SpECULARIA

Structured Ecological CULtivation with

## Autonomous Robots in Indoor Agriculture

Deploying robots on big farms is not a new concept. It is rather a fast growing industry, that focuses on big machines applied for specific crops and use cases. The proposed system goes beyond current state of the art, in a sense that it proposes a system comprised of small robots with specific abilities that can execute certain tasks only when they are introduced to work together. Such a system surpasses current farming robots in its scalability and versatility, which makes them ideal for small family run organic farms. Each robot has specific abilities, but when put to work together they can be applied to achieve versatile goals in an unstructured and challenging environment.

Compliant multi degree of freedom manipulator

The key issue in dealing with sensitive plants is to ensure the necessary compliance from the manipulator motion. This will ensure the robot can execute certain tasks, and at the same time make sure that the plant is not harmed. This requirement also fits within the Soft robotics paradigm, that focuses researchers to build better sensing machines, capable of dexterous human like motion. Testing the robots on such a challenging application, represents an interesting research opportunity that will certainly lead to new results in a rapidly expanding field of research.

Unmanned aerial robot (UAV)
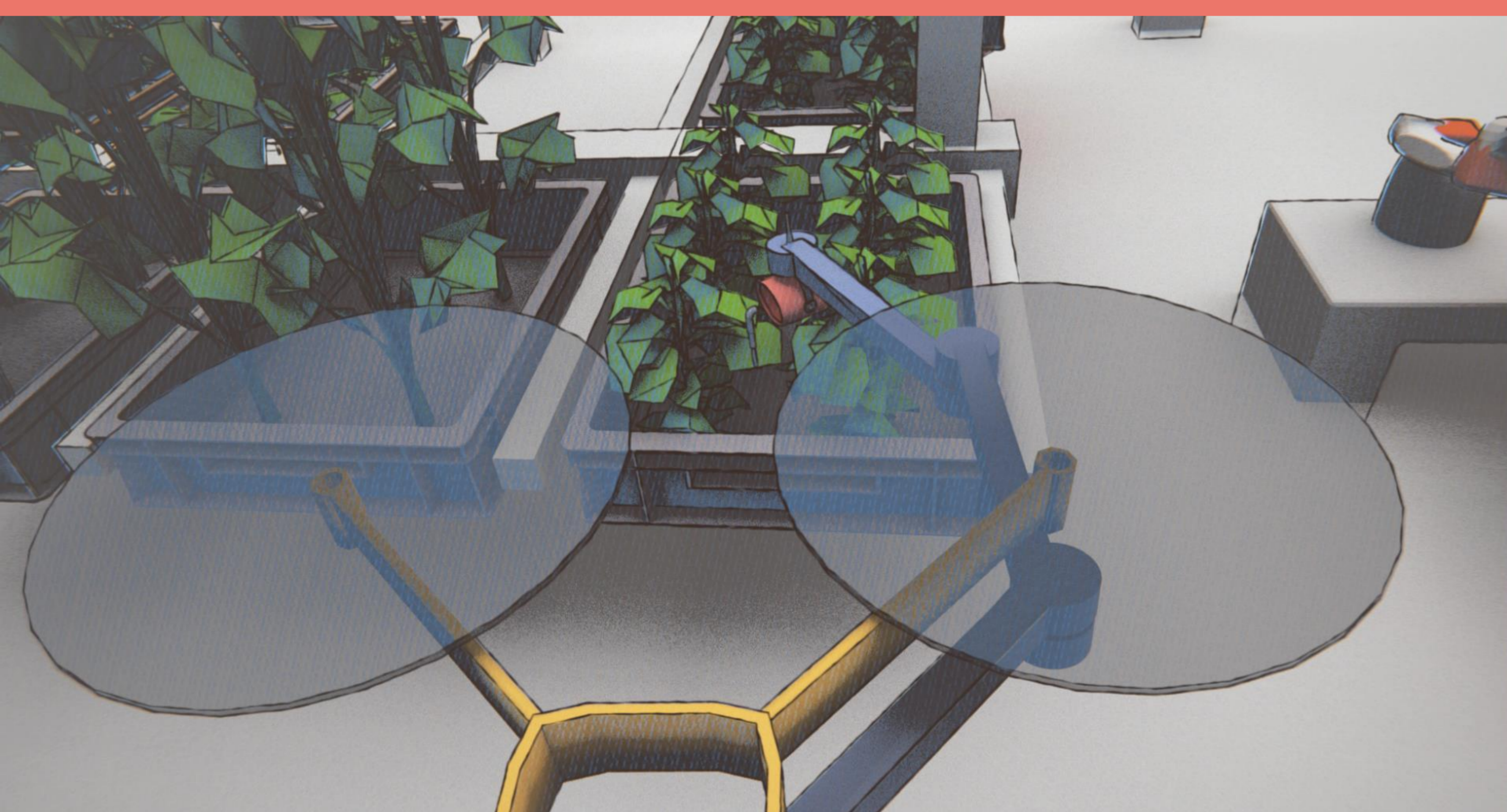
Our UAV is equipped with a multi degree of freedom manipulator carrying sensors for plant surveillance. The multi degree of freedom manipulator enables the robot to fly outside the danger area, where its prop wash wind gust can damage the plant.

Unmanned ground robot (UGV)

This robot is equipped with a mechanism allowing it to transport growth unit containers. These containers, are the smallest organization unit within the farm consisting of a single or variety of plants, that are used in the structured greenhouse environment, designed to suit the robot aided farming paradigm.