Wireless Multipurpose AGRI Robot

Shwetha M[1] Nisarga S Shetty[2] Nisarga V[3] Pooja Gundagadagi[4] Prathiksha S J[5]
[1]Assistant Professor [2,3,4,5]Student
[1,2,3,4,5]Department of Electronics & Communication Engineering
[1,2,3,4,5]Dr. Ambedkar Institute of Technology Bangalore, India

Abstract— The main aim of this paper is to design a robot which automates the basic agricultural functions like ploughing, seeding, levelling which helps in increasing the accuracy, productivity, efficiency and decreases the human labour and time consumption. This proposed model will also detect the diseased leaf using image processing. The designed robot will operate on either manual mode or auto-mode. In manual mode, robot monitoring can be done through ZigBee communication. GSM is also used to notify the farmer regarding the status of robot. Arduino acts as a heart of the model. Soil moisture sensor and water pump is also included.
Keywords: Arduino, Zigbee, Ploughing, Levelling, Seeding, leaf disease, GSM

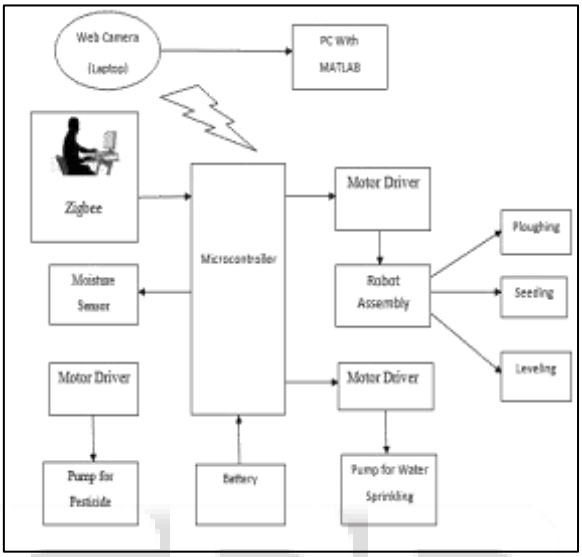
I. INTRODUCTION

In India, agriculture is the primary source of livelihood for 58 percent of India's population. It gives a overall of 17-18 percent of GDP (2018). Nowadays, most of the people are interested towards leading a corporate life and are showing very less interest towards agriculture. This results in wastage of agriculture land and decrease in country's economy.

The automation in agriculture helps the farmer to minimise the human effort and also time consumption in performing repetitive farming tasks and increasing the productivity of yield by treating every crop individually using precision farming concept. In traditional agriculture technique, people used to spill the seeds randomly over the land which could result in improper distance between the seeds which could result in improper growth of plants due to insufficient aeration and light. Also by using tractor based drillers and levellers, the power required is very high, noise and vibrations caused are detrimental to human health. The proposed model will overcome these difficulties. The operations like seeding, ploughing, levelling will be performed accordingly with specific distance between the crops by the robot. Soil moisture sensor is also used which would check the moisture content of the soil and water will be supplied accordingly from water pump. The farmer will be notified about the status of robot like battery low, etc through SMS using GSM.

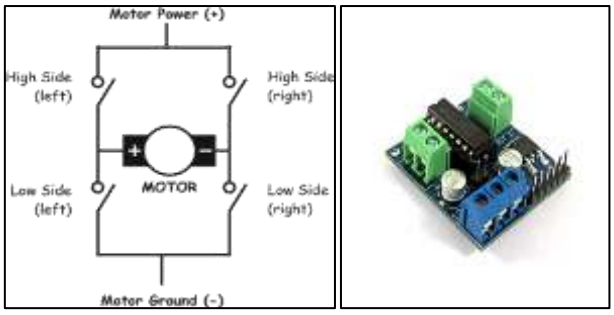
In earlier days, farmers used to detect the diseases in crops by naked eye observation method and use the pesticides. This technique would be helpful for small area of land, but not suitable for large areas because there may be chances of farmer not observing the diseased leaf and by the time the farmer observes it, it would be too late and disease would be spread to other plants also which could not be controlled by organics. This results in damage of entire crops and loss to farmer also. So detection and recognition of plant diseases has to be carried out effectively by automating the monitoring process by using image processing. The proposed model will give information about seeding, ploughing, levelling and also image processing. Hence all the problems of conventional method can be overcome by using this system.

