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SURVEY PAPER ON AgRo-Bot AUTONOMOUS ROBOT

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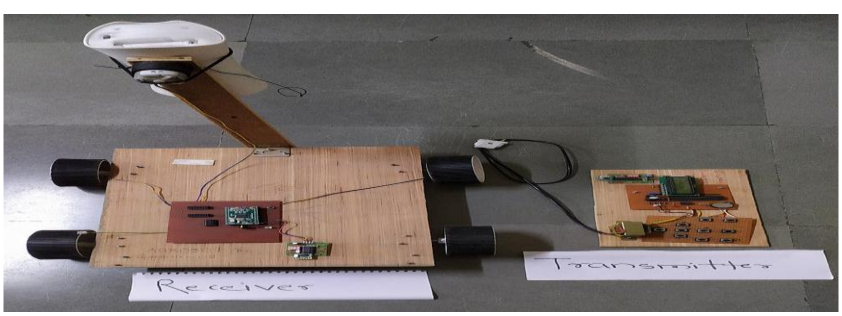
Abstract:- In recent years, robotics in agriculture sector with its implementation based on precision agriculture concept is the newly emerging technology. The main reason behind automation of farming processes are saving the time and energy required for performing repetitive farming tasks and increasing the productivity of yield by treating every crop individually using precision farming concept. Designing of such robots is modelled based on particular approach and certain considerations of agriculture environment in which it is going to work. These considerations and different approaches are discussed in this system, also prototype of an autonomous. Agriculture Robot is presented which is specically designed for grass cutting with storing facility, whether detection, Crop prediction and 360 Spraying. Most existing agricultural mobile robots share the same platforms with industry mobile robots or commercial research robots, agricultural mobile robots greatly suffer from improper shape and insufficient traffic_ability.

1. INTRODUCTION

The discovery of agriculture was the first big step toward a civilized life. Is a famous quote by Arthur Keith. This emphasizes that the agriculture plays a vital role in the economy of every nation. Since the dawn of history agriculture has been one of the significant earnings of producing food for human utilization. Today more and more lands are being developed for the production of a large variety of crops. The field of agriculture involves various operations that require handling of heavy materials. For example, in manual ploughing, farmers make use of heavy ploughing machines. Additionally, while watering the crops farmers still follow the traditional approach of carrying heavy water pipes. These operations are dull, repetitive, or require strength and skill for the workers. In the 1980's many agricultural robots were started for research and development. Kawamura and co-workers developed the fruit harvesting robot. Grand and co-workers developed the apple harvesting robot. They have been followed by many other works. Over history, agriculture has evolved from a manual occupation to a highly industrialized business, utilizing a wide variety of tools and machines. Researchers are now looking towards the realization of autonomous agricultural vehicles. The first stage of development, automatic vehicle guidance, has been studied for many years, with a number of innovations explored as early as the 1920s. The concept of fully autonomous agricultural vehicles is far from new; examples of early driverless tractor prototypes using leader cable guidance systems date back to the 1950s and 1960s. The potential benefits of automated agricultural vehicles include increased productivity, increased application accuracy, and enhanced operational safety. Additionally, the rapid advancements in electronics, computers, and computing technologies have inspired renewed interest in the development of vehicle guidance systems. Various guidance technologies, including mechanical guidance, optical guidance, radio navigation, and ultrasonic guidance, have been investigated. A robot is a machine that can be programmed and reprogrammed to do certain tasks and usually consists of a manipulator such as a claw, hand, or tool attached to a mobile body or a stationary platform. Today agricultural robots can be classified into several groups: harvesting or picking, planting, weeding, pest control, or maintenance. Scientists have the goal of creating robot farms where all of the work will be done by machines. The main obstacle to this kind of robot farm is that farms are a part of nature and nature is not uniform. It is not like the robots that work in factories building cars. Factories are built around the job at hand, whereas, farms are not. Robots on farms have to operate in harmony with nature. Robots in factories don't have to deal with uneven terrain or changing conditions. Scientists are working on overcoming these problems.

i. **Tradional system :**



ii. Conventional system:

2. LITERATURE SURVEY

Neha S. Naik; Virendra. V. Shete [1], In recent years, robotics in agriculture sector with its implementation based on precision agriculture concept is the newly emerging technology. The main reason behind automation of farming processes are saving the time and energy required for performing repetitive farming tasks and increasing the productivity of yield by treating every crop individually using precision farming concept. Designing of such robots is modeled based on particular approach and certain considerations of agriculture environment in which it is going to work. These considerations and different approaches are discussed in this paper. Also, prototype of an autonomous Agriculture Robot is presented which is specically designed for seed sowing task only. It is a four wheeled vehicle which is controlled by LPC2148 microcontroller. Its working is based on the precision agriculture which enables efficient seed sowing at optimal depth and at optimal distances between crops and their rows, specific for each crop type.

