

HiWi / Master's Thesis

Real-time feedback control of a piezo-driven tunable-focus liquid lens through charge sensing

Tunable optics is widely used in photography, microscopy, adaptive optics, and many other applications. At the Laboratory for Microactuators, we've developed tunable optics, including a successful tunable-focus liquid lens powered by piezoelectric actuators. Piezoelectric actuators are preferred for their precision and speed, however they pose challenges due to their nonlinear behavior such as hysteresis, creep, and temperature sensitivity. It has been shown that these issues can be mitigated by utilizing the direct piezoelectric effect.

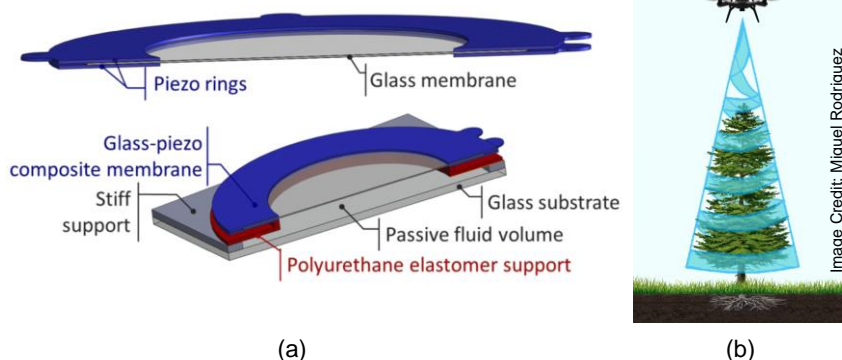


Figure: (a) Concept of the piezo-driven tunable lens. [Wapler, Optics Express (2020)]
(b) Concept of the LiDAR measurement in ECOSENSE – Research Area B2.

As part of the DFG funded collaborative research center ECOSENSE, along with our partners, we're integrating these components into a LiDAR system for evaluating the stress state of forests. To effectively use them in practical scenarios, precise control is essential. This project therefore aims to develop an advanced real-time feedback control system through charge sensing for these devices. The hardware for precise charge measurement will be provided by the lab.

We're seeking a highly motivated master's student with a background in Microsystems Engineering, Embedded Systems Engineering, or a related field to undertake this project.

Ideally you should have:

- Basic understanding of optics and piezoelectric actuators.
- The ability to work with lab equipment and measurement setups.
- Experience with Python programming and GUI design for characterization setups.
- Basic knowledge of control theory.
- Basic CAD skills.

Your benefits:

- Access to cutting-edge lab equipment.
- A substantial thesis topic for a real practical application.
- Dedicated supervision and assistance.
- An opportunity to engage in a diverse range of engineering tasks.

For more information or to apply, please send an email with your current CV and transcript of records.

