Innovating Sustainable Agriculture: Integrating Robotics and Mechatronics in Controlled-Environment Agriculture

One of the major challenges in optimizing resource utilization and maximizing production yield in food production lies in the complexity of the controlled system. Highly complex mathematical nonlinear dynamical models of the environment and biomass growth exist. Such models describe the relation between outside weather (uncontrolled environment), and inside environment (controlled) variables like temperature, humidity, CO_2 concentration, etc. However, it is not trivial to accurately estimate the environmental parameters nor to estimate biomass growth in praxis.

Within the Faculty of Engineering, our research in controlled-environment agriculture integrates robotics, predictive control systems, and artificial intelligence to enhance agricultural processes, exploring their potential to improve traditional farming methods aiming at environmental resilience and resource efficiency.

Recent Research:
Using neural networks and exploiting some mathematical properties of mobile robot system, we developed a control method that allows the robot to more accurately follow a path, while being more computationally efficient. This research can help in use cases like mobile sensing platforms inside a greenhouse.
Similarly, using artificial intelligence, we developed a mathematical method to predict the environmental variables inside a greenhouse. The novelty of this method relies on its computational
efficiency.

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