Soft Surgery: Surgical Robotic Tools

THE UNIVERSITY OF ALABAMA | Research & Economic Development
Office for Innovation & Commercialization

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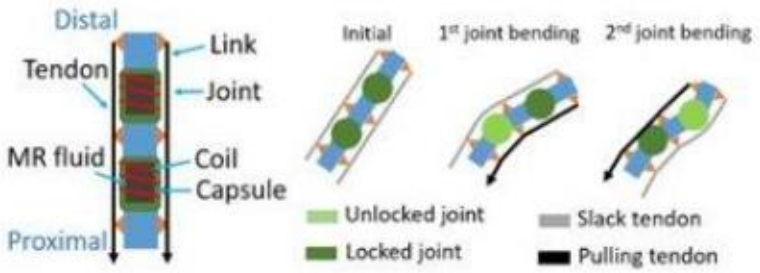
The Problem:

Minimally invasive surgeries (MIS) are becoming increasingly popular. Typically, these surgeries involve inserting a flexible tube mounted with tools into the body, and insertion is done by a surgeon, either by hand or robotically. The pathways that these tools must take are complex (Non-linear, Branching, Changing in diameter), and a surgeon must navigate complex biological systems to arrive at buried, diseased or injured tissue, requiring repeated re-insertion and re-positioning. A better tool would allow for medical professionals to reach injured and diseased locations simply, quickly, and in one smooth motion.

The Solution:

Researchers at the University of Alabama have developed a compact and highly dexterous surgical robot system with controlled mobility using Magnetorheological (MR) fluids contained in a soft, elastomeric capsule surrounded by a metallic coil. The Robot can be integrated into a semi-or fully-autonomous evacuation system. It may be mounted with bio-sensors, digital imaging equipment, and drug delivery components for rapid treatment. It can also assess and treat life-threatening injuries either in the area of action or as part of a larger unmanned system.



Model of Fluidic Joints

Benefits:

- Adjustable compliance materials minimize damage to human tissue
- Customized geometrical design of surgical tools
- More efficient, effective, and customized in vivo surgery
- Controls the insertion speed of the robot and the time sequence of unlocked joints
- Lightweight and portable

INVENTOR

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Dr. Koh received her Ph.D. from Rensselaer Polytechnic Institute in 2016. Her research interests include environmental remediation, functional material interfaces for soft robotics, polymers and soft materials initiative, sensing, and stretchable electronics.

Recent Publications

Effect of Particle Geometry on Electric Field Distribution, Partial Discharge, and Dielectric Strength of Iron-Polymer Composites (2022)

Multimodal Deformation of Liquid Metal Multimaterial Composites as Stretchable, Dielectric Materials for Capacitive Pressure Sensing (2022)

Simultaneous Thermo-Magnetorheological Response of Magnetorheological Fluids: Effect of Concentration and Composition (2021)

Performance and stability of magnetorheological fluids—A detailed review of the state of the art (2021)

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