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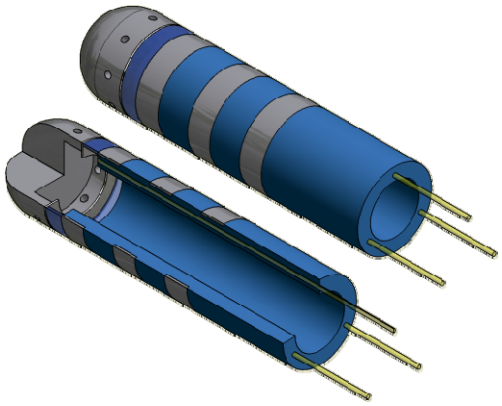
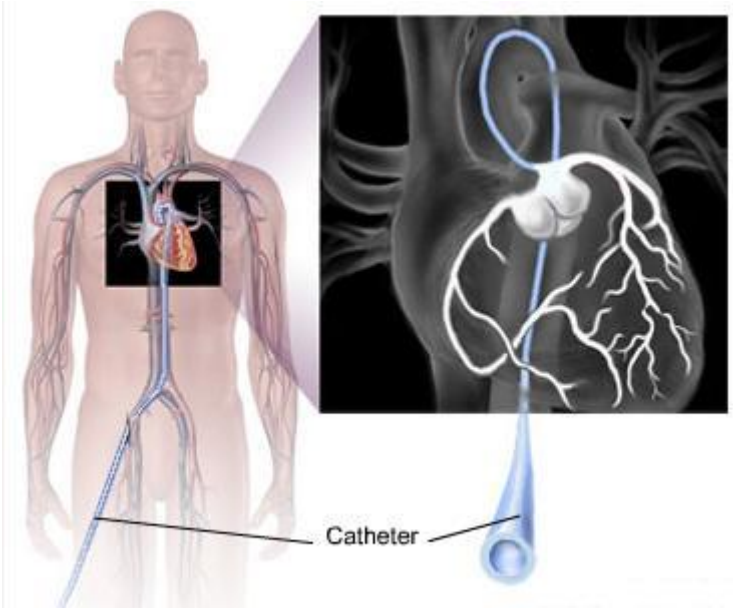
SURGICAL ROBOTICS
MONTPELLIER/FRANCE/2009
4th Summer School

LIRMM

MRI-compatible Miniaturised Force Sensing for Cardiac Catheterisation





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Centre for Mechatronics and Manufacturing Systems (CMMS)

Department of Mechanical Engineering

King's College London

EPSRC
Engineering and Physical Sciences Research Council

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- Founded 1829, has 9 Schools in 5 Campuses and more than 25,000 students.

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Cardiac Catherisation

- A MIS procedure where a long, thin, flexible tube called catheter is put into a blood vessel in the groin (upper thigh) and threaded to the heart.
- Through the catheter, doctors can perform diagnostic tests and treatments on the heart.

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Catheterisation Imaging Techniques

- Fluoroscope (X-rays)

No Radiation!

Better representation!

Metallic components cannot be used!!

- MRI Scanner

Radiation!

Poor soft tissue representation!

- CT Scanner (X-rays)

