

Topic for student research / diploma / master project

Design of miniaturized dielectric elastomer drivers for soft robotic applications

Dielectric elastomer artificial muscles (DEAs) are a promising technology for soft robotic actuation, offering lightweight, highly deformable, and energy-efficient motion compared to conventional actuators. Their unique material properties make them particularly well-suited for creating compliant, bio-inspired robotic systems. However, operating DEAs typically requires large and powerful driving electronics, which limits their use in compact or mobile applications. The goal of this thesis is therefore to develop miniaturized DE-drivers, building upon and refining existing circuit designs from different research groups, to enable more practical and portable DEA-based robotic systems.

In this thesis you will first explore the state of the art by reviewing existing single-PCB dielectric elastomer drivers, then analyze how such a miniaturized driver could be integrated into a soft robotic example. Building on this, you will design the circuitry, schematics, and PCB layout while selecting suitable electronic components, and bring the system to life by programming a simple firmware. The work continues with the assembly of a prototype and culminates in testing, documenting, and discussing the results. This project offers the opportunity to combine literature research, circuit and PCB design, firmware development, and hands-on prototyping within the exciting field of soft robotics.

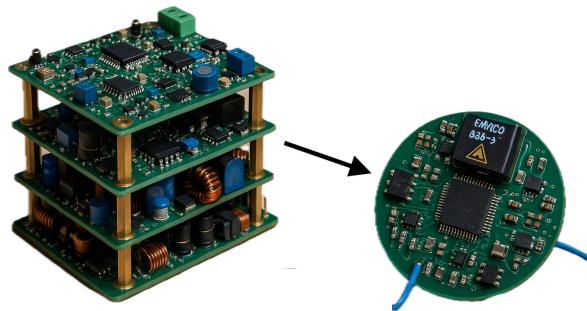


Figure: Sensor-integrating coupling with measuring electronics, enabling the implementation of a self-priming energy harvesting circuit

Focus of work

- Literature review on current single PCB DE drivers
- Analysis of requirements for integrating a one PCB miniaturized DE driver into one soft robotic example
- Design of the required circuitry, schematics, and PCB layout, including the selection of suitable electrical components
- Programming of a simple firmware to run the device
- Assembly of a prototype
- Test, documentation, and discussion of results

Counterpart

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