Flexible Medical-Robotic Instruments

Development and Fabrication of a Feedable Tendon-driven Continuum Robot for Handheld Devices

— 20th February 2021 —

Context

Flexible medical instruments are small, handheld continuum robots for minimally invasive surgery that can be of great help to surgeons while operating next to or within critical compartments of the human body (e.g., crucial blood vessels). The design and control of such instruments is challenging. Actuation via tendons is a rather simple mechanical approach that is widely used in today’s application. Unfortunately, pushing and pulling multiple tendons require large and bulky external actuation units that can hardly provide additional feeding mechanism so that the instrument can actually move forward.

Task Summary

- Review the state-of-the-art of tendon-actuation.
- Develop a concept for compact feeding.
- Design and fabricate a demonstrator.
- Test and evaluate the demonstrator.

Objective

Enhance and extend given designs for tendon-driven continuum robots, to allow for compact feeding of the continuum structure.

Figure 1: Team of surgeons in the operation theatre. Source: © Solvay 2020.

Figure 2: Hybrid continuum robot proposed by Amanov et al. (2017).

Figure 3: Mechanical structure of a tendon-driven continuum robot as reviewed by Li et al. (2017).

Requirements

Qualified candidates (computer science, engineering, physics, material science) shall be interested in:
- Mechatronics
- CAD-Design
- Experimentation

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