S. Mohan; E. Praveen Kumar [2], Developed agriculture needs to find new ways to improve efficiency. One approach is to utilize available information technologies in the form of more intelligent machines to reduce and target energy inputs in more effective ways than in the past. Precision Farming has shown benefits of this approach but we can now move towards a new generation of equipment. [1]The advent of autonomous system architectures gives us the opportunity to develop a complete new range of agricultural equipment based on small smart machines that can do the right thing, in the right place, at the right time in the right way. Autonomous agricultural robots that could identify, spray and pick individual rice and wheat may soon be a reality. The process might help advance other fields too including robotic surgery and other medical application. The concept of designing agriculture robot can be achieved by using lab view software and GSM to interface the robot and PC.

Shah Alamgir; Israt Jahan [3], oil testing is essential for modern agriculture: to optimize the production, protect the environment from fertilizers overuse, save money and energy during the production. The purpose of this work was to develop an autonomous mobile platform with soil sampling device for agriculture. Soil samples are analysed to determine the composition, charac-teristics or nutrient levels of the soil. Smallholder farmers can use simple hand-held field-testing kits. However, in the case of large farms where plants are grown upon hundreds of hectares, the autonomous mobile platform with a soil sampler would be the optimal solution. Precision farming is a concept of using new production and management methods that use all kind of data collected about specific locations and crop variety. The mentioned robot can increase resource and cost efficiency in acquiring the required data. Information about the soil properties can be retrieved from the field using the robot's onboard systems, enabling farmers to respond to abrupt changes in real time. Data technologies and collecting soil system allows an efficient production process. Use of robots on farms is associated with the progressive digitisation of all areas of our lives, and agriculture is no exception.

Sami Salama Hussen Hajjaj ; Khairul Salleh Mohamed Sahari [4], This paper investigates the possible reasons for this phenomena, by continuing the review of agriculture robots, only this time focusing on practicality and feasibility. Upon extensive review and analysis, the authors concluded that practical agriculture robots rely not only on advances in robotics, but also on the presence of a support infrastructure. This infrastructure encompasses all services and technologies needed by agriculture robots while in operation, this include a reliable wireless connection, an effective framework for Human Robot Interaction (HRI) between robots and agriculture workers, and a framework for software sharing and re-use. Without such infrastructure being in place, agriculture robots, no matter how advanced in design they could be, would remain impractical and infeasible. However, for many organizations, the technological and monitory costs of establishing such infrastructure could be very prohibitive, which renders agriculture robots uneconomical and enviable. Therefore, the paper concludes that the key to practical agriculture robotics is to find a novel, cost-effective, and a reliable approach to develop the support infrastructure needed for agriculture robots.

Qingchun Feng ; Xiaonan Wang [5] ,In order to improve robotic harvesting for fresh tomato and reduce the amount of human labor, this paper designed a tomato intelligent picking robot. The picking robot included the vision positioning unit, the picking gripper, the control system and carrying platform. Based on the working principle of each component, the working process of picking robot was revised. Based on his color model for image segmentation, the recognition accuracy was improved. The sacs filled with constant pressure air were adopted as the grasping component of the picking end-effector, to prevent the fruits from being damaged. The performance test of picking robot indicated that vision positioning module and the gripper module ran well. The execution time of a single harvest cycle was about 24s, and the success rate for harvesting tomatoes was 83.9 percent.

3. BLOCK DIAGRAM

We are making an android application that will control our robot. Android application is also responsible for crop prediction, whether control and grass cutting. Robot consist of 4 wheels, it will be movable robot , we will mount sensor on robot as well microcontroller that is used to process our data coming from sensor. Wi-Fi or Bluetooth will be used for wireless transmission and controlling robot. Whether prediction is also been done by our system as well as 360 spraying.

