International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 06 | June - 2023 SJIF Rating: 8.176 ISSN: 2582-3930

Automation in Farming with IOT

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ABSTRACT-

Internet of things (IoT) is an emerging technology that shows the fu- ture of computing and networking. Agricultural monitoring from a remote location is one of the essential applications of IoT based wire-less sensor networks. The IoT based wireless sensor network faces problems due to the dynamic changes in the environment. The num- ber of required sensor nodes increases for monitoring of the vast area. By introducing mobility of all nodes in the IoT based wireless sensor network, we can decrease the number of nodes and thus re- ducing the cost of the overall system. In this research project, an IoT based mobile robotics network is proposed for farming applications. Master and slave robots incorporate the wireless sensor network and are connected via the NRF protocol for reliable sharing of sensor data. The master robot also transmits this data to the IoT server. The highlighting features of this research include weeds detection through image processing and sensors for gathering light, moisture, humidity, temperature parameters.

Robots are also equipped with an ultrasonic sensor for avoiding obstacles during navigation. The proposed computer vision algorithm for weed detection is based on texture feature analysis and artificial neural networks. The algo- rithm is implemented on Raspberry Pi 3 based single board com- puter for classification of weed and non-weed images.

INTRODUCTION-

Today the environmental influence of agricultural production is very much in focus and the demands to the industry are increasing. In the present scenario, most of the cities in India do not have sufficient skilled manpower in the agricultural sector and that affects the progress of developing countries.

Therefore, farmers have to use upgraded technology for cultivation activity (digging, seed sowing etc.). Seed sowing Machine which are developed so far are operated manually or there is less use of smarter technology. Manual method includes broadcasting the seeds by hand. Sometimes method of dibbling i.e. making holes and dropping seeds by hand is used. Also, a tractor or a pair of bullocks is used to carry the heavy equipment of leveling and seed dropping. So it’s time to automate the sector to overcome this problem. There is a need to study on upgrading agricultural equipment. Innova- tive idea of this paper is doing the processes of digging and seed sowing of crops and covering the land automatically so that human efforts will get reduced up to 90 percent.

Agricultural Robots or Agribot is a robot deployed for doing agricultural purposes. Nowadays robotics technology plays a paramount role in all Sections like medical field, industries and various organizations. In other countries robots are used to perform different operations in the agricultural field.

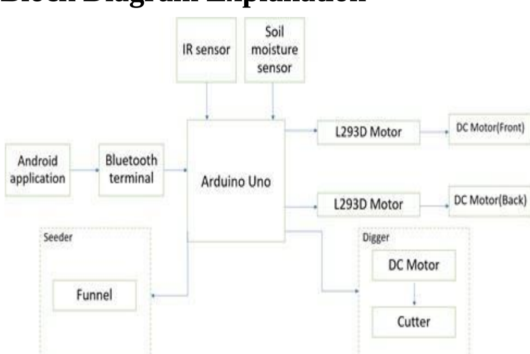
The main application area of robots in agriculture is at the harvesting stage and Seed Sowing Stage. Driverless robots are designed to replace human labor. The data logger through Wi-Fi module on web server increases the effectiveness of the system so that surveillance of all actions will be maintained. The Agribot developed in this paper performs digging, seed sowing and covering seeds simultaneously with a control of Android Appli- cation. Also, every movement is monitored on web server as well as on Android Application from anywhere.

Block Diagram And Explanation-

The block diagram for the proposed project is as shown below. It includes three sensors namely Ultrasonic sensor, Compass sensor and soil moisture sensor. The microcontroller is the heart of the system. Solar panel is used for providing power. Four DC motors are used for movement of the robot. The drill bit is used for digging, sprinkler for spraying fertilizers and bluetooth module for communication.

Figure : Block Diagram

Block Diagram Explanation-



motors have been used which receive supply voltage from a motor driver L293D. Since the supply voltage of the motors been used is 12V, a motor driver is essential as a microcontroller can't provide such high voltage. Now when desirable growth of plants is obtained then the fertilizers are sprayed. A reminder will be provided in the android application which will remind the user about spraying fertilizers. Then the user will just need to give the command for fertilizer spraying and in this way the fertilizer spraying operation will be carried out by robot at regular intervals. Bluetooth interface will be used operated on android application to man oeuvre robot in the field. Every movement is monitored on android application from anywhere. Hence, in this way seeds will be successfully sowed in the soil and fertilizers will be properly sprayed as well as the monitoring can be done on an Android application.

The solar panel is used to capture solar energy and then it is converted into electrical energy which in turn is used to charge 12V battery.

The soil moisture sensor is used to determine whether the soil contains 25.

Working principle-

Smart agriculture refers to the use of advanced technologies, such as IoT, big data, and the cloud in agriculture to grow food smartly, sustainably, and cost-effectively. Smart agriculture using IoT involves the use of IoT sensors to collect environmental and machine data that enable farmers to make informed decisions.

IoT enabled agriculture helps farmers to perform intelligent operations with efficient business processes. Farmers get better control over the processes, making them more predictable and efficient.

For instance, IoT sensors in agriculture enable farmers to automate vital farming processes. They can monitor them from anywhere with an internet connection. Farmers can also track the state of crops and identify what quantity of fertilizers they have to use. This helps them reach optimal efficiency.

