position on the leg based on data transmitted from the body

Solution





IR Communication Demo

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QUESTIONS?