

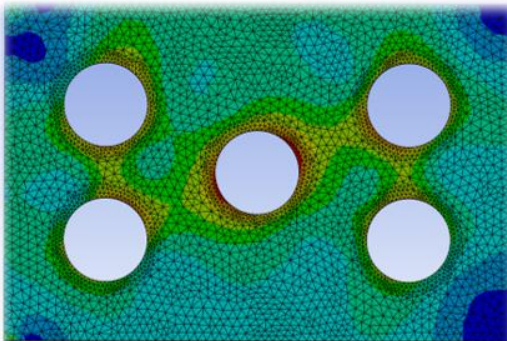
Master / Bachelor / Research Project *

Biomass Estimation via Strain Gauges

A key challenge in plant growth experiments is measuring biomass. Ideally, biomass should be measured frequently to enable effective control later. However, most biomass measurements are destructive, meaning only the final biomass can often be determined reliably. This creates a problem, especially when trying to implement model predictive control (MPC). To address this, a new method for real-time, non-destructive biomass measurement in hydroponics is to be developed and tested in a research project. It should use strain gauges to measure the deformation of the carrier plate, which supports the plants. The plants are placed in net pots on the carrier plate, with the roots suspended in water below and the leaves and fruit growing above. As the plants grow, their increasing weight deforms the plate slightly. This deformation should be detected by the strain gauges at specific points, allowing an estimate of the biomass. The project includes preliminary experiments, theoretical planning, building of an experimental prototype, and calibration of the system.

Task description

- Conducting a literature review with a focus on optimal placement of strain gauges
- Performing mechanical calculations to determine the test setup and required sensor sensitivity
- Planning and conducting preliminary tests with a simplified setup
- Designing a sensor arrangement and circuit to extend the system for more complex setups involving multiple plants
- Building and testing a prototype for the complex case of multiple plants on the carrier plate



Requirements: Background in mechanical engineering including (solid state) mechanics and experience in using FEA simulation tools like ANSYS

Start: as soon as possible

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What to expect: During your research you can expect close guidance, while also maintaining freedom in how you approach the tasks. Through intermediate presentations you can prepare for your final defense and gather feedback from multiple team members throughout your project. The thesis can be written and supervised both in English or German, if your study regulations allow.

* Depending on your background and interests, the task can be adapted to fit master, bachelor or research project.