Wristed Vine Robot Design  
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BACKGROUND

The Vine Robot platform has proven useful for a wide array of applications ranging from probing soil in low-gravity environments to delicate medical procedures. The platform is continuously tailored to new applications and each new application reveals new opportunities to advance the design. Most Vine Robot bodies, the evert ing components that travel along their intended path, are on the order of several centimeters in diameter or more. Various active steering techniques have been successful for robots of this size, but it is difficult to apply these techniques to robot bodies on the millimeter scale. Just as it was for the original Vine Robot, the solution for actively steering small-diameter Vine Robots can be found by mimicking biology.

DESCRIPTION

Researchers at UC Santa Barbara and UC San Diego have introduced active steering capability to millimeter-scale vine robots by integrating a tendon-actuated wrist in a working channel located inside the vine. Translating and rotating the working channel and actuating the wrist enables curvatures to be formed along the vine in desired locations and orientations, with a desired angle. The tendon exits the working channel through its wall before it reaches its tip. It then follows the external wall of the working channel and is attached to its tip, thus forming a wrist. By pulling on the tendon at its proximal end, the tip of the working channel bends, which also bends the vine body at this location. This extends their workspace and reachability and enables the deployment of these robots along very small curved paths.
ADVANTAGES

▶ Tendon-actuated wrist enables active steering of small-scale Vine Robots (millimeter-scale diameters)
▶ Scalable design can be implemented in larger vine robots as well for a minimalized mechanical profile

APPLICATIONS

▶ Robotics
▶ Inspection
▶ Installation
▶ Medical devices
▶ Catheters
▶ Endoscopes

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Hydraulically Actuated Textiles
▶ Soft Burrowing Robot for Simple & Non-Invasive Subterranean Locomotion
▶ Mechanism for the Autonomous Control of a Vine Robot
▶ Self-Anchoring Burrowing Device for Sensor Placement with Low Reaction Force
▶ Vine Robot Designs for Miniaturization