

# Agricultural Automation System with Field Assisting Robot

Edwina G Rodriguez<sup>1</sup>, Kannan S A<sup>1</sup>, Renjith G<sup>1</sup>, Karishma.Raju<sup>2</sup>, Anju Parvathy N<sup>2</sup>, Soumya Sunny<sup>2</sup>,  
Amrutha .I. Nair<sup>2</sup>

Assistant Professors, Department of Electrical and Electronics Engineering, College of Engineering Perumon, Kollam  
Kerala, India<sup>1</sup>

B. Tech Scholars, Department of Electrical and Electronics Engineering, College of Engineering Perumon, Kollam,  
Kerala, India<sup>2</sup>

**ABSTRACT:** Agriculture is one of the most important industry for providing fuel for our survival. Robots are playing an important role in field of agriculture for farming process autonomously. Agrobot is a robot designed for agricultural purposes. It is designed to minimize the labour of farmers in addition to increasing the speed and accuracy of the work. We have precisely developed a multitasking robot keeping the ideology that multiple small autonomous machines could be more efficient than traditional large tractors and human effort. It facilitates the manual control through GSM

**KEYWORDS:** GSM, Raspberry Pi.

## I. INTRODUCTION

Agriculture is the backbone of India. Robotics play a major role in industrial, medicinal and military applications ...etc. Agricultural robotics is the use of automation in bio-systems such as agriculture, forestry and fisheries. Some of the major problem in Indian agricultural are rising of cost, availability of skilled labors and lack of water resources. Applying automation to the field help to create advancement to the industry and farmer to save money and time. Robots are being developed for the process such are ploughing, seed dispensing, fruit picking etc.. All these functions are not yet performed using a single robot. Conventional techniques depend on human power for lifting, dragging, weed control, fruit picking. Humans are prone to work in hazardous environment while spraying chemicals and pesticides. The tractors that compact the soil are larger in weight and cannot move in terrain conditions. These methods cannot identify the crop and soil in close proximity. An automated agricultural system (which uses field robot) is exemplified from above problems. Robots can work restlessly in all environments as they are programmed to perform the desired activities. The light weight of robot is a major advantage, since they do not compact the soil as large machinery does. Agricultural Automation With Field Assisting Robot is very simple techniques where many instruments are coupled together and the irrigation system is fully automated

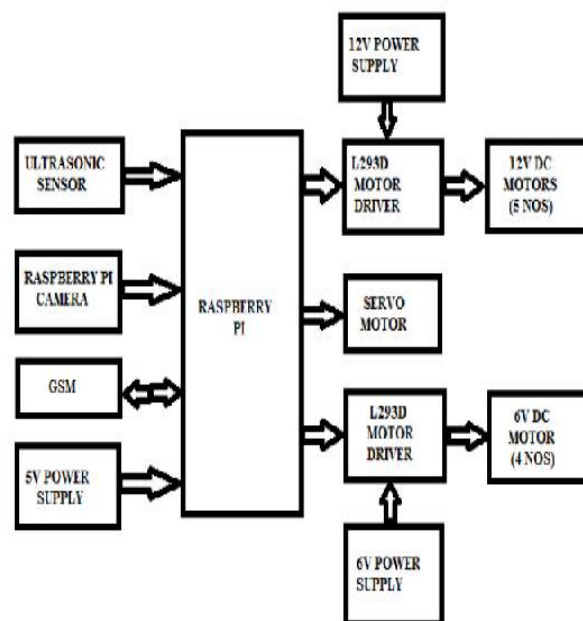
## II. MODEL AND DESCRIPTION

The proposed robot is implemented to assist farmers in their agricultural field. The robotic system can perform multiple operations like ploughing, seed dispensing and fruit picking. The controlling technology of the entire system is Raspberry Pi and a GSM module is also provided for the manual controlling of the system. The proposed system has three sections: ploughing, seed dispensing and fruit picking. The robot is composed of 10 motors out of which one is a servo motor and the remaining are DC motors. Four DC motors are attached to the wheels on either side such that each side is driven by two motors each. The movement of the robot is guided by ultrasonic sensors that is fixed on the robot's body which continuously sends ultrasonic waves at a long distance. These waves while encountering on a wall or any obstacle sends signal back to the controller that further conveys the robot to stop or else keep moving.

