Context

The work of the team DEFROST at Inria is focused on numerical methods to simulate and control soft robots. The main tool used to this end is the simulation framework Sofa (C++, Python), that is also being developed by the team. One important aspect of control of soft robots is the ability to include external forces due to contacts with the environment. Therefore, recently the team has pushed in this research direction, developing methods and also sensors to provide the soft robots with the sense of touch.

Short description

The topic of the internship is the development of a capacitive, tactile sensor using soft materials (silicone). The sensing element will consist of an arrangement of conductive and insulating layers that will function in a way similar to touch screens in modern consumer electronics (tablets, smartphones), which have the capability of detecting and localizing touch interactions. The idea is to complement an existing touch modality based on pneumatic measurements, effectively making it a multi-modal sensor.

The activities of the intern will comprise the fabrication of the sensor and the experimental validation. Read-out electronics are available, but need to be programmed at the firmware level to achieve the desired functionality. The main challenge is to fabricate the sensor, requiring the design of 3D-printed parts, the testing of material properties, etc. The programming aspect will require some effort at the level of controlling electronic components (e.g. multiplexer), communication with a host system and plotting of the data.

Profile

Expected skills are:
- Programming: General experience, Micro-controller, C/C++ and Python are a plus
- Circuits and sensors: Experience working with hardware, especially sensors (understanding circuits, soldering, etc.)
- Motivation: Interest in learning and endurance to overcome difficulties, which are guaranteed to be available by working with hardware

Schedule

- Design and fabrication of a single capacitive tactile cell in silicone
- Data sampling, communication with host system and experimental validation
- Re-iteration of the design and extension to a 2D-array
- Experimental validation for the updated version
- Joint evaluation of the pneumatic and capacitive modalities in Sofa (if enough time)

Contact

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