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Cherry Tomato Harvesting Robot Utilizing Arduino UNO Controller

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Abstract*: *The rapid growth in technology and utilization of robots is agricultural field is always challenging issue as the robot has to face various environmental changes while performing in real field. The proposed system provide cherry tomato harvesting Robot Utilizing Arduino UNO controller. The harvesting robot effectively detects ripened tomatos from the fields with the help of Robotic arm gripper and releases the tomatoes after harvesting with the help of multiple sensors. The harvesting robot is also capable of detecting the obstacle encountering in the field.
Key words: Robot, Arduino UNO, obstacle, GSM.

I. INTRODUCTION



Fig.1 Stages of ripening tomatoes

The advancement in Robotics in every field such as IT field, medical field, constructional field, mechanical field and many such fields has brought great changes. The proposed system consists of Robot chassis that consists of joins, links similar to human. The robot consists of two rigid bodies on moving base connected together with rotatory joint. The two rigid bodies has bottom which comprise of motor for movement of robot. The proposed system comprises of colour sensor to detect ripened tomatoes, force sensing resistor to ensure the required application of force on the tomato and IR sensor for detection of obstacle. The proposed system designing is done with the help of Arduino IDE complier and Proteus simulator software. After picking and ungripping action of tomato by the robot, the arm returns back to original position. The IR sensor is used to detect the Obstacle encountering while working in the field.

II. LITERATURE SURVEY

In [1]The presented papet provides the Design and realization of cherry tomato harvesting robot based on IOT. The proposed system utilizes 16X2 LCD display, Rasberry pi processor, and Node MCU ESP8266 Wi-Fi module to upload all the results on the server. In [2] the presented paper provides “A cherry tomato harvesting Robot”. The harvesting robot is a robot that created for harvesting chery tomatoes in households and green houses. The robot identifies cherry tomato by image camera. The ARM7 controller is the heart of the project that processes all the electrical signals and provides desired output. In [3] the presented paper provides “Design an operation of Wi-Fi agribot integrated system”. The proposed robotic module proposed is utilized for the harvest tomatoes, cucumbers mushrooms and other fruits. In [4] the presented paper provides the detailed study of cherry tomato harvesting robot based on IOT. The proposed system utilizes 16X2 LCD display, Raspberry pi processor, and Node MCU ESP8266 Wi-Fi module to upload all the results on the server.

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III. PROPOSED DESIGN METHODOLOGY

A. *Block Diagram*

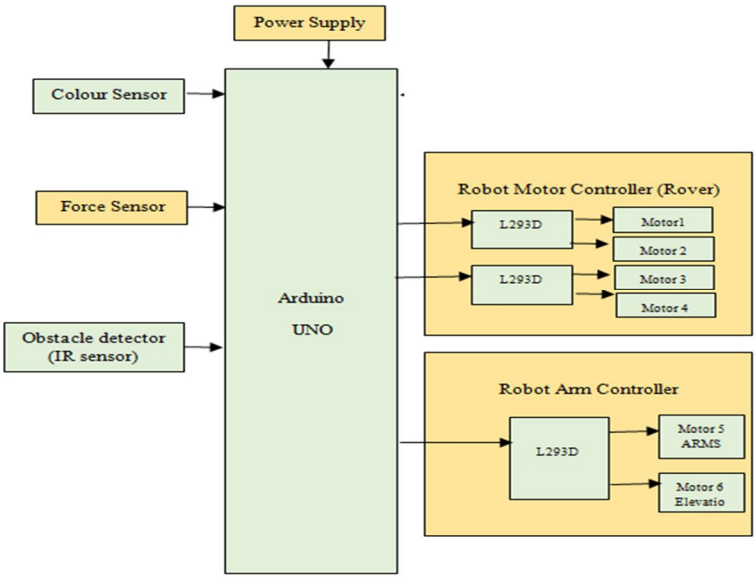


Fig. 2 Block diagram of proposed system

IV. HARDWARE IMPLEMENTATION

The hardware Details utilized in the proposed system are as follows

1) *Arduino UNO Controller:* The Atmega3288 controller consist of 40 pins onboard out of which 6 pins are utilized analog inputs and 14 pins for digital Input/output pins.
2) *DC Motor:* The DC motor is an electric component that converts electrical energy into mechanical energy.
3) *L293D Motor Driver:* The electronic component to drive DC motors.
4) *Colour Sensor:* The sensor to detect RGB colour components.
5) *Force Sensor:* The electronic senor to monitor the force applied on the tomato.
6) *IR Sensor:* The passive sensor for detection of obstacle.

