WormBot: Mimicking Earthworm Locomotion

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This research designed, constructed, and tested an earthworm-inspired robot that can maneuver through narrow spaces in order to search for survivors in rubble or inspect dangerous sites without risking lives. An earthworm can crawl through dirt or passages little wider than its own diameter. Like an earthworm, the “WormBot” alternately elongates and contracts its body and uses retractable claws to grip its surroundings to prevent it from slipping. This research made use of biomimicry, emulating animals or biological processes, as well as soft-robotics, using pliable parts and actuators to interact with moving environments and flex instead of breaking. The WormBot is modular, and is built from inexpensive, commonly available parts. It is powered by compressed air, and the control and power components are remote, connected to the robot through a “leash” of thin, plastic air tubes. Thus, a crushed or lost WormBot could be abandoned and inexpensively replaced. The working prototype has an extension section, which can lengthen, bend, or contract using inflatable actuators based on surgical tubing, and two claw sections, each with eight plastic claws that extend and retract. It is controlled by an Arduino microcontroller, which switches electric valves in precise sequences to move the robot. Additional research will test potential claw improvements, adding more modules, more accurate and repeatable extension, and air pressure sensing to provide feedback to the control programs. With additional research and improvements, earthworm-based robots could save lives in disasters, improve the safety of machinery maintenance, or even assist in minimally-invasive surgery.

Awards Won:

IEEE Foundation: The IEEE Foundation Presidents' Scholarship Award of $10,000

NASA: Honorable Mention