Bio-inspired Mechanisms for Transitional Locomotion using the Harvard Ambulatory Microrobot

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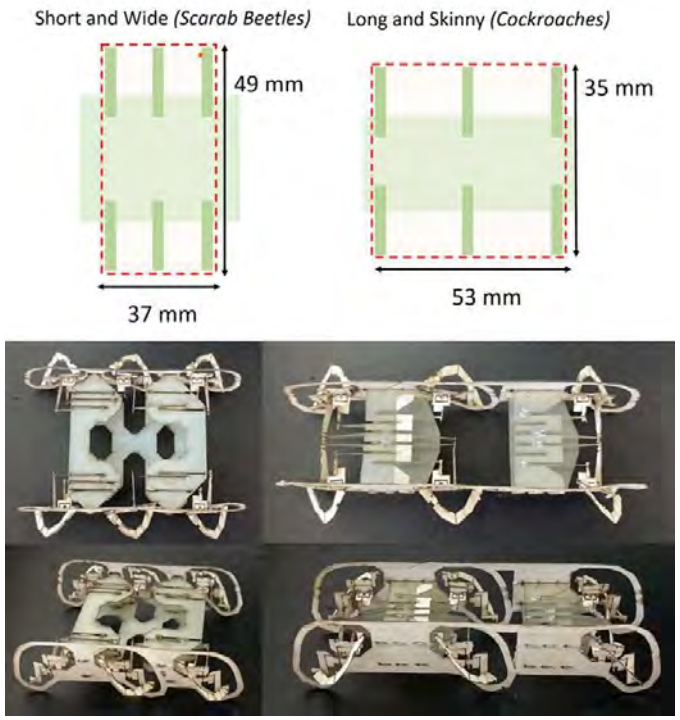
While robots have recently been shown to perform precise movements in industrial settings, they are still unable to match the performance of animals in natural environments (*forests, lakes, sand, etc*). Recently, Harvard researchers have developed the HAMR platform, a 4-legged microrobot the size of a beetle that has shown promising abilities to move on flat ground. However, the HAMR platform is still unable to traverse terrains that are inclined. The primary problem is that the 4-legged movement is unstable on inclines leading to tipping. To address this issue, my REU project was to investigate the body shape, leg motion, and aspect ratio of beetles that excel at inclined locomotion and design new HAMR microrobots based on my observations. So far, I have design 2 working prototypes and have begun fabricating a insect-scale robot. We hope to see increased stability in our future inclined experiments. Having a microrobot that can traverse both flat and inclined surfaces brings researchers on step closer to deploying swarms of these microrobots to aid in search and rescue missions.



Prototypes of new beetle-inspired microrobots to explore the role of aspect ratio in locomotion

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Velin Kojouharov is a rising junior at the Georgia Institute of Technology where he is majoring in Mechanical Engineering with a minor in Computer Science. His research interest are in bio-inspired robotics, microfabrication, and the physics of animal locomotion.

This summer I had a wonderful experience as a part of the Harvard SEAS REU Program working in the Microrobotics Lab of Prof. Robert Wood. Previously, I had experience in physics research focused on modeling the movement of animals, so this summer was my first exposure to research as part of an engineering lab. I learned about new fabrication techniques (l*aser cutting, stack pressing, microfabrication*) and new actuation methods (*piezoelectric actuators, soft actuators*). More importantly, this REU experience reassured me that I want to pursue a Ph.D. in the future and work towards a career as a professor.