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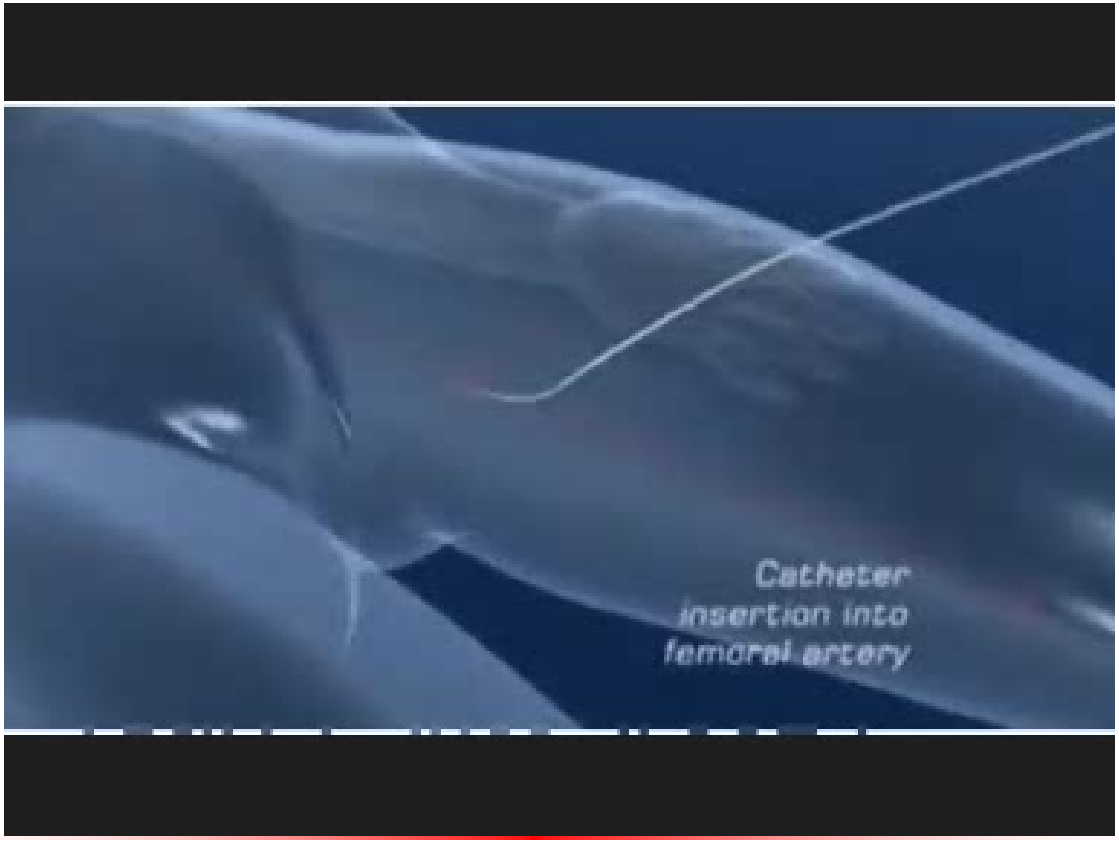
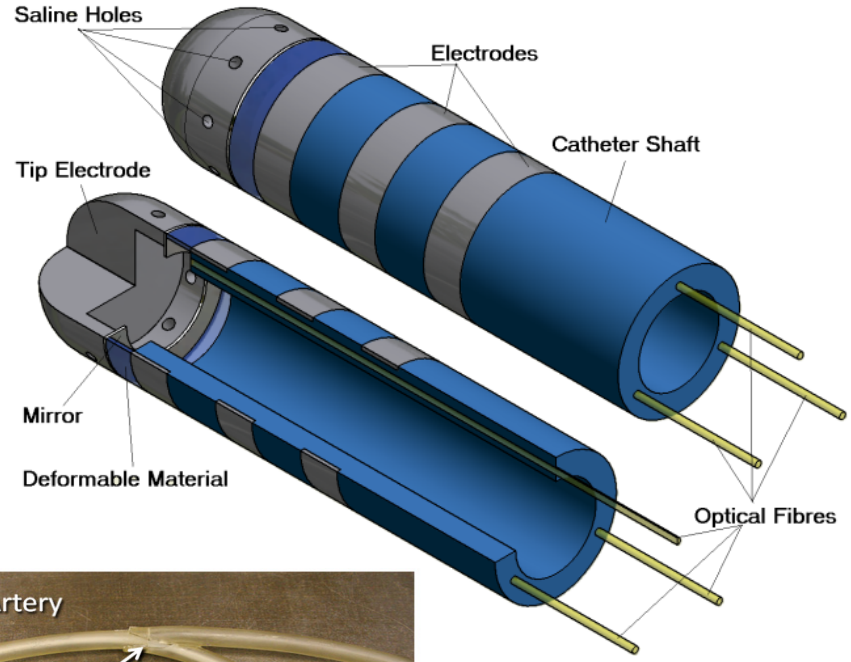
Why Force Feedback?