II. BLOCK DIAGRAM

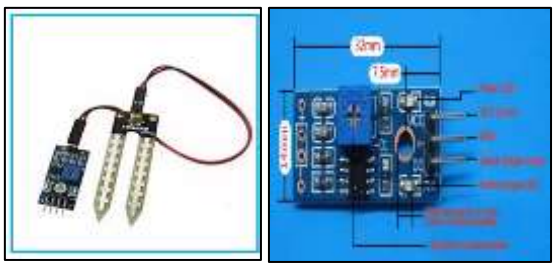


A. *Motor driver*

H-bridge acts as motor driver, there are four switching elements within the bridge. These four elements are often called, high side left, high side right, low side right, and low side left.



B. *Moisture Sensor*



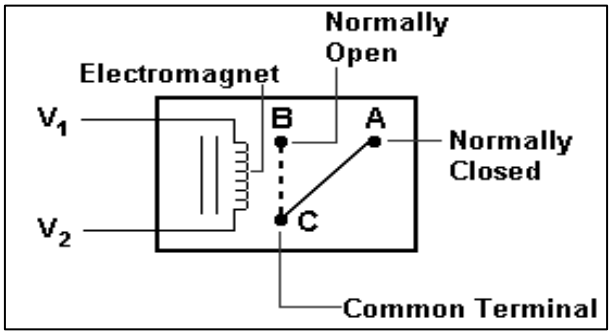
FC-28 soil moisture sensor is a simple breakout for measuring the moisture in a soil and similar materials. The soil moisture sensor is user friendly. The two large exposed pads function as probes for the sensor, which acts as a variable resistor.

C. Battery

Fig. 2.1: 12V battery

The common battery (dry cell) is a device that changes chemical energy into electrical energy. Dry cells are widely used in remote cars, flashlights+, portable radios, cameras, hearing aids, and other devices in common use.

D. Relay



A relay acts as electrically operated switch. Current flows through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off ,so relay has two switch positions and they are double throw (changeover) switches.

E. Water Pump

In this paper the water pump is used for sprinkling the water and for pesticide.

III. PROPOSED METHODOLOGY

A. Agriculture Automation

In the proposed model, the robot movement can be through manual mode or auto-mode. The agricultural functions like ploughing, seeding, levelling is monitored by ArduinoMega2560.

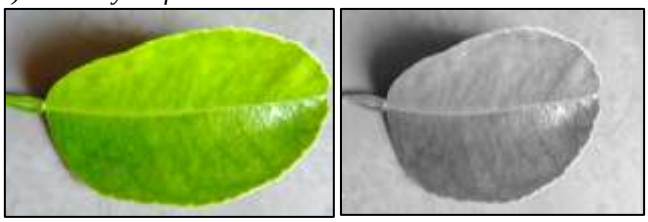
Many hardware components are interfaced to it. DC motors are used for movement of robot, seeding, ploughing and levelling. The DC motors are controlled by the motor drivers (H bridges). LCD is used to display the status like the mode selected, operations performed, moisture value, battery status, etc. Single channel and two channel relays are used which monitor the water pump, pesticide sprayer and seeding operations. Relays get voltage from voltage divider which is used to divide the voltage and provide it to the required parts.

Moisture sensor is used to check the water content present in the soil, if it is less than threshold value then required quantity of water will be supplied by water pumps. Zigbee communication is used to control the robot manually by giving specific commands for each operation. Notification will be sent to farmer through GSM.

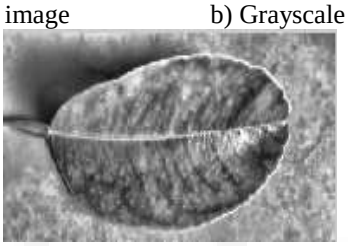
B. Leaf disease detection

The diseased leaf can be identified and detected by using image processing technique.

