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Agricultural Crop Monitoring Using IoT

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Abstract-The Internet of Things(IOT) plays a vital role in the field of agricultural. The IOT technology helps to gain the information about temperature, moisture, humidity and fertility of the soil using sensors. The advanced development in wireless sensor networks is used in monitoring the various parameters in the agriculture. IOT leverages farmers to get connected to his farm from anywhere and anytime using WI-FI. The wireless sensors are used to get the information about the farm. Microcontrollers are used to access the activities of the farm. Here in this paper, we propose agriculture robot known as AGRIBOT. This robotic vehicle is an agricultural machine of a considerable power and great soil cleaning capacity. It is a multi¬tasking robot which performs various activities such as ploughing, seeding, harvesting, water pumping and leveling. This is controlled by using android application. A smart phone empowers farmers to keep updates with the ongoing conditions of his agricultural land using IOT at anytime and at any part of the world. This technology can be used in the fields to solve the problems of the farmers efficiently.

Keywords- ESP8266 WI-FI Module; Blynk App;

I. INTRODUCTION

The Internet of Things(IOT) is a network of physical devices, vehicles and other items embedded with electronics, software, sensors, actuators and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system. IOT allows objects to be sensed or controlled remotely across existing network infrastructure.

In the 1980.s many agricultural robots were started for research and development. Kawamura and co-workers developed the fruit harvesting in orchard. Grand and co¬workers developed the apple harvesting robot. They have been followed by many other works. Many of the works focus on structure systems design (e.g., mechanical systems design) of the robot and report realization of the basic actions in actual open fields. However, many of the robots are not in the stages of diffusion but still in the stages of research and development. It is important to find rooms to achieve higher performance and lower cost of the robots.

Over history, agriculture has evolved from a manual occupation to a highly industrialized business, utilizing I 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.

In the 1980s, the potential for combining computers with image sensors provided opportunities for machine vision based guidance systems. During the mid-1980s, researchers at Michigan State University and Texas A&M University were exploring machine vision guidance. Also during that decade, a program for robotic harvesting of oranges was successfully performed at the University of Florida. In 1997, agricultural automation had become a major issue along with the advocacy of precision agriculture. The potential benefits of automated agricultural vehicles include increased productivity, increased application accuracy, and enhanced operation 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.

II. SYSTEM MODEL

IOT has a very large the play in the field of agriculture. Using IOT large range of techniques can be implemented which are efficient and face the challenges in the field which intern helps farmers getting better field. Agricultural crop monitoring system, we get the sustainable agriculture with precision and efficiency. In this crop monitoring system, many features are implemented in one machine i.e, cultivating, harvesting, seeding, harvesting, water pumping , leveling etc. All these features can be accomplished in a single machine with less human work. Rather than doing single work at a time with a great human energy, which is time consuming also. Using of this technology is a better option. The system/machine is called agricultural robots or AGRIBOT, a robot meant for agricultural purpose. It is a multitasking robot, they can replace the human labor by performing varies activity such as fruit picking, sowing etc. This type of robot can be useful for the farmers as a low investment option instead of buying two or more machines to do multiple works. All we need is a android

smart phone to control the robot and respond to the control signal. The wireless sensor networks are used here for monitoring the field condition. Microcontroller are used to control and access the field works. There will be a wireless communication between robot and smart phone application. The crop monitoring robot also enables the detection of animal intrusion into the field, crop growth, kevel of water, pest detection etc.

III. PREVIOUS WORKS

The existing system consists of manual implementation that are necessary for the agriculture purpose. Suppose a person wants to know about the agriculture land profile of a field, then he need to go to his land which is far away. So, it is proven to be hectic task to like this. Each operation have separate system or machines. The methods such as ploughing, seeding, harvesting, water pumping ect are inefficient, time consuming and require high labor work. As all these functions are done manually and no artificial intelligence are included the crop productivity is less. Due to the use of different machine for different operations the cost is high. Hence it is very difficult to obtain real time information on environmental monitoring, because high investment of cost, laying lines hardly and man made destruction. The agricultural work includes heavy activities like crop cutting, fruit picking etc. These operations are dull and require skills and human intervention is more. The current system uses Bluetooth medium to access the ongoing conditions in field. The blue tooth medium is limited for certain distance. When farmer is far away from the field he cannot access the ongoing conditions in the field as the blue tooth medium has limited range.

IV. PROPOSED METHODOLOGY

The hardware is interfaced with all the sensors in the board. The hardware components include the microcontroller, step- down transformer, temperature sensor, humidity sensor, soil sensor, DC motor. The board is connected to the android application which is used to communicate with the owner and the recorded values. The output consist of temperature, soil moisture conditions and humidity. These results are obtained from the android application i.e., Blynk app that is developed in smart phones.Hence in order to reduce this need, and save time and money, robots are employed it is feasible to implement internet connection.

Through IOT farmers can be connected to his farm form anywhere and anytime. It calculate the temperature, soil moisture and humidity and display it on a android application. The wireless camera can also be implemented to view the conditions, it may be in the form of image or video. Using this technology, can reduce the cost and also enhance the productivity of the farming.