V. EXPERIMENTAL SETUP AND RESULT

The proposed cherry Tomato Harvesting Robot utilizing Arduino UNO controller system's experimental setup is shown in the following figure. The proposed system consists of Robot chassis that consists of joins, links similar to human. The robot consists of two rigid bodies on moving base connected together with rotatory joint. The two rigid bodies has bottom which comprise of motor for movement of robot. The proposed system comprises of colour sensor to detect ripened tomatoes, force sensing resistor to ensure the required application of force on the tomato and IR sensor for detection of obstacle. The proposed system designing is done with the help of Arduino IDE complier and Proteus simulator software. After picking and releasing action of tomato by the robot, the arm returns back to original position. The IR sensor is used to detect the Obstacle encountering while working in the field.

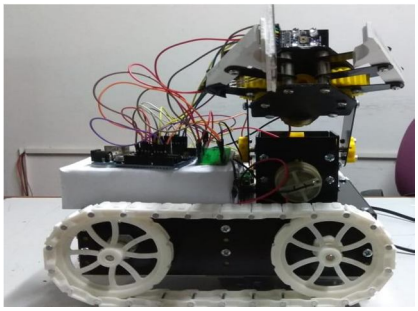


Fig. 3 Experimental setup

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The following figures represent the stages of the harvesting robot for picking and releasing actions performed on the cherry tomatoes.

