

Multifunctional Dielectric Elastomer Electronics for Next Generation Soft Robotics – MEITNER

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Summary



Conventional robots usually consist of heavy and rigid components, such as motors, gearboxes, and linkages, that are made of high-density materials. Although they can perform complex movements and tasks, adequate actions similar to those of biological models are typically lacking. Alternatively, entirely soft robots resembling animal behaviour will pave the way for new perspectives and applications in artificial organs, drug delivery, surgical procedures, etc. To do so, sensing, control, and actuation have to be integrated in the same soft structure. Partially soft actuators (e.g. pneumatic or hydraulic) are available nowadays, however, traditionally stiff semiconductor electronics for sensing and signal-processing are still required, preventing them from designing an entirely soft structure for broader applications. Therefore, it is necessary to develop novel materials with the capability of achieving full functions of the units embedded in the robotic system, including support structures, actuators, sensors, signal-processors, and power storage. A picture of a Caterpillar Robot is given below and it is a completely soft robot that possesses distributed, soft, and functional nodes throughout its entire body.

DE-Electronics

Dielectric Elastomer Circuits for Soft Computing

Multidomain Modelling with SIMULINK

Soft Robotic Demonstrators and applications

DE Oscillators as Soft Robotic Pacemakers

Experiment

Modelling

Applications

DE-Actuators

Ink Preparation

Actuators & Fabrication Tech.

Characterizations

Ink Preparation

Actuators & Fabrication Tech.

Characterizations

Soft Robotics pneumatic

pneumatic controller

- independently regulates pressure on five channels
- build-in pressure and vacuum source

manufacturing

actuators

- tentacle – manipulator and gripper
- embeds three air channels for actuation
- achieves desiring deflection angles by pressure control

pneumatic controller

manufacturing

actuators

Kontakt
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