

Iot Based Agricultural Bot with Image Processing

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Abstract—A multifunctional agricultural robot using IOT is a system that can perform various agricultural tasks. The robot is controlled using IOT technology, which allows it to be monitored and operated remotely. The robot consists of a mobile platform, various sensors, actuators, and an IOT controller. The mobile platform allows the robot to move around the farm field. The sensors are used to collect data about the environment, such as soil moisture. The actuators are used to perform various agricultural tasks. The IOT controller is responsible for processing the sensor data and controlling the actuators. The robot can be controlled using a variety of devices, such as a smartphone. The user can use the device to select the task that the robot should perform and to monitor the robot's progress. The use of IOT technology in agriculture has several benefits. It can help to improve the efficiency and productivity of agricultural operations. It can also help to reduce the need for manual labor, which can be expensive and difficult to find. Additionally, IOT technology can help to improve the quality of agricultural products by providing farmers with more precise control over their operations.

Index Terms—4WD bot, soil moisture sensor, Humidity and Temperature sensor, DC motor, Motion sensor

I.INTRODUCTION

Agriculture is a major occupation in India. Some of the major problems in the Indian agriculture are, rising of input costs, lack of skilled labours, scarcity of water resources and crop monitoring. Over 60 % of India's land area is cultivable making it the second largest country in terms of total arable land. Several agricultural industries have switched to IoT engineering for smart farming to increase productivity, performance, global market, and other features such as minimal human interference, time, and cost, among others. Agriculture is a labour-intensive and time-consuming industry, and farmers are increasingly facing challenges such as climate change, water scarcity, and labour shortages. Multifunctional agriculture robots IOT (Internet of Things) can help to address these challenges by automating a wide range of tasks, such as seed

moisture using IOT-enabled agriculture robots use sensors to collect data about the environment and the crops, such as soil moisture levels. The IoT plays a vital role in various fields such as industrial, medical, automobiles etc., The IoT technology is gradually increasing its productivity in agricultural field. The IoT technology is being developed for irrigation system, soil health monitoring, environment monitoring, etc., All of these functions have not yet performed using a single IoT platform.

II. LITERATURE REVIEW

This paper offers a system which performs the seeding process in the agricultural field. The main idea behind this development is to perform agricultural tasks without human intervention and to implement a prototype of an effective low cost agribot. This project is based on a wireless communication by making use of Arduino and Bluetooth.[2]

This system consists of Arduino UNO which acts as the hearth of the system. This system consists of a camera, to detect the obstacles falling in it's path which will help in taking the required actions and it proposes three main functions: Ploughing seed dispensing and harvesting. The main idea behind this is to design a multitasking robot which in turn reduces the working hours, cuts down on labour expenses and helps in the correct way of seeding.[3]

The paper provides information about the demonstration and working of Agribot controlled by IoT. This robot carries out varied functions such as ploughing, seeding and spraying of pesticides. servo motor and solenoid valves are implemented in order to the mechanism of seeding and spraying of pesticides. the moto of this project was to aid the farmers with a good yield of crops and to avoid direct contact with chemical pesticides.[4]

This proposed Agribot consists of IR, moisture and temperature sensors. In order to make use of the naturally available sunlight they have used solar panels. The sensors check the temperature of the soil and irrigates the land depending on the temperature and then feeds the data to the cloud. this robot will change the path if an obstacle occurs. the main intention behind this project is to build a economical robot to help the farmers and to make use of the available natural resources.[7]

The authors propose a multipurpose agricultural robot that can be used for soil nutrition level detection. The robot uses a variety of sensors, including a colour camera and a soil nutrient sensor, to perform its tasks. The authors believe that their robot can help to improve the efficiency of agricultural operations and reduce the need for manual labour. The paper proposes an IOT-based robot for crop monitoring. The robot is equipped with a camera, sensors. It can be used to monitor the crop and the environment around the crop, and to identify. Overall, the proposed IOT-based robot for crop monitoring has the potential to be a valuable tool for Indian farmers. It can help them to improve crop yields and reduce losses due to animals and insects .[1]

Author intends to present methods to monitors Soil moisture levels, Humidity and temperature of the soil. In this paper, researcher has been presented IoT based system for soil pH, temperature, and moisture measurement. Sensor designs for pH, temperature and moisture have been implemented and tested.[6]

III.HARDWARE DESCRIPTION

A.ESP8266

ESP8266 is a complete, standalone Wi-Fi networking solution that can host software applications. The device can be utilised as a request processor and booted immediately from an external disc if it has flash memory. Onboard cache helps to boost system performance and minimise memory needs. Wireless Internet connectivity is also limited to certain interfaces, such as the SPI/SDIO or CPU AHB bridge, which can be easily integrated into microcontroller designs with the help of Wi-Fi adapters. With its large storage capacity and fast processing speed, the ESP8266 is ideal for low-power startup and operation applications that make use of sensors and other specialised devices

connected to its general-purpose I/O (GPIO) interface. This is seen in Figure 1, which displays the ESP8266.

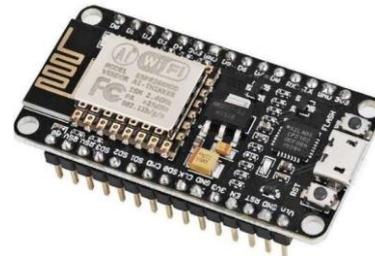


Figure 1: ESP8266

B.Soil Moisture Sensor

The soil moