MASTER'S PROJECT INVITATION

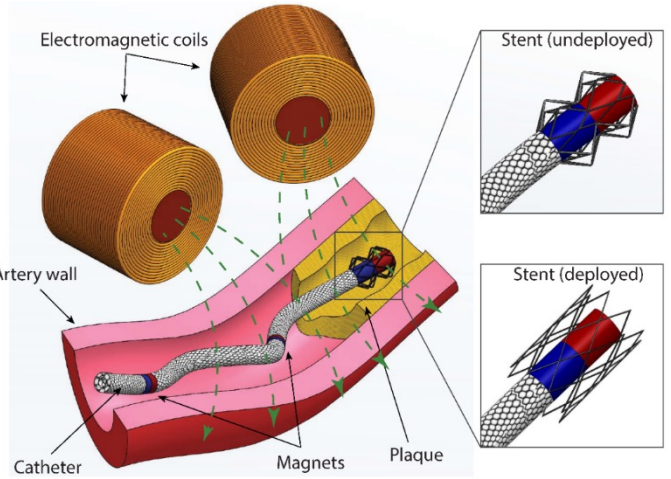
SURGICAL ROBOTICS LABORATORY

www.surgicalroboticslab.nl

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

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

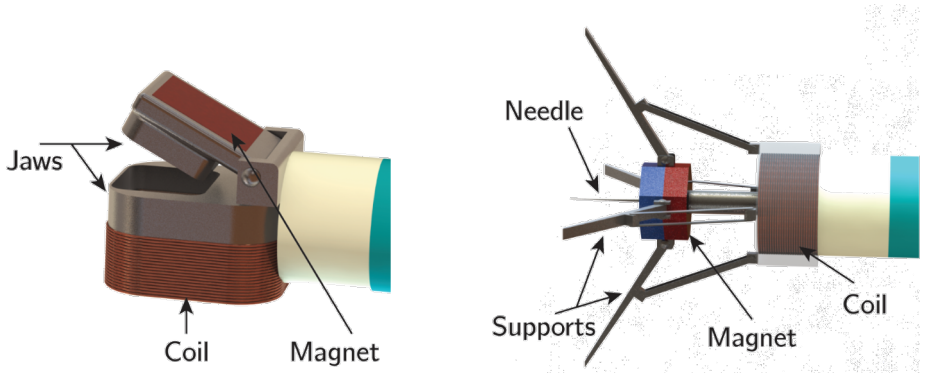
Background: Magnetic actuation shows good promise in driving the development of next era of surgical instruments. We will aim to harness the advantages of magnetism and create new tools for specific surgical interventions. Example applications may include gripping, drug delivery, ablation, removal of calcified tissue and suturing. Remote actuation using magnetic means is expected to make the device more compact and applicable for minimally invasive surgery (MIS).



Example of magnetically-actuated stent catheter

Tasks:

- Survey literature on robotic minimally invasive surgical tools
- Develop a new design that overcomes limitations of state of the art
- Determine most suitable method of magnetic actuation
- 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 tool concepts

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

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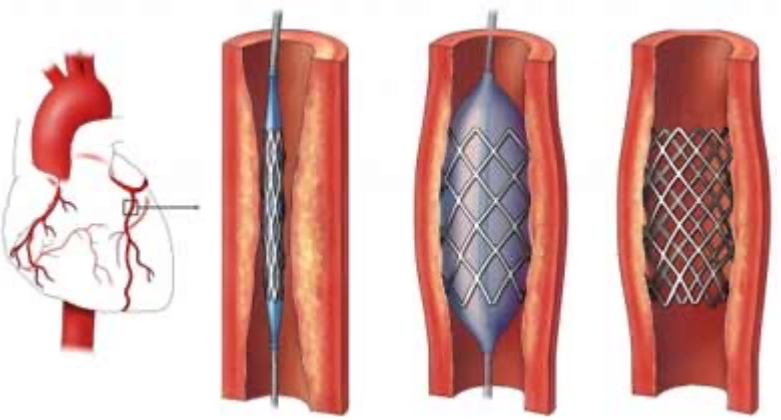
SUPERVISORS: V. KALPATHY VENKITESWARAN[1] & PROF. S. MISRA[2]

Project title: Origami-based design of 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. Example applications include stenting, diagnostic imaging and drug delivery. 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.



Stenting in arteries

Tasks:

- Survey literature on origami patterns
- Conceptual design of surgical capsule, including magnetic elements
- 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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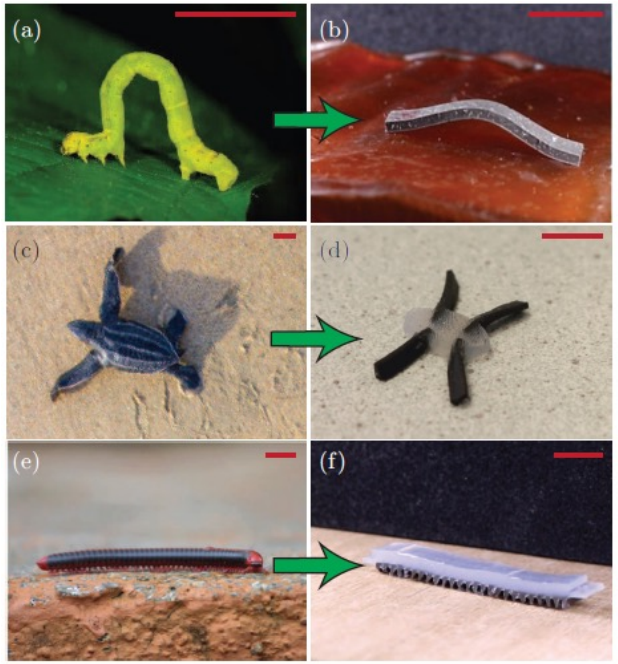
SUPERVISORS: V. KALPATHY VENKITESWARAN[1] & PROF. S. MISRA[2]

