Mechanosensing for soft robotics: technological approaches and open issues

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Tactile sensing is crucial robotics, and soft robotics poses more stringent requirements for design - since it is expected that robots are immersed in the real world moving in vulnerable and undefined surroundings by easily adapting through their soft bodies. Similar to the natural mechanosensitive structures of animals and plants, artificial sensing solutions need to be compliant with the environment, in addition to being conformant to the robot soft body (or human body in case of wearable systems) without compromising sensing functionality. Moreover, external stimuli should be distinguished from mechanical cues originated from the soft body itself during movement. I will describe the approaches of our group in the area of tactile sensing, and mechanical sensing more at large - i.e. “mechanosensing”, aiming at sensitive but robust and low-cost solutions. We have exploited smart layouts with combinations of soft materials (e.g. elastomers and conductive textiles), to enable detection and discrimination of different mechanical cues (e.g. pressure, strain, multi-directional force) by means of different principles (e.g. capacitive, resistive, optical), and I will also show how some of the results in 2D soft sensing can be successfully applied to develop smart garments for rehabilitation and human assistance. In this workshop we aim at discussing a plethora of possible technologies and methods that can go beyond the classic 2D smart sensing approaches, hence I will mention some preliminary work on soft sensing systems inspired from nature (like for structures from plant sensory organs).