Ploughing is executed using a plougher which is a horizontal bar with a number of jagged teeth's fixed on it to aerate or loosen the soil bed. The plougher is raised and lowered by using a DC motor which is driven by a L293D motor driver.

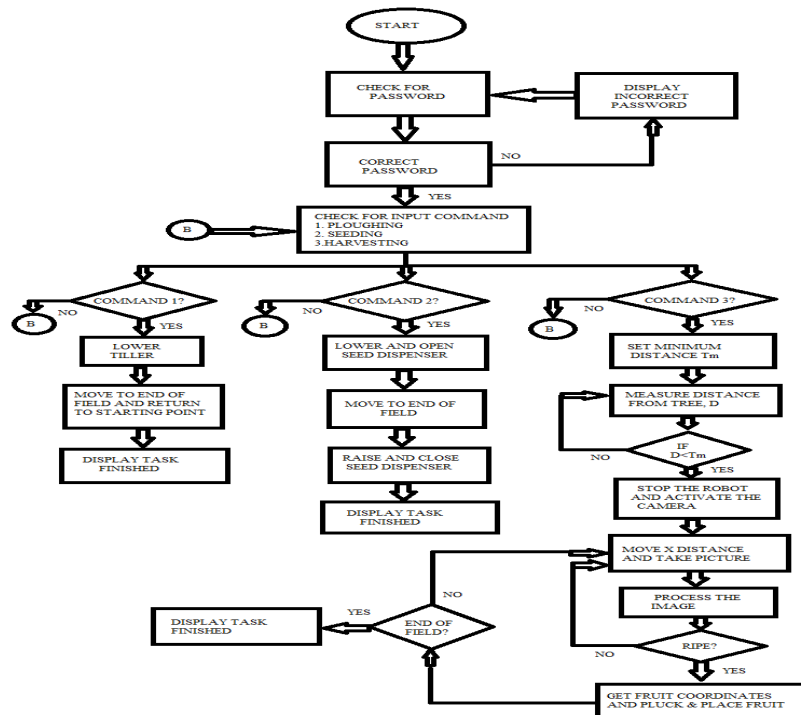
A 12V battery supply is feeded for the operation of wheels and plougher. For the process of seed dispensing, the seeds which are stored in a box are allowed to pass through a valve to the seed dispenser. From where the seeds are led to fall into the soil through the dispenser whose movement is aided by a servo motor. A 6V supply is provided for the servo mechanism. Fruit picking is accomplished using the technique of image processing along with a robotic arm. A Raspberry Pi camera is employed for fruit picking. The Pi camera locate the fruits by the technique of image processing and robotic arm picks the fruit. The Raspberry Pi controller is interfaced with pi camera, motors, GSM module and ultrasonic sensors. The controller and other interfacing hardwares are mounted on the robot for convenience.

### III. BLOCK DIAGRAM AND DESCRIPTION



Block diagram consist of Raspberry Pi, the heart of the project. It works on 5V supply. The robo is capable of performing multiple operations like automatic ploughing, seed dispensing and fruit picking. It provides manual control with the help of GSM. On the field, navigation mechanism of the robot is guided by the signals being sent out from the Raspberry Pi controller in coordination with ultrasonic sensor placed on the robot. DC motors are used for rotation of the wheels of the robot. These DC motors are driven by L293D motor driver to control the direction and speed of the motor. Am servo mechanism is used for seed dispensing. For the process of fruit picking we use image processing along with robotic arm. Here a camera which is fixed to the arm of robot is used for capturing images and we use a fruit gripper which is an arm tool to pick fruit with intense care