1) Healthy leaf



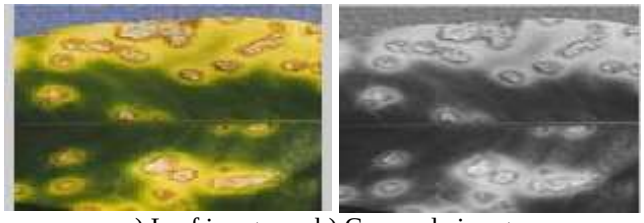
a) Leaf image b) Grayscale image



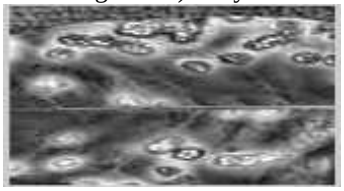
c) Adaptive Histogram image

An image pattern classification to identify different disease in leaf with a combination of texture and colour feature extraction is done. Firstly, diseased and normal images are collected and pre-processed. Then, features of shape, colour and texture are extracted from these images. After that, these images are classified by SVM classifier. A combination of several features is used to evaluate the appropriate features to find the distinctive features for identification of type of disease. When a single feature is used, shape feature has the lowest accuracy and texture feature has the highest accuracy. A combination of texture and colour feature extraction results a highest classification accuracy. A combination of texture and colour feature extraction with polynomial kernel results best classification accuracy.

2. Diseased Leaf



a) Leaf image b) Grayscale image



c) Adaptive Histogram image

IV. ADVANTAGES

Applying the automation techniques to agriculture can save the energy, time and money of the farmers

1) Most of the work is done by robot so workload on farmers can be reduced.
2) Increases the productivity and efficiency of crops.
3) Diseased leaf can be detected easily

V. DISADVANTAGES

1) Initial cost for implementation of robot will be high
2) If proper care is not taken by controller unit then complexity may increase.

VI. EXISTING MODEL

VII. CONCLUSION

We can conclude that one single robot can perform so many agricultural operations automatically which will eliminate the usage of labours. Benefits from automating the system will be associated with the increased field efficiency and accuracy by supporting the farmers. Flexibility of automation system is higher than traditional system.

VIII. FUTURE SCOPE

Along with seeding, levelling, ploughing operations more no of other operations can be included to this robot like fruit picking, harvesting, weeding, etc. The ploughing tool tip can be arranged separately, so if in case there's any breakage then it can be replaced easily.

REFERENCES

[1] Amritanshu Srivastava, Shubham Vijay, Alka Negi, Akash Singh, "DTMF Based Intelligent Farming Robotic Vehicle,"International Conference on Embedded Systems (ICES 2014), 978-1-4799-5026-3, IEEE 2014.
[2] Gulam Amer, S.M.M. Mudassir, M.A. Malik, "Design and operation of Wi-Fi Agribot Integrated system", InternationalConference on Industrial Instrmentation And control (ICIC), 978-1-4799-7165-7/15, IEEE 2015.
[3] M. priyadarshini, Mrs. L. Sheela, "Command based self guided digging and seed sowing rover",International Conference on Engineering Trends and Science & Humanities, ISSN: 2348 – 8379, ICETSH-2015.
[4] AkhilaGollakota, M. B. shriniva, "Agribot - a multipurpose agricultural robot," India conference (INDICON) 2011 Annual IEEE 978-1-4577-1110- 7, 1-4, IEEE 2011.
[5] Shivaprasad B. S., Ravishankara M. N.,B. N. Shoba, "Design and implementation of seeding and fertilizing agriculture robot", International Journal of Application or Innovation in Engineering & Management (IJAIEM), Volume 3, Issue 6, June 2014.
[6] Karan singh, K. Agrawal, A. K. Dubey, M. P. Chandra,"Development of the controller based seed cum fertilizer drill", Intelligent systems design (ISDA) 12th Internal conference 978-1-4673-5119-5/12 IEEE 2012.
[7] Sandeep Konam, "Agricultural Aid for Mango cutting (AAM)," Electronics & Communication Engineering, RGUKT, R.K. Valley Kadapa, India, 978-1-4799-3080-7 IEEE 2014.
[8] QingchunFeng,Xiaonan Wang, Guohua Wang, Zhen Li, "Design and Test of Tomatoes Harvesting Robot," International Conference on Information and Automation Lijiang,China, pp 949-952, IEEE 2015
[9] Hetal Patel, Dr. R. K. Jain, Dr. M. V. Joshi, "Fruit Detection using Improved Multiple Features based Algorithm," International Journal of Computer Application, Volume 13- No.2, IEEE 2011.
[10] Stefania Matteoli, Marco Diani, RossanoMassai, Giovanni Corsini, Damiano Remorini, "A Spectroscopy-Based Approach for Automated Nondestructive Maturity Grading of Peach Fruits", IEEE Sensors Journal, Vol.15, No. 10, October2015.
[11] Audrey Guillet, Roland Lenain, Benoit Thuilot, Philippe Martinet, "Adaptable Robot Formation control", IEEE Robotics& Automation Magazine, March 2014.