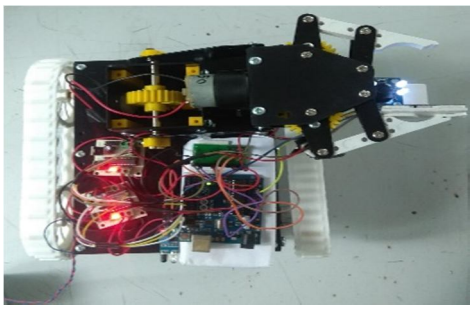


Fig. 4 Stage1 Initial Position of the ARM

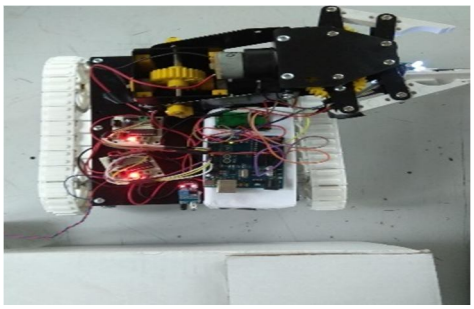


Fig. 5 Stage2 ARM ready to detect

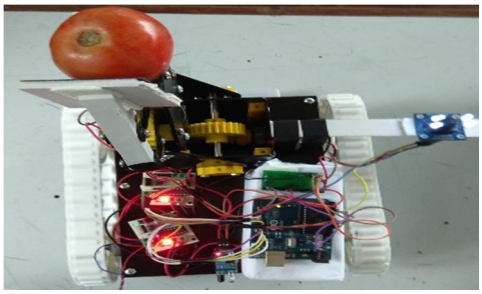


Fig. 6 Stage3 Gripping Ripened Tomato

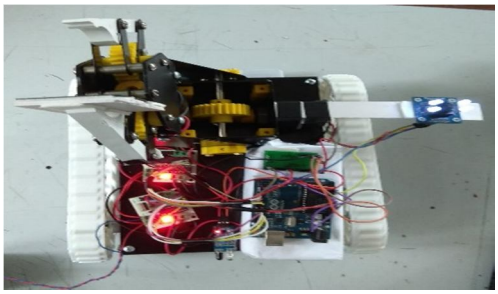


Fig. 5 Stage4 ARM releasing position

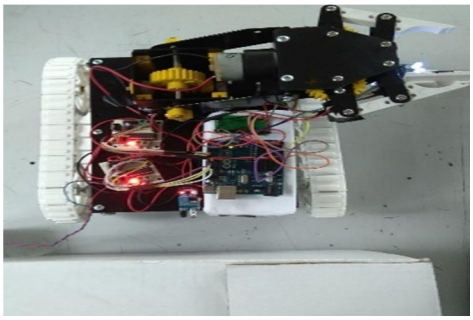


Fig. 6 Stage5 Obstacle detection

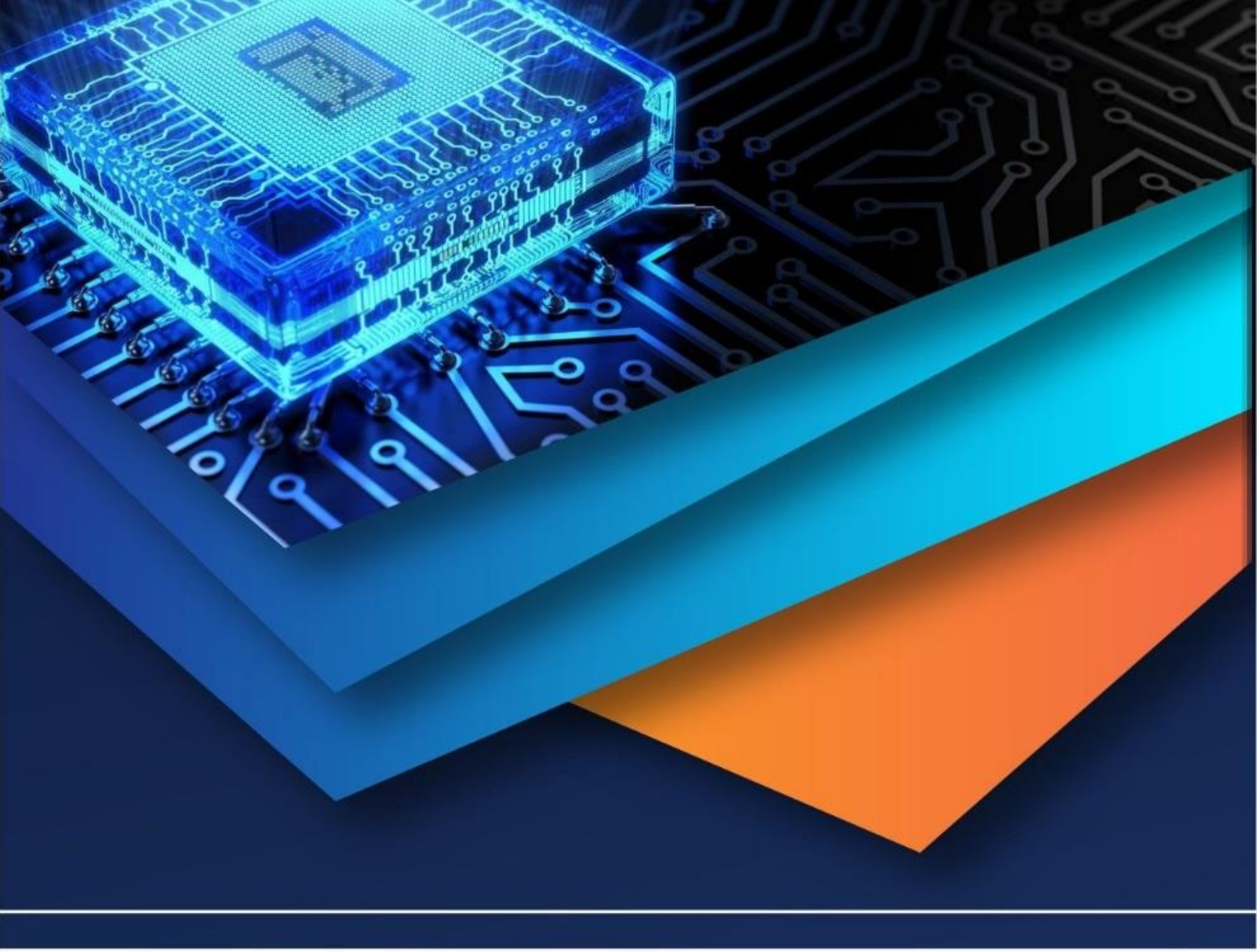
VI. CONCLUSION

The proposed cherry Tomato Harvesting Robot utilizing Arduino UNO controller is designed and all the results are executed accurately. The proposed system utilizes multiple sensor robot and Arduino UNO controller that provides harvesting of ripened cherry tomatoes thus providing new vision of robot utilization in the field of agriculture.

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