SlothBot: Sustainable Solution for Studying Climate Change (#8194)

A solar-powered, fail-safe robot for environmental monitoring applications

The SlothBot is a solar-powered, wire-traversing robot designed for long-term environmental monitoring applications. Its unique ability to easily switch between branching wires allows it to survey a wide area. It also provides a fail-safe as it keeps the robot attached to a wire at all times. SlothBot takes advantage of its simple and compact system design to reduce maintenance as well as the risk of failure. The robot uses solar power to recharge its battery. It also leverages slowness as a design principle—in stark contrast to conventional robotic strategies—in order to be as energy-conserving as possible. Slowness and long-term sustainability make SlothBot perfect to study environmental changes over extended periods of time.

A key feature of the SlothBot is its unique and modular mechanical setup, composed of standalone bodies connected by actuated hinges. Each body contains a motor, a wheel and four spur gears. Two of the spur gears are c-shaped, allowing the body to either remain locked onto the wire or turn depending on their position. Compared to existing robotic wire-switching systems, these features make Georgia Tech's SlothBot significantly more energy efficient and lower risk.

Benefits/Advantages

- **Wide-ranging**: Can switch between two different wire branches and can therefore traverse a whole mesh of wires
- **Sustainable**: Utilizes solar energy and runs with a low power consumption, making the robot highly energy efficient
- **Low risk**: Employs a fail-safe design that protects the robot from damage in the event of a mechanical failure

Potential Commercial Applications

- Environmental monitoring
- Conservation research
- Precision agriculture
- Autonomous sensing/monitoring equipment

Background/Context for This Invention

Wire-traversing robots are often useful in environmental monitoring and agricultural applications as well as for monitoring and maintenance in hazardous settings, such as on a power line. However, many

conventional designs for these applications require multiple battery changes due to their high power consumption and are not always capable of wire-switching, limiting their coverage area.

The Georgia Tech SlothBot was designed with total self-sustainability in mind. It remains attached to the wire at all times and autonomously seeks out solar energy when its power is low. For these reasons, the SlothBot is the ideal robot for tasks over an extended period of time, supporting crucial information-gathering efforts for climate change research and conservation.

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More Information

U.S. Number: 62/976,641

Publications

Georgia Tech deploys SlothBot in Atlanta Botanical Garden, Video, June 17, 2020

'SlothBot in the Garden' Demonstrates Hyper-Efficient Conservation Robot, June 16, 2020

The SlothBot: A Novel Design for a Wire-Traversing Robot, IEEE Robotics and Automation Letters, April 2019

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/slothbot-sustainable-solution-studying-climate-change

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot