

Integrating tactile and visual information for flexible manipulator contact estimation

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STIFFness controllable Flexible and Learnable manipulator for surgical Operations

- To create a novel flexible manipulator using biological novel, structures that are inherently capable of morphing their state from **completely soft** to **entirely rigid**,
- To create novel **control** strategies based on **biological inspiration** taken from octopus,
- To embed distributed **sensing** (tactile as well as position) to enable **cognitive development and intelligent control** in a **highly redundant manipulation device**,
- To advance **learning and cognitive reasoning** in a complete embodiment of a hyper-redundant manipulation system that experiences and **learns from physical interactions** with its environment,
- To provide a practical solution to the important areas of **minimally invasive surgery** with great commercial potential and impact



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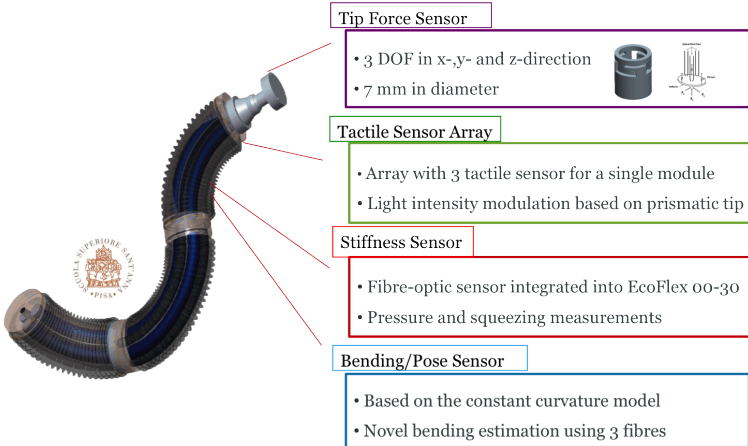
STIFF-FLOP Sensors (1/3)

Aims

Sensors

Software

My Contribution



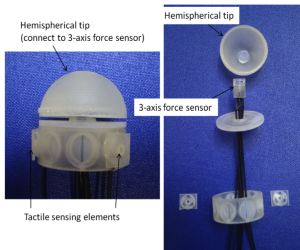
STIFF-FLOP Sensors (2/3)

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Tactile sensing elements



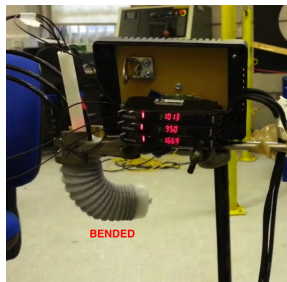
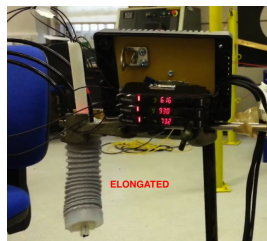
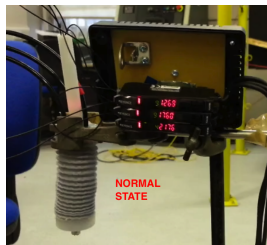
Optical fibres



- 3 axis force sensor at the tip
- Tactile sensing element on the sides

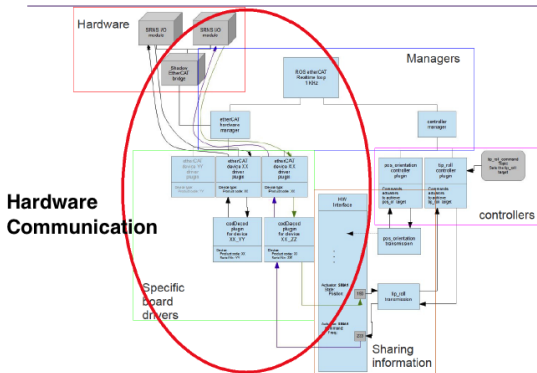
STIFF-FLOP Sensors(3/3)

- Bending Curvature sensor based on constant curvature model



The realtime loop running in ROS (Robot Operating System) covers different tasks:

- Reads and sends analog/digital data from and towards the hardware,
- Loads the I/O modules drivers for the different hardware connections,
- Starts the Low level controllers (using the sensors reading as input to compute the output commands),
- Runs at 1 KHz .



- Tactile and Bending sensors integration in the system map
- Real-Time interface with Sofa Simulator
- Real-Time interface with the Real Hardware

(SV.mp4)



THANKS FOR YOUR ATTENTION

