

Capstone Project Planning

Subject Code -(22058)

-Instructed /Guided by – Mr. Hemant Bansal

Group Members

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Topic

Fruit-Plucking Robotic Arm
(Manual / Automatic)

Introduction

- Agriculture faces challenges in **labor** and **efficiency**.
- Automation can **improve productivity** and **reduce human effort**.
- **Our project**: a robotic arm designed to cut ripe vegetables.
- Uses **sensors** and machine learning to **detect ripeness**.
- Aims to enhance **sustainable** and **efficient farming practices**.

Objective

- To automate the **harvesting process in agriculture.**
- Develop a robotic arm **capable of identifying and cutting ripe vegetables.**
- **Minimize labor** dependency and **reduce harvesting time.**
- Promote sustainable farming by **reducing waste and enhancing crop yield.**

Literature/Research

- **Agricultural Automation:** Robots used to reduce labor needs and increase efficiency.
- **ML for Ripeness Detection:** Machine learning improves accuracy in detecting crop maturity.
- **Sensor Use in Farming:** Sensors assess crop health and ripeness for precise harvesting.
- **Robotic Arms in Agriculture:** Existing models handle tasks, but few focus on vegetable harvesting.
- **Challenges:** Issues like cost and environmental adaptation impact adoption

Components / Steps of Project

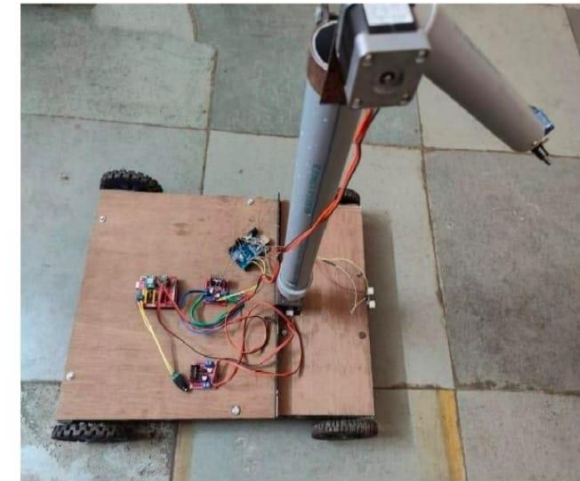
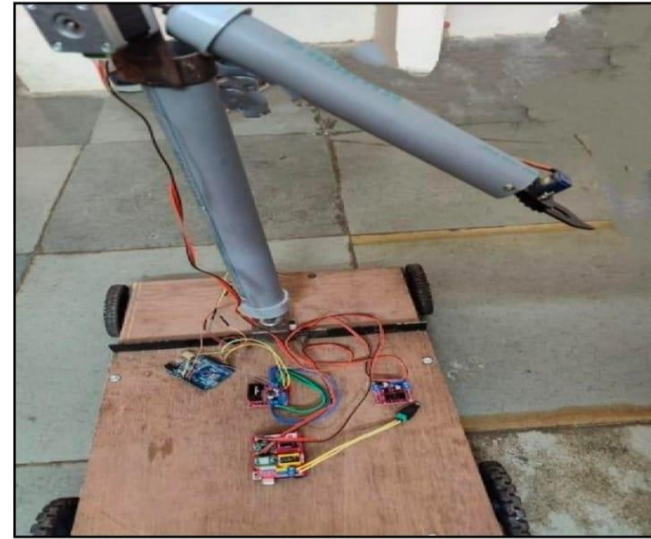
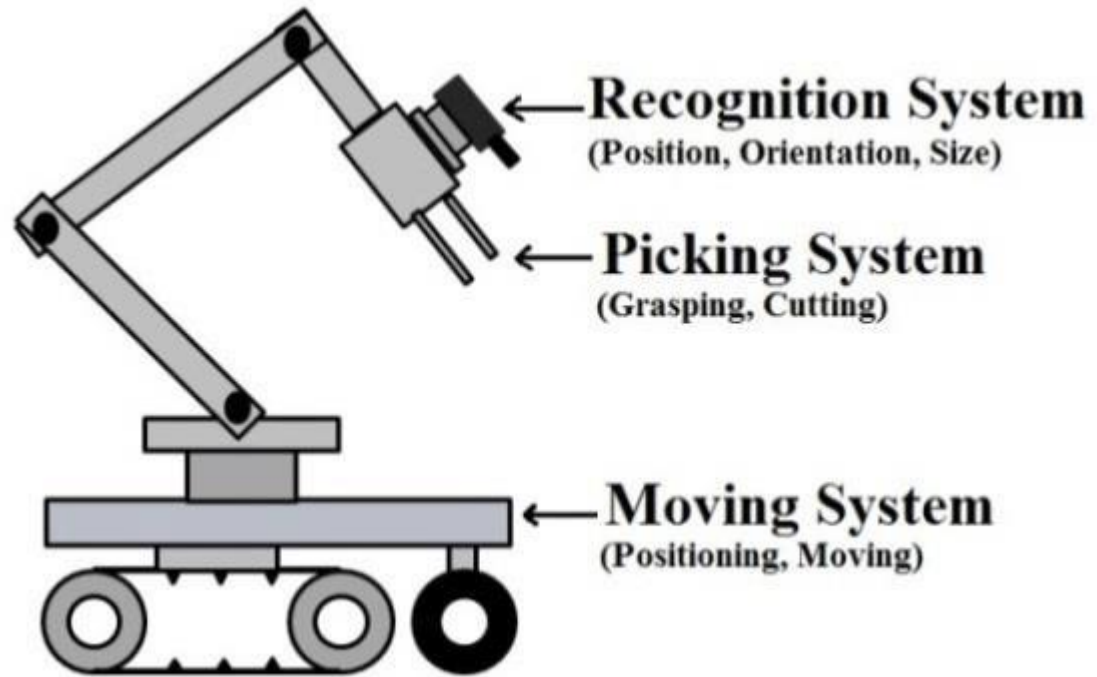
- **Step 1 -**
- **Microcontroller:**
 Arduino Uno
- **Motors:** 1.Servo motors (for arm joints)
 2.Stepper motor (for precision movements)
 3.DC motor (for gripper)-
- **Motor Drivers:** - 1.L298 Driver Module (for DC motor)
 2. ULN2003 Motor Driver (for stepper motor)
- **Gripper:** Servo-controlled gripper-
- **Sensors:** - Ultrasonic sensor (for object detection)
 TCS34725 Color Sensor (for ripeness/color detection)
 Camera (for advanced object detection via OpenCV)-