COMPONENT OF BLOCK DIAGRAM-

Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to var- ious expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.[4]

It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo.[5][6] The hardware reference design is distributed under a Creative Com- mons Attribution Share- Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. The word ”uno” means ”one” in Italian and was chosen to mark the initial release of Arduino Software.[1] The Uno board is the first in a series of USB-based Arduino boards;[3] it and version 1.0 of the Arduino IDE were the reference versions of Ar- duino, which have now evolved to newer releases.[4] The ATmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it with- out the use of an external hardware programmer.[3] While the Uno communicates using the original STK500 protocol,[1] it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.[7]

Specification:-

Recommended Input Voltage 7-12V Input Voltage Limits 6-20V

Analog Input Pins 6 (A0-A5)

Digital I/O Pins 14 (Out of which 6 providePWM output) required moisture for the desired crops namely wheat, jowar and sunflower. An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. HC-SR04 is used to detect if any obstacle is present in the path. The soil is drilled using a drill bit based on a predefined depth. Here, for the desired crops, the depth is 5cm. Compass sensor is used for determining exact rotation of robot if we need to rotate in right or left direction. Magnetometer HMC5883L measures the direction and magnitude of the Earth's magnetic field and hence is used for low cost compassing. It measures the Earth's magnetic field value along the X, Y and Z axes from milli-gauss to 8 gauss. According to the received signal the robot will move in the direction and it will place the seed and fertilizer on field for specified distance. Then the microcontroller sends the command to drop the seeds into the drilled hole. Hence, in this way uniformity is achieved in the drilled depth and. After the set numbers of seeds are dropped in the hole created, ATmega328 sends a command to move further and this is fed to the motor driver IC L293D. The L293D IC receives signals from the Atmega328 and transmits the relative signal to the motors. We need motor driver for running them through the controller. To interface between motor and microcontroller we will use L293D motor driver IC in our circuit. Four 60 rpm.

Figure : Arduino MEGA

L239D

The L293D is a popular 16-Pin Motor Driver IC. As the name suggests it is mainly used to drive motors. A single L293D IC is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. **Specification:-** • Supply Voltage Range: 4.5V to 36V

• 600-mA Output current capability per driver

• It can drive small DC-geared motors, bipolar stepper motor.

• Pulsed Current 1.2-A Per Driver

• Thermal Shutdown

• High-Noise-Immunity Inputs

Soil Moisture -

Soil moisture sensors measure the volumetric water content in soil.[1] Since the di- rect 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, di- electric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instru- ments can be used by farmers or gardeners. Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usu- ally referred to as soil water potential sensors and include tensiometers and gypsum blocks.

Specification:-

• Operating voltage: DC 3.3V - 5V

• Output voltage signal: 0 4.2V

• Current: 35mA

Figure : Soil Moisture

Advantages –

1.Conservation of electricity

The robot uses solar panel so electricity will be conserved. It also helps to reduce the carbon footprint. Due to solar powered robot, it becomes possible to eliminate the use of long wires. Also, it eliminates the dependency on power supply from the electricity board as the robot will work even if there is any power cut off.

2. Conservation of time

The time required for the operations will be reduced. The robot will get the job done quickly. Unlike laborers, robot doesn't require breaks, vacations, etc. The work can continue without any interruption. This in turn, will increase the productivity.

3. Saving of labor cost

The labor cost will be saved. The cost of manual operations can be steep. It requires time, skill and concentration. However, the use of robot will eliminate need of labors and hence the overall cost of production will reduce.

4. Elimination of wastage of seeds and fertilizers

Wastage of seeds and fertilizers will be avoided. As the broadcasting of seed and fertilizers by hand leads to irregular distribution, it results in wastage of seed and fertilizers. The utilization of robot will avoid the manual broadcasting and hence will save the seeds and fertilizers.

5. Better productivity

Better productivity will be obtained. As the job will be done with accuracy so the seeds will germinate properly and hence the productivity of crops will increase.

Application

1. Nursery planting

Ease of availability of quality planting material at reasonable costs is a challenge. At present only up to 30-40% demand for planting material is being met by the existing registered nurseries. By using the robot the required demand can be met satisfactorily.

2. Farming

In manual farming the seeds and fertilizers are manually broadcasted. This leads to their wastage. This drawback can be overcome using the robot which will avoid the wastage. The robot will broadcast only the required amount of seeds and fertilizers and hence will reduce the wastage.

3. Gardening

A garden requires a time commitment from the planning stages through harvest time. The greatest investment of time is required when you first start your garden. The robot saves a lot of time and hence the time constraints are followed.

CONCLUSION -

This project plans to design fully functional automated product. In this proposed work, solar powered seed sowing and fertilizer spraying robot with wireless con- trol will be successfully developed and implemented in real time environment. The proposed system will be developed at low power and low cost with an efficient out- put. Adding more accessories to the mobile robot and controlling it using an android application will also be possible. This robot with wireless control system gives an alternative way of broadcasting seeds and fertilizers by hand. This robot will per- form the seed sowing and fertilizer spraying operations and hence will save labor requirement so as labor cost, labor time and lot of energy.

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