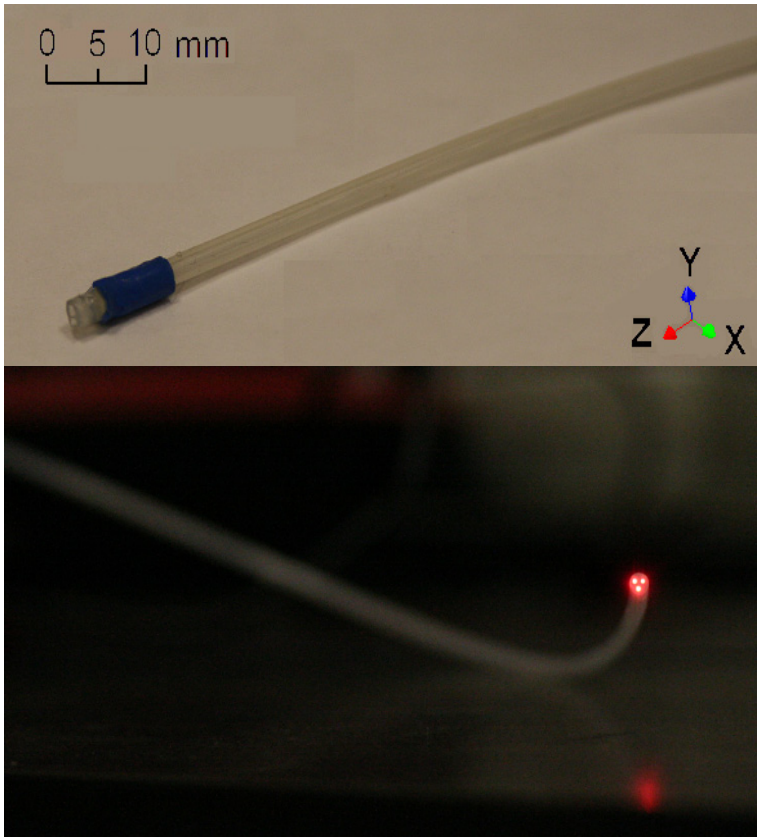
- Advancing a catheter through extremely delicate vasculature without force feedback is a risky procedure.
- A good and safe contact must be achieved inside the heart between catheter tip and the heart walls.

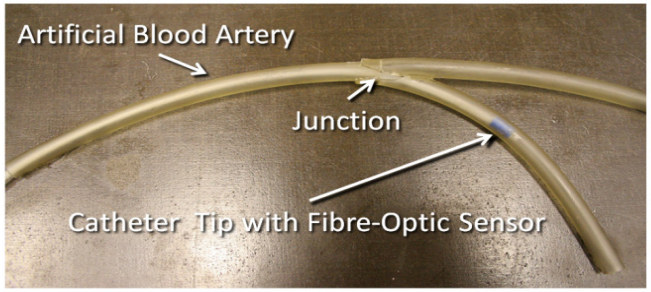


Fibre Optic Force Sensing - Preliminary work

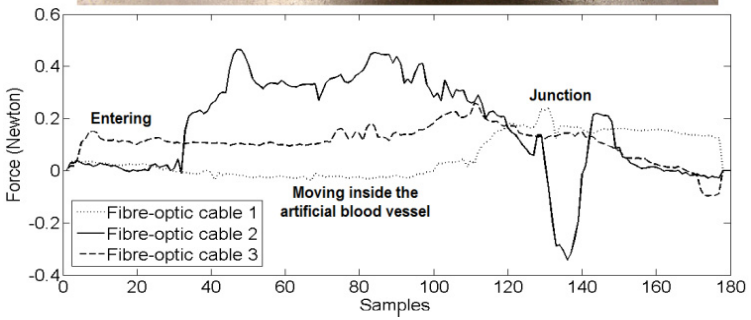


- MRI-compatible solution





Light Intensity Modulation!



Panagiotis Polygerinos, Tobias Schaeffter, Lakmal D. Seneviratne, Kaspar Althoefer, "A Fibre-Optic Catheter-Tip Force Sensor with MRI Compatibility: A Feasibility Study", *IEEE Engineering in Medicine and Biology Conference, Minneapolis (EMBC), MN, USA, 2009.*

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Future Work

Develop an MRI-compatible fibre optic force sensor for cardiac catheterisations

Perform calibration and in-vitro, ex-vivo experiments to validate the sensor

Prove MRI-compatibility

Perform in-vivo trials under MRI guidance → Successful? → Happy End!

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… Thank you for your attention!

- Panagiotis Polygerinos, Ph.D Student

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