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Main Takeaway / Abstract

Using Reinforcement Learning to create controllers for flexible legged jumping systems leads to designs that outperform traditional optimization methods for jumping tasks. Further, using a power conservative reward function to train the agent results in a control strategy that maximizes jump height while also conserving power.

limit?

for a given

How can we show this strictly. Maximizing has a strict meth. meaning. Can we really say it accurately in that sense?

Introduction

Mention what figure you'll include too

- Discussion on the pros and cons of using legged systems for tasks that require locomotion
    - Legged locomotive robots have many advantages over their wheeled counterparts, for example their ability to more easily navigate harshly uneven terrain. However, there are disadvantages as well, one of which is power consumption.
- Discussion on the potential of using flexible links to replace rigid ones to increase performance in terms of accomplishing the goal and in conserving power.
    - In an effort to alleviate the power consumption issues seen when using legged systems to accomplish locomotive tasks such as walking, running and jumping, research has been conducted which replaces rigid aspects of said systems with flexible ones. It has been shown that this not only leads to higher performance but also higher efficiency.
- Discussion on using RL for controller design for creating higher jumping robots that also conserve power.
    - In this work, RL is used to train an agent (controller) which seeks to jump a simplified jumping robot modeled as a pogo stick. The RL agent is tasked with maximizing jump height while conserving power. It is shown that when tasked as such, the agent finds unique control strategies to maximize the jumping potential of the system, as well as balancing power usage.

End with "roadmap" paragraph

Related Work

map out what papers you plan to cite

This will very often fit better in the intro

- Discussion on using RL to create controller to control legged locomotive systems
    - Research has shown that using RL for defining control strategies for legged systems is a viable path for simple and even complex legged locomotive systems.
- Discussion on using RL to create controllers for flexible systems both legged locomotive and non locomotive type
    - Research has been conduction which shows the potential of using an RL approach to define controllers for flexible systems which are to have high accuracy. Additionally, the use of RL for defining controllers for flexible legged locomotion is also an emerging study, showing the possibilty and viability of the direction.
- Discussion on flexible systems, legged locomotive or not, being used to be more power conservative

    - Using flexible components within robotic systems has shown great potential for conserving power. Using both flexible links and joins has shown that a system which in less rigid has the ability to more energy efficient. Further more using flexible components in legged locomotive systems has shown that higher performance can be achieved when looking at metrics like running speed and jumping height.

- Discussion on traditional control methods which seek to be more power efficient

    - Research has been completed showing the effects of more traditional methods for creating more energy efficient control methods.

Method

You need to introduce the model first. If not the reward, etc won't make sense

- Using RL to develop a controller for the pogo stick env
- Defining different types of reward functions
    - Maximizing jump height
    - Maximizing jump height punishing power conservation
    - Maximizing jump height punishing power conservation past 50% of max jump height
- Defining pogo stick environment

Results

- Analyze jump height results form all three agents
- Analyze power consumption results from all three agent
- Make comparisons of jump height reached to power consumed
- Compare results to DV's paper

Conclusions

- Using RL leads higher jumping robot control designs
- Using RL also leads to more energy efficient controller designs
- Mention future work giving RL access to the design parameters to further optimize jump height and power consumption

I like to include a list of figures I think I'll need to. They can make something to work on when you have short amounts of time, that aren't long enough for substantial research.