The explanation of Blocks diagram is as follows:

A. Application: We are making android application to control the motion of robot and to perform the operation like grass cutting, weather detection, crop prediction and 360 spraying.
B. Server: It is use for the storing the database like login id and password of users, and also the data which will required for processing.
C. Node MCU: Its our micro controller used for data transmission.
D. Argo robot: It's a moving robot use for multiple operations
E. Grass cutting: It is one of the operation of our robot, grass cutting is been done and the wastage is also collected by robot.
F. Fertilizer Spray: Here we are providing 360 spraying to the farms.

G. Crop prediction: The feature of crop prediction is been provided by our robot, it will be beneficial for user to predict the suitable land for crops

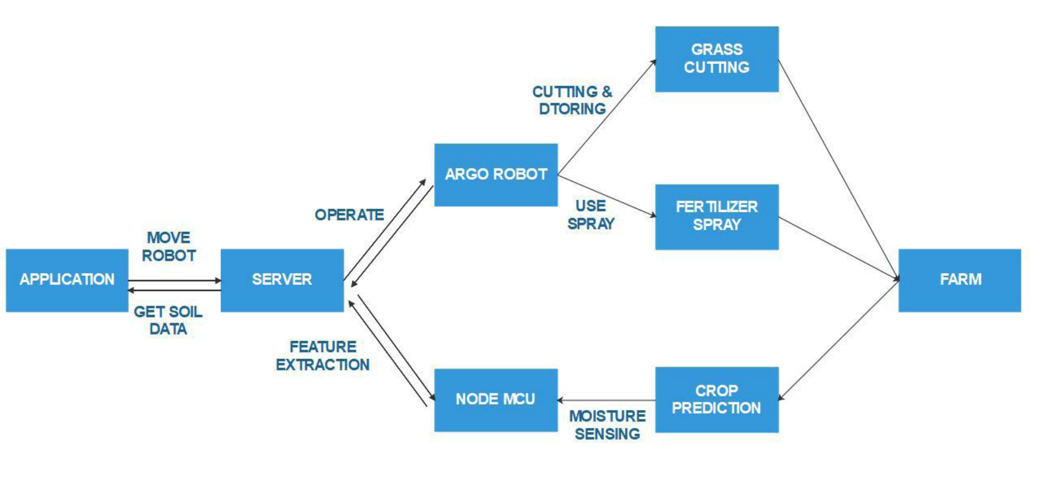


Fig: Block Diagram

1. WORKING **PRINCIPLE**

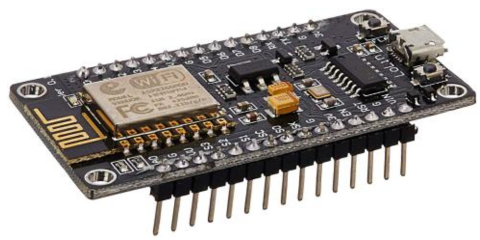
We are making an android application that will control our robot. Android application is also responsible for the crop prediction, whether detection, grass cutting. It will be movable robot and we will mount sensor on robot. WIFI or Bluetooth will be used for wireless transmission and controlling robot. Whether prediction is also being done by our system as well as 360* spraying.

5. COMPONENTS

i. Node MCU

NodeMCU is an open source IoT platform. It includes _rmware which runs on the ESP8266 WiFi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espress if Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems[6] began production of the ESP8266.[10] The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core,[citation needed] widely used in IoT applications (seerelatedprojects). NodeMCU started on 13 Oct 2014, when Hong committed the first of nodemcu firmware to GitHub.[11] Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber of an ESP8266 board, named devkit v0.9.[12] Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266

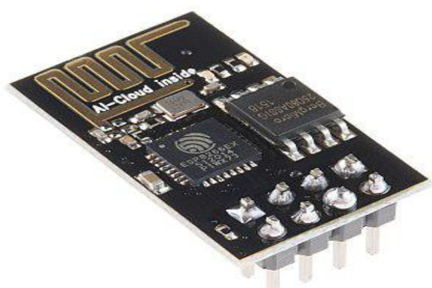
SoC platform, [13] and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib[14] to NodeMCU project,[15] enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays. In summer 2015 the creators abandoned the firmware project and a group of independent contributors took over. By summer 2016 the NodeMCU included more than 40 different modules. Due to resource constraints users need to select the modules relevant for their project and build a firmware tailored to their needs.



ii. WIFI

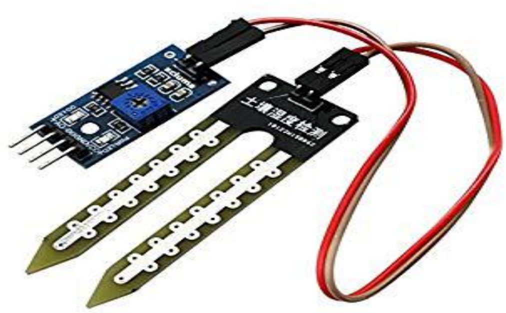
The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands.