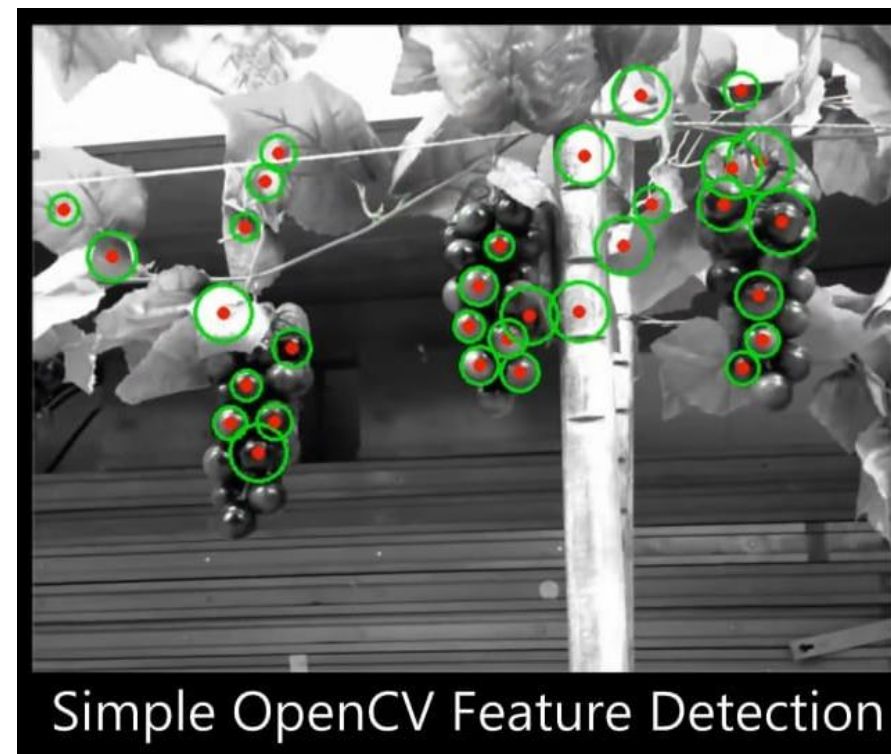
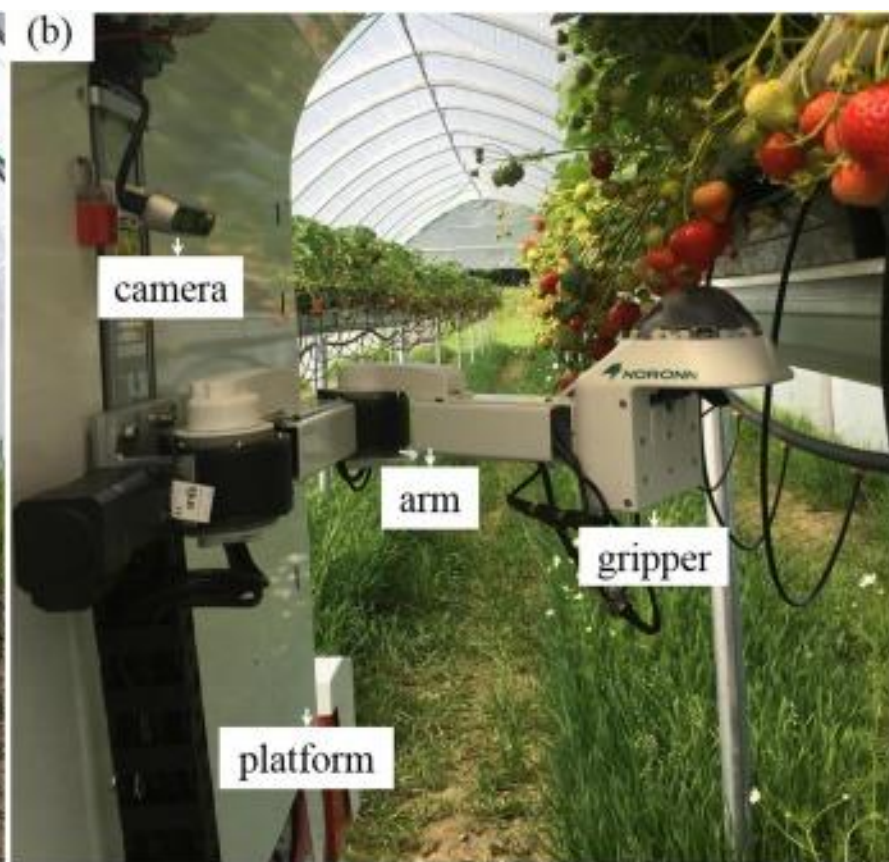
Components / Steps of Project

