DEPARTMENT OF MECHANICAL ENGINEERING
National Institute of Technology Calicut
ME4098D - B.Tech Project

ME4098D Project Final Report

Title of the project work:

Robot based automation of vertical farming

Major objectives of the project: (Give the most important one or two objectives)

1. Development of vertical farming environment which includes a Multi-stacked table for planting, growing crops and a Lift.
2. Development of 4 Degrees of freedom Manipulator integrated with a mobile base to perform activities like planting, inspection, harvesting etc.
3. Control and automation of mobile manipulator.

Have the objectives been met? If not, briefly state the difficulties faced and the steps being taken to overcome them:

- CAD models of the robot and vertical farm are completed. Due to the absence of resources in online mode, the fabrication of the developed models is not possible. The fabrication will be completed after returning to the campus.
- Also, the detection algorithm requires vast data which is not available in the open-source platforms. So, we are working on collection and labelling of the data.

Brief overview of the methodology followed to meet objectives (Modelling, simulation, fabrication, experiments etc.)
- Designing of a 4DOF manipulator, end-effectors, lift and vertical farm using Solidworks software.
- Analysis and optimization of the developed end-effectors.
- Simulation of the mobile base and manipulator in the virtual environment.
- Selection of actuators and sensors
- Fabrication and automation of the entire system.
- Performance analysis.

Activities completed after mid-semester evaluation: (Use bullet points)

- Developed End effectors for multi-purposes like planting and harvesting.
- Analysis of the developed CAD models.
- Simulation of the mobile base in the complex virtual environment.
- Developed a detection algorithm for tomatoes and apples.

Actions taken on the comments of evaluation panel during mid-semester review: (In 4 to 5 lines)

- No comments were particularly made by the evaluation panel during the review.

Major conclusions/findings from the study: (Use bullet points)

- The research gaps were studied by literature review and a more efficient automated vertical farming method is proposed.
- Novel models of multipurpose end-effectors are proposed.

Work plan for the next semester:

- Performing required simulations in the virtual farming environment.
- Development of required AI/ML algorithms
- Fabrication of the Robot and the vertical farm
- Control and automation of the robot by implementing developed algorithms in the fabricated model

Major references: (1 or 2 most important references, in ASME/IEEE referencing format)

1. Lepp.M.T., Pedastsaar.P.E., 2016. System for indoor plant application. US2016/0316646 A1.
2. Loo.C.E., Zhang.T., Yau.C., 2018. Domestic Autonomous Vertical farm that is moveable in stackable units. WO 2018/131016 A2.
3. Marchant.W., Tosunoglu.S., 2017. Robotic Implementation to Automate a Vertical Farm System. 30st Florida Conference on Recent Advances in Robotics May 11-12, 2107, Florida Atlantic University, Boca Raton, Florida

Details of the members of the project group:

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