However, at first there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.



iii. Soil Moisture

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

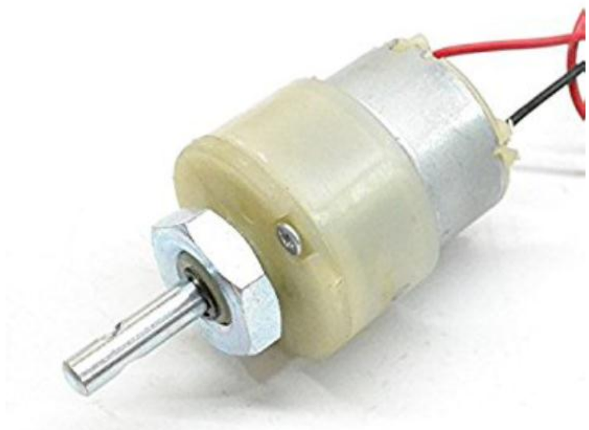


iv. Temperature Sensor

LM35 is a temperature measuring device having an analog output voltage proportional to the temperature. It provides output voltage in Centigrade (Celsius). ... The sensitivity of LM35 is 10 mV/degree Celsius. As temperature increases, output voltage also increases.

v. DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current own in part of the motor.



6. ALGORITHM

Step 1- To initialize robot
Step 2- Connect to robot
Step 3- Then
Go for crop prediction

Go for 360* spraying

Go for Grass cutting

Go for weathers detection

Step 4- If error occur then initialize the robot
Step 5- Else stop

7. FLOWCHART

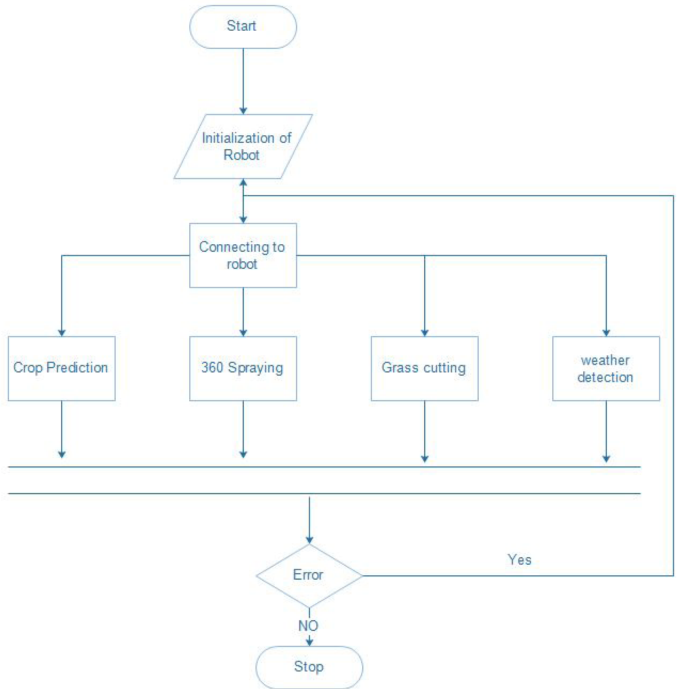


Fig: Flow Chart

8. ADVANTAGES

Robots can work 24 hours a day, every day with no breaks.

A. Robots don't need to be paid wage (so money is saved)
B. Robots are extremely accurate compared to humans, so product quality is high.
C. Robots can perform tasks more quickly than humans, so more products can be made.
D. Robots can work in very dangerous conditions

9. APPLICATION

A. Monitoring the crops and giving analysis
B. Crop seeding
C. Nursery Planting
D. Harvesting Picking

10. CONClUSION

Our system is having multiple features like grass cutting, whether detection, crop prediction, etc. System is overcoming the drawback of existing system and also its easy to used. Hence our system is one of the innovation that helps our farmers to grow, maintained and monitor the crops

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