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Harvesting Tomatoes in Greenhouses by Using a Robot Arm

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INTRODUCTION

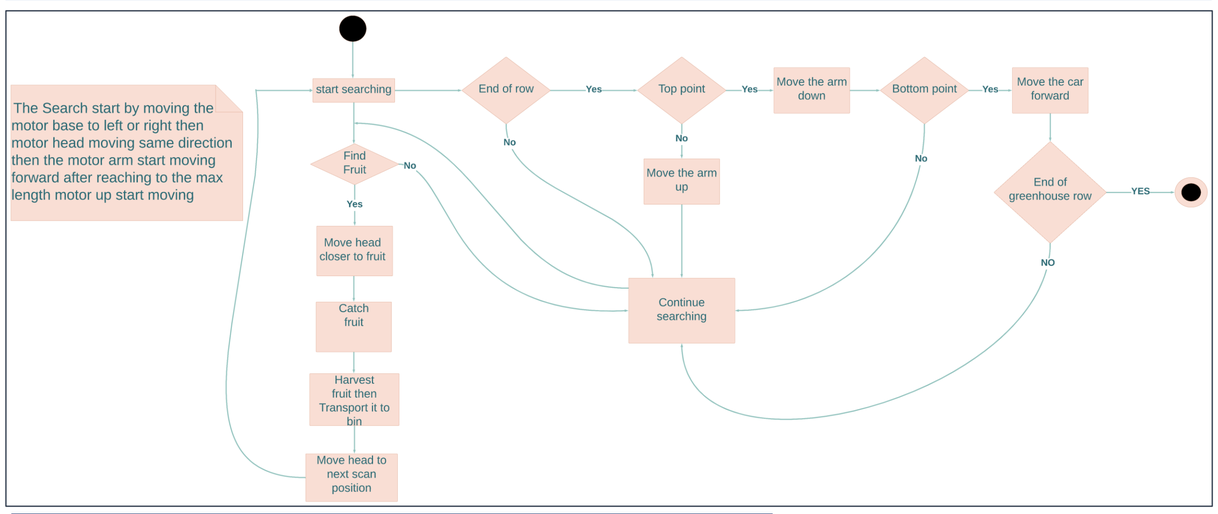
Greenhouse tomato farming is a growing industry, but rising labor costs and the demand for increased efficiency present significant challenges for growers. Robotic harvesting offers a promising solution. Our project focuses on developing an affordable and efficient robotic arm system for tomato harvesting in greenhouse environments.

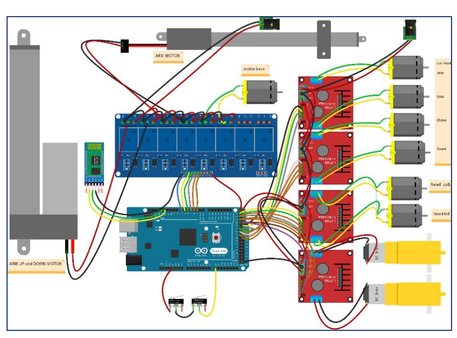
METHODOLOGY

A six-degrees-of-freedom arm, constructed from readily available PVC pipes, is employed for precise tomato harvesting. A custom end-effector is integrated to ensure gentle handling and minimize fruit damage. A six-wheeled car, inspired by the Mars Rover's Rocker-Bogie suspension system (Li et al., 2008), is utilized to navigate the greenhouse terrain. Four-wheel drive, powered by DC motors, ensures maneuverability. A mobile application, running on an Android phone, is used for real-time image processing. Ripe tomatoes are identified using machine learning algorithms. The Arduino Mega microcontroller receives coordinates from the application and controls the robot's movements.

RESULTS & DISCUSSION

Tensile tests confirmed the strength of PVC pipes (Jemii et al., 2020), validating their use as a cost-effective material for the robot arm. The mobile application, powered by machine learning, accurately identified ripe tomatoes in real-time, and the Arduino Mega precisely controlled the robot's movements. This project demonstrates a highly functional and significantly more affordable approach to automated tomato harvesting.





COCLUSION

Our project provides an innovative and affordable solution for automated tomato harvesting in greenhouses. The system is designed to be efficient, reduce labor costs, and optimize resource utilization for greenhouse growers. Future work will focus on adapting the system to a wider range of tomato varieties and conducting field tests in commercial greenhouses.

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