Research Project

AGILE LEGGED LOCOMOTION

Motivation

Animals use legged locomotion and are able to move around on nearly the entire land surface of our world. The ubiquity of legs amongst animals suggests they must be an effective means of locomotion and the knowledge necessary to incorporate legs in machines is useful. This may have utility in agriculture, defence, entertainment and the exploration of earth and space. Also engineering advancements will continue to contribute to the scientific understanding of animal locomotion.

Objectives

This project aims to develop control techniques and algorithms for a hopping or running robot to perform rapid changes in speed and direction when the ground properties or external disturbances change. This set of control strategies is being tested on a prototype bipedal hopping robot, BBH (Bath Bipedal Hopper). The BBH (top) is a highly dynamic hydraulically actuated robot with three servo-controlled cylinders, and incorporates sensing for joint position, force (via pressure sensors) and body motion via an Inertial Measurement Unit. Controller development is being undertaken with the help of multi-body simulation models (left) and analytical models derived from equations of motion (bottom).

Future work

Controllers will be developed to achieve both vertical and forward hopping motion and to address the balancing issues for the bipedal hopper moving on rough terrain. Controllers will be tested experimentally on the BBH, and the BBH hardware will also be optimised to maximise performance.

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