- **Software Tools:** -
 - 1.Arduino IDE (for coding the Arduino)
 - 2.MATLAB (for vision and image processing)
 - 3.Python (for integrating OpenCV)

Components / Steps of Project

- **Step 2: Setup of the Robotic Arm**
- **Step 3: Programming the Robotic Arm**
- **Step 4: Object Detection Using Camera**
 - Set Up Camera for Object Detection
 - Implement Computer Vision with OpenCV
- **Step 5: Sensor Integration**
- **Step 6: Testing and Calibration**







Summary

- Proposed an automated robotic arm for **precise vegetable harvesting**.
- Combines **sensor technology** and **machine learning** for ripeness detection.
- **Aims** to enhance efficiency, reduce labor dependency, and promote sustainability.

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Conclusion

- The project addresses critical challenges in **modern farming**.
- Automation **ensures timely** and **waste-free harvesting**.
- This innovation can significantly contribute to **sustainable agricultural practices**.

References

Research papers -

- Fruit Plucking Robot Arm Avanti Nachankar, Pranali Patil, Shruti Thakare, Dnayaneshwar Jadhao, Prathmesh Potdar
- Robotic Arm Vehicle with Object and Facial Recognition Mr. Mahesh Runnaware¹, Mr. Kunal Muddamwar², Mis. Damini Chaudhari³, Mr. Hemant Shende⁴, Mr. Someshwar Muddamwar⁵, Prof. Mr. Mohammad Hassan Ansari⁶
- Etc.....

For coding : Git hub and opencv codes

Report : Wikipedia and research gates



Thank You