MASTER'S PROJECT INVITATION

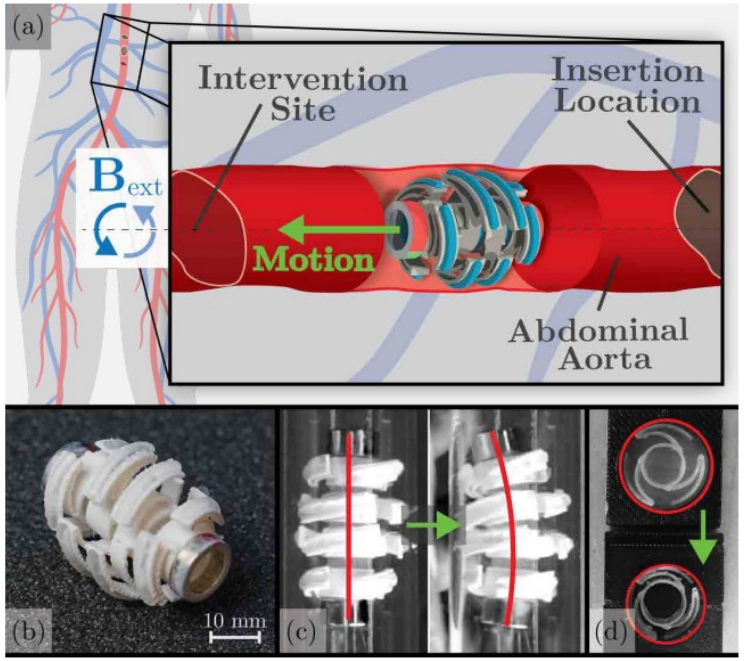
SURGICAL ROBOTICS LABORATORY

www.surgicalroboticslab.nl

SUPERVISORS: V. KALPATHY VENKITESWARAN[1] & PROF. S. MISRA[2]

Project title: Design and development of a magnetically-actuated surgical capsule

Background: Magnetic actuation shows good promise in driving the development of next era of surgical instruments. We will aim to harness the advantages of magnetism and create a new for minimally invasive surgery (MIS). A capsule robot with structural flexibility will be designed as a vehicle for minimally invasive access to difficult to reach surgical sites. Remote actuation using magnetic means is expected to make the device more compact.



Example of magnetically-actuated flexible capsule robot

Tasks:

- Survey literature on robotic minimally invasive surgical tools
- Develop a new design iterating from previous versions
- Investigate procedures for fabrication of components, including integration of sensors
- Create an accurate system model to help achieve precise motion
- Demonstrate feasibility of design through experiments or simulation

Suited for: *BME, ME, 4TU S&C*

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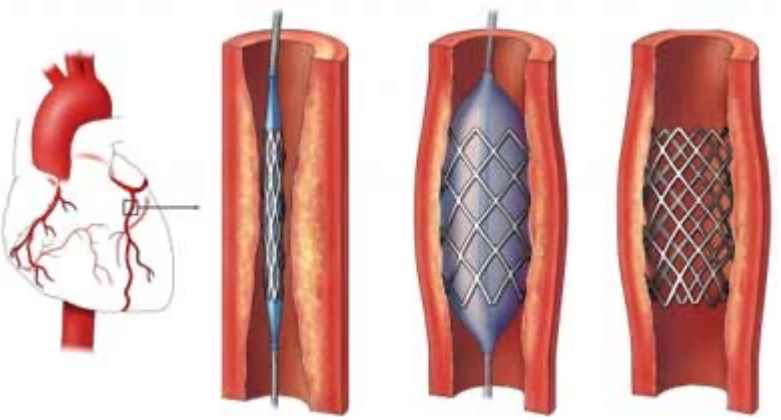
SUPERVISORS: V. KALPATHY VENKITESWARAN[1] & PROF. S. MISRA[2]

Project title: Origami-based magnetically-actuated flexible surgical capsule

Background: Origami-based engineering allows the development of flexible devices that are capable of dramatic shape change. We aim to harness the advantages of origami design and develop new tools for surgical interventions. This project will focus on developing minimally invasive surgical tools using origami designs. The use of magnetic actuation and structural flexibility will also be considered. The focus will be on developing a model-based design methodology for magnetically-actuated origami robots.



Stenting in arteries

Tasks:

- Survey literature on origami patterns
- Conceptual design of surgical capsule, including magnetic elements
- Development of model combining flexibility and magnetic actuation
- Calculations and/or simulations to develop working designs
- Fabrication of prototypes 3D printing, molding etc.
- Experiments with phantom blood vessels or organs

Shape-changing origami structures

Suited for: *BME, ME, 4TU S&C, IDE*

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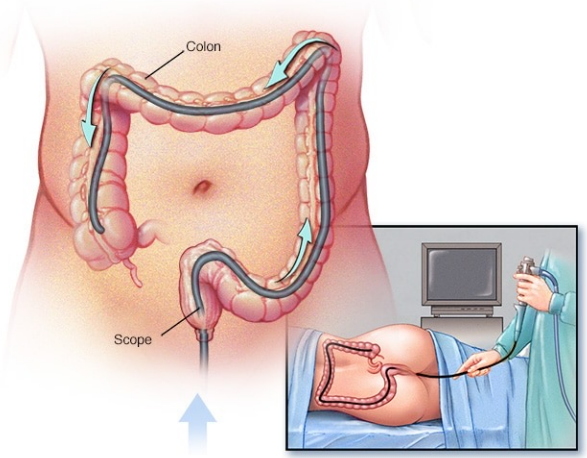
SUPERVISORS: V. KALPATHY VENKITESWARAN[1] & A. SADEGHI[2]

Project title: Magnetic actuation of a "growing" colonoscope

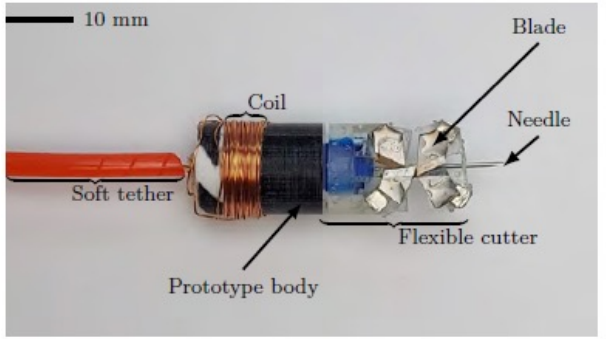
Background: Magnetic actuation shows good promise in driving the development of next era of surgical instruments. Remote actuation using magnetic means is expected to make the device more compact and applicable for minimally invasive surgery (MIS). We will aim to harness the advantages of magnetism to develop a controllable actuator for a colonoscope with benefits for the patient and clinician. The colonoscope will be designed based on recent developments in the area of "growing" soft robots.



Conventional colonoscopy

Tasks:

- Survey literature on magnetic actuation for clinical applications
- Develop a concept colonoscope head that uses magnetic actuation in tandem with growing soft robots
- Investigate procedures for fabrication of components, including integration of sensors
- Create an accurate system model to help achieve precise motion
- Demonstrate feasibility of design through experiments or simulation



Magnetic surgical tool concept

Suited for: *BME, ME, 4TU S&C*

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