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Thin cable-like continuum robots for remote inspection

This talk will provide an overview of research in long, thin, cable-like "tendril" continuum robots. Resembling robotic cables, this new class of robots can enter and explore congested and potentially unstable environments, sending back information from sensors at their tips. This capability is of particular value in search operations in urban disaster relief situations. In such situations, lives can depend on whether the existence and location of buried victims and/or dangerous entities (gas leaks, explosive materials, etc.) can be established among damaged infrastructure. Further, inspection needs to be made without further collapsing structures within the environment. There is therefore, a need for alternative sensor placement technologies which can maneuver through tight space in cluttered, complex, a priori unknown (or partially known) environments. In the event of contact between the deployed technology and its surroundings (either planned or inadvertent), the machine interface needs to be compliant, to prevent the generation of high contact forces which could destabilize the environment. Conventional robot technologies are based around rigid elements (links, wheels, tracks, etc.), which inherently present a relatively high stiffness mechanical interface to the environment. While this is highly advantageous in traditional robot application arenas (factories, hard floors/road surfaces, etc.), enabling high precision and repeatability operations in structured or semi-structured environments, it is less inherently suited to compliant and adaptive operation in unstructured and potentially unstable environments. Continuum robots are a novel and rapidly emerging class of robot with continuously bendable backbones. Sometimes inspired by biological structures such as elephant trunks, octopus arms and vines, continuum robots are inherently more compliant and adaptable than conventional robot structures based on rigid links. This compliance allows them to gently maneuver among and through obstacles, while avoiding the generation of large contact forces. Use of these robots for remote inspection operations will be discussed.

Figure 1: Thin continuum robot performing outdoor inspection

Recent Publications

1. 1. Trivedi D, Rahn C D, Kier W M and Walker I D (2008) Soft robotics: Biological inspiration, state of the art, and future research. Applied Bionics and Biomechanics 5(2):99-117.

Biography

Ian D Walker completed his BSc in Mathematics from University of Hull, England, in 1983; MS and PhD in Electrical and Computer Engineering from University of Texas, Austin in 1985 and 1989, respectively. He is a Professor in Department of Electrical and Computer Engineering at Clemson University, USA. His research focuses on "Robotics, particularly novel manipulators and manipulation". His group is conducting basic research in the construction, modeling, and application of biologically inspired robots.

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