Project title: Milli-scale magnetic soft robots

Background: Magnetic actuation has the advantages of requiring no on-board power source, untethered control and easy "programmability". Our aim to harness the advantages of magnetism and develop small-scale soft robots for potential applications in minimally invasive surgery (MIS). In this project, the focus is on design of millimeter-scale magnetic soft robots with functional components.



Bio-inspired magnetic soft robots

Tasks:

- Survey fabrication methods for soft robots
- Cultivate background in magnetic actuation
- Developing concept of specific function (sensing, gripping, locomotion etc.)
- Calculations and/or simulations to develop working designs
- Fabrication with smart materials and embedded components
- Experiments with soft robots and magnetic actuation systems

Example designs for 3D printable magnetic soft robots

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

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MASTER'S PROJECT INVITATION

SURGICAL ROBOTICS LABORATORY

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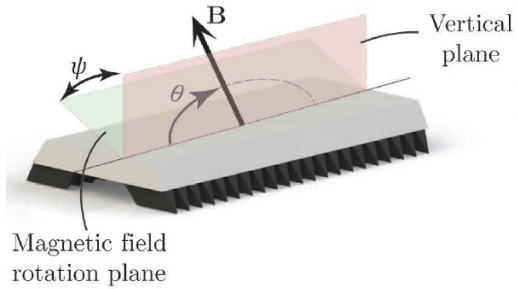
SUPERVISORS: V. KALPATHY VENKITESWARAN[1] & PROF. S. MISRA[2]

Project title: Tracking and control of milli-scale magnetic soft robots

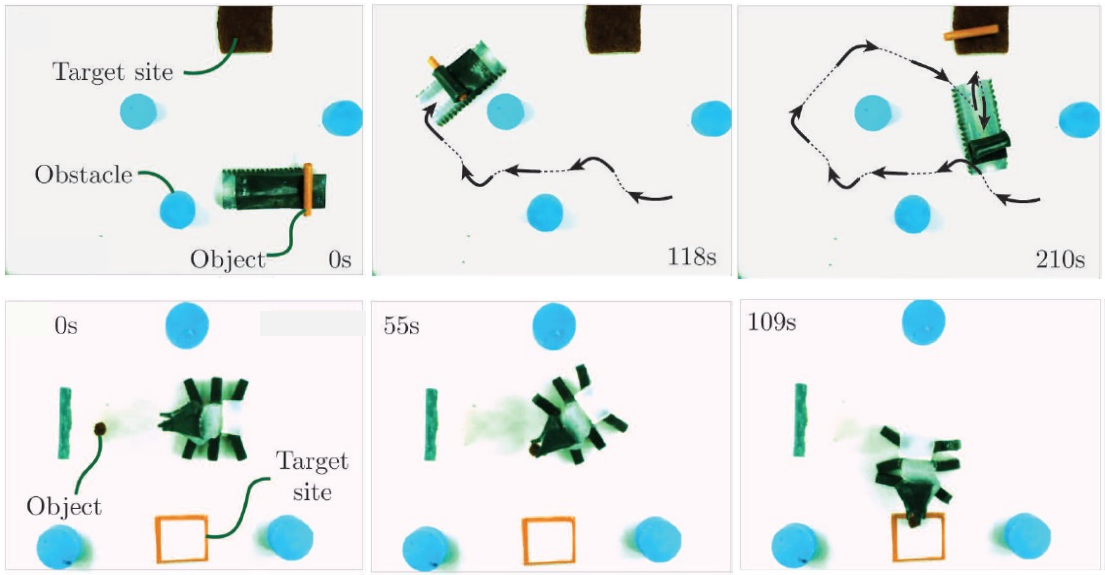
Background: Magnetic actuation has the advantages of requiring no on-board power source, untethered control and easy "programmability". Our aim to harness the advantages of magnetism and develop small-scale soft robots for potential applications in minimally invasive surgery (MIS). In this project, the focus is on developing methods for tracking existing specimens and controlling their motion to follow specific trajectories.



Magnetic actuation for control of soft robot

Tasks:

- Survey current methods in literature to identify suitable tracking method
  - Clinical relevance
  - Soft robotics
- Cultivate background in magnetic actuation
- Understanding control options through investigation of motion
- Calculations and/or simulations to back up control strategy
- Experiments with soft robots and magnetic actuation systems



Pick-and-place tasks using soft robots

Suited for: *BME, ME, 4TU Systems and Control*

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