Robot side:

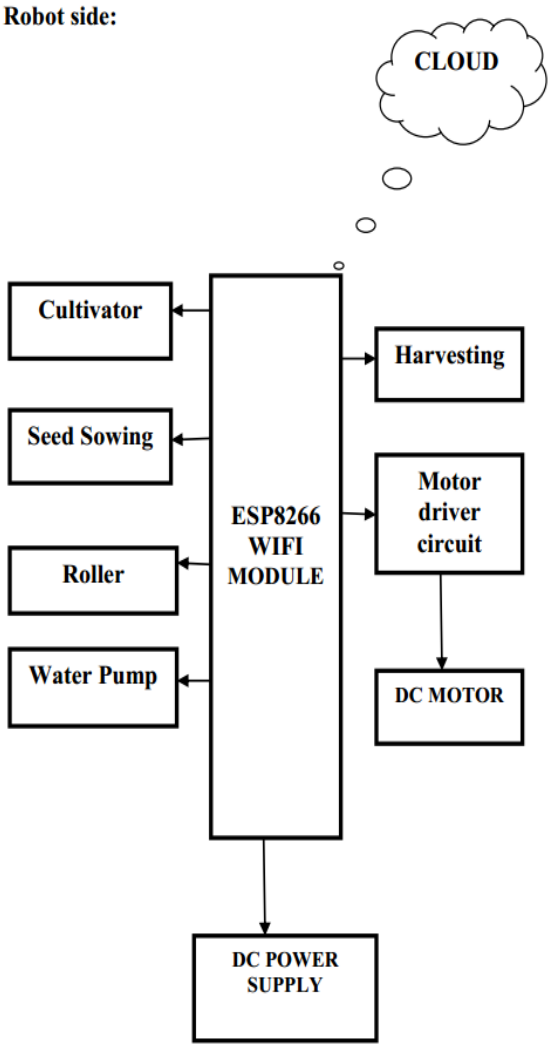


Fig. 1 System architecture

Fig 2.Transmitter

A. DC Motor

A DC motor is class of rotary electrical machines that converts direct current electrical energy into mechanical energy. Based on the inputs of the driver circuit DC motor runs.

Fig 3.DC Motor

B. ESP WI-FI Module

The ESP8266 is low cost WI-FI micro chip with full TCP/IP stack and microcontroller. This small module allows microcontroller to connect to a WI-FI network and make simple TCP/IP connections. Some of the features are - Integrated TCP/IP protocol stack, power down leakage current of less than 10microamp, 1MB flash memory, Integrated low power, 32bit CPU could be used as application processor, standby power consumption less than l.Omicrowatts.

Fig 4. ESP8266 WI-FI Module

C. Soil Sensor

Soil moisture sensors measure the volumetric water content in soil. It measures the loss of moisture over time due to evaporation and plant uptake and evaluates the soil moisture contents of various species of plant. Another class of sensors measure another property of moisture in soil called water potential, these sensors are usually reffered to as soil water potential sensors.

Fig.5 Soil sensor

D.Temperature sensor

Temperature sensors are built to measure the temperature of plant, soil or water. These sensors use a solid state technique to determine the temperature. There are two types-

Contact temperature sensor type- These type of sensors are to be in physical contact with the objects and by using conduction, monitors the changes in the temperatures.

Non-Contact temperature sensor type- These type of temperature sensor use conviction and radiation to monitor change in temperature.

Fig 6. Temperature Sensor

E. humidity sensor

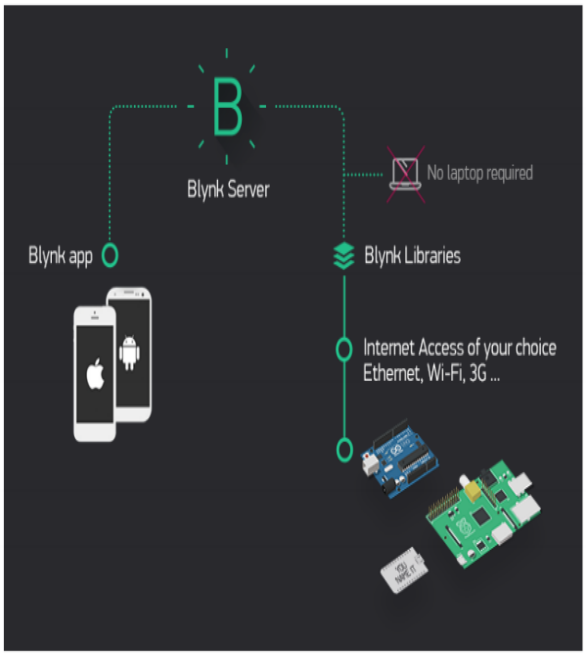
Humidity is the presence of water in air. The ratio of moisture in the air to the highest amount of moisture at a particular air temperature is called humidity. Humidity sensors work by detecting changes that alter electric current or temperature in air. By calibration and calculation, these measured qualities lead to the measure of the humidity.

Fig 7. Humidity Sensor

F. Blynk App

Process like ploughing, seeding, fertilizing, harvesting, spraying etc require large amount of man power. Hence in order to reduce this need, save time and money, robots are employed. It is feasible to implement internet connection. The development of Blynk App is easy and cost effective.

