Spider-inspired miniature jumping robot

Brief Description of Design Project Goals:

Overview:

Arachnids are an incredibly successful species, numbering over 100.000 sorts found in all climates and areas of specialization, including social and solitary individuals living in webs, burrows, on and even under water surfaces. They have hydrostatic skeletons with relatively simple joint articulations. Interestingly, most have none or few extensor muscles in the distal joints of their appendages. Instead, researchers have found that they can create high transient pressures within their joints to stretch their legs and use strong flexor muscles to bend them. Although this theory was first presented in 1957, and have been supported many times since, researchers still argue over how this pressure is generated and whether it is indeed the primary force of locomotion in larger spiders. The overarching goal of this work is not just to enable more versatile robots, but also to create a model with which we may advance our understanding of the biological system.

Specific MEng Contribution:

In collaboration with the Max Planck Institute for Intelligent Systems in Germany, we are studying a variety of species of spiders and developing a large-scale jumping robot with hybrid joints utilizing both pressure and tendons. In this project we will aim to supplement this work by creating a life-sized (<2 inches) jumping robot with similar joints. This project will involve collaboration between an ECE and MAE student. The students will design a driver circuit to be placed on board the robot, complete with a microcontroller, sensors, and motor drivers. They will furthermore design and fabricate a simple miniature robot body, likely using molding and casting of various polymers, and do performance tests.

ECE Field Advisor Name:

- Email – kirstin@cornell.edu
- Phone – 607-255-9335
- Office - 324 Rhodes

Project Web Site:

http://www.is.mpg.de/16061945/arachnabot

Number of MEng Students Needed:

2

Required Skills:

Smart, motivated, and creative students interested in robotics and practical implementations. Students are required to have 1) basic knowledge of circuit design, microcontrollers, embedded programming, and dc motor drivers; and/or 2) experience in Solidworks CAD design software, rapid prototyping, and basic knowledge of statics and dynamics. Furthermore, experience with molding and casting would be a plus.

Estimated Project Time Frame:

2016-17 Academic Year, Two (2) Semesters