#### IV.FLOWCHART



#### V.ALGORITHM

- STEP1: START
- STEP2: Check for password.
- STEP3: If correct password go to step5 otherwise go to next step.
- STEP4: Display incorrect password, go to step2.
- STEP5: Check for input command (1.ploughing,2.seeding,3.harvesting)
- STEP6: If input = =1 go to step7,else if input = =2 go to step9,else if input = =3 go to step12, else go to step5.
- STEP7: Lower tiller for ploughing.
- STEP8: Plough the entire field and return to starting point, go to step20
- STEP9: Lower and open the seed dispenser.
- STEP10: Seeding the entire field.
- STEP11: Raise and close the seed dispenser, go to step20.
- STEP12: Set a minimum distance between the tree and the robot  $T_m$ .
- STEP13: Measure the distance of robot from the tree(D)
- STEP14: If  $D \leq T_m$  go to next step else go to step
- STEP15: Stop the robot and activate the camera.
- STEP16: Move x distance and take the picture of fruits.
- STEP17: Process the image.
- STEP18: If the fruits are ripened go to next step else go to step16.

STEP19: Get the fruit coordinates and pluck & place the fruits.

STEP20: Check if end of field is reached. If yes go to next step else go to step16.

STEP21: Display task finished.

STEP22: STOP

## VI.COMPONENTS USED

### 1.RASPBERRY PI

It is a single computer board with credit card size. Its 2nd version is used here. It has no on board memory .Any SD card of required memory can be placed . It requires a power supply of 5V. Connections to Raspberry pi can be made by using

- a. Two USB Ports.
- b.Ethernet.
- c.General purpose input /output pins



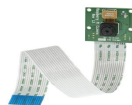
### 2. L298 MOTOR DRIVER BOARD

The board uses a 5V supply. It is a double bridge driver. It is used to drive the motors



### 3. Raspberry Pi Camera Module

High definition camera module compatible with the Raspberry Pi model A and model B. Provides high sensitivity, low crosstalk and low noise image capture in an ultra small and light weight design



### 4. GSM SIM900

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/1800MHz. The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS.



### 5. DC Geared Motor

60RPM 12V DC geared motors for robotics applications. Very easy to use and available in standard size. Nut and

Department of Electrical & Electronics Engineering, College of Engineering Perumon, Kollam, Kerala – 691601, India

threads on shaft to easily connect and internal threaded shaft for easily connecting it to wheel.

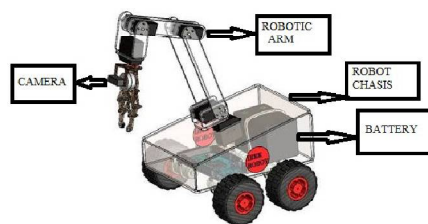


#### 6. Servo Motor

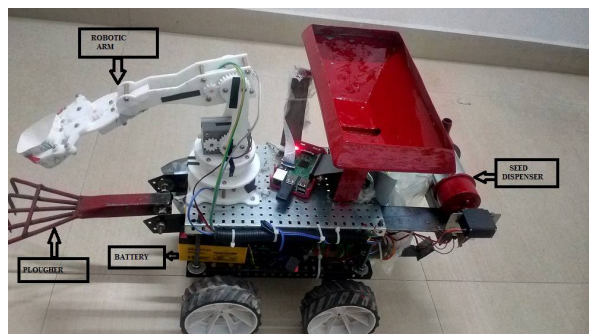
Servo refers to an error sensing feedback control which is used to correct the performance of the system. Servo or RC servo motors are DC motors equipped with a servo mechanism for precise control of angular position.



### VII. DESIGNED STRUCTURE



### VIII. STRUCTURE DEVELOPED AS PER DESIGN



### IX. FUTURE SCOPE

The project can be implemented with enormous results in large scale that benefits all farmers of the world. Apart from ploughing, seed dispensing and fruit picking other farming process like spraying pesticides, harvesting etc can also be implemented in one robot thus making the machine capable of multitasking.

### X. CONCLUSION

Project aims on the design, development and fabrication of a multitasking robot which can perform automatic ploughing, seed dispensing and fruit picking. The technique of image processing in fruit picking helps to achieve high quality products. Servo mechanism in seed dispensing allows to control the flow of seeds. This project intent to reduce

the requirement of large man power and cost of equipment making it affordable to farmers. The system helps in the reduction of labour costs and restrictions on working hours can be significantly improved. The agricultural robot is designed to facilitate the farmers to ease their work. Once the concept of automation in agriculture is accepted the adoption rates will become high and the costs of technology will come down.

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