Blynk is a app to control electronics like Arduino, RaspberryPi etc. Blynk will work with all popular boards and shields that works on iOS and android. Blynk works over the internet. So, the one and only requirement is that your hardware can talk to the internet. No matter what type of connection you choose- Ethernet, WI-FI or may ESP8266.



V. EXPERIMENTAL RESULTS

After downloading the app, create an account and log in. Welcome to Blynk. You'll also need to install the Blynk Arduino Library, which helps generate the firmware running on your ESP8266. Download the latest release from Blynk's GitHub repo, and follow along with the directions there to install the required libraries. Next, click the "Create New Project" in the app to create a new Blynk app. Give it any name you please, just make sure the "Hardware Model" is set to ESP8266. The Auth Token is very important - you'll need to stick it into your ESP8266's firmware. For now, copy it down or use the "E-mail" button to send it to yourself. Then you'll be presented with a blank new project. To open the widget box, click in the project window to open. Add a Button, then click on it to change its settings. Buttons can toggle outputs on the ESP8266. Set the button's output to gp5, which is tied to an LED on the Thing Dev Board. You may also want to change the action to "Switch. Now that your Blynk project is set up, open Arduino and navigate to the ESP8266_Standalone. Before uploading, make sure to paste your authorization token into the auth[] variable. Also make sure to load your WiFi network settings into the Blynk.begin(auth, "ssid", "pass") function. After the app has uploaded, open the serial monitor, setting the baud rate to 9600. Wait for the "Ready (ping: xms)." message Then click the "Run" button in the top right corner of the Blynk app. Press the button and watch the LED. Then add more widgets to the project. They should immediately work on the ESP8266 without uploading any new firmwar You can add analog output sliders, digital input monitors, and analog input gauges.

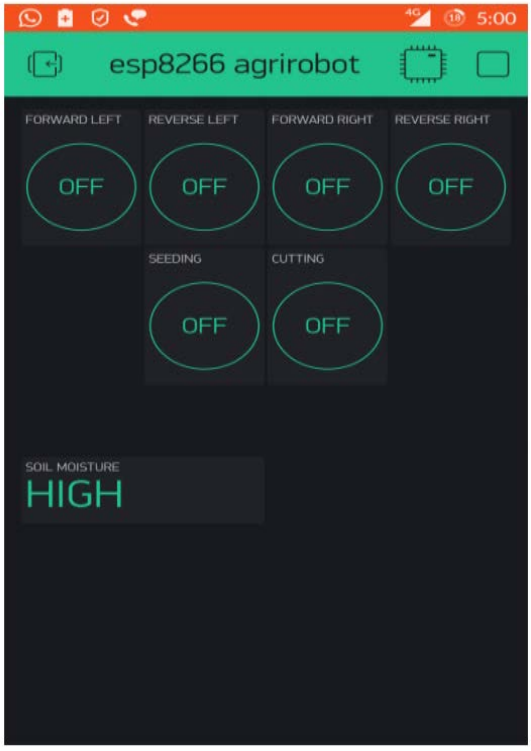


Fig 8.Blynk Architecture

VI. CONCLUSION

The smart farming system gives an advanced method to sow plough and cut the crops with minimal man power.

The mechanism includes the cultivation of crops by considering the specific rows and specific column at fixed distance depending on crops. The sensors are used to collect the detailed information regarding the environmental changes and crop conditions. The obstacle detection problem will also be considered, sensed by sensor. These informations are directly transmitted to the farmers through IOT.

In agriculture, the opportunities for robot enhanced productivity are immense and robots are appearing on farms in various increasing numbers. This technology makes the agriculture crop productivity easy and efficient.

VII. FUTURE SCOPES

IOT has been used for agriculture sector. This technique is suitable for different predictions in agriculture. IOT devices are used by multiple users which helps to enquire about the crop details to the farmers after harvesting. It stores these details in a central place which is known as cloud storage.

Many researchers are done in the field of agriculture and most of them uses wireless sensor network in order to collect the data from different sensors which are deployed at various nodes and send it through wireless protocol. The collected data provide information about the various environmental factors such as temperature, soil moisture, humidity etc.

This system includes robots to perform agricultural operations automatically such as cultivating, cutting crops, seeding, fruit picking, water pumping etc which allows farmers to reduce the environmental impact, increase precision and efficiency

Agriculture play a very important role in Indian economy. For future development, it can be enhanced by developing the system for large areas of land. Also the system can be integrated to check the quality of the soil and the growth of crop in each type of soils. In this proposed work the sensor part is limited only for monitoring the crops hence in future it can be automated for irrigation and system can be enhanced by security of land under video surveillance which prevents it from intrusion. Robots that can be implemented in future are-

1. Flying micro robots can be implemented in the field of agriculture to control weeds and insects.
2. Agriculture robots suit can be used for tough agricultural works like pulling radishes.
3. Vitirover solar robot is used to cut the grasses and weeds. The is agricultural robot could work for 100 hours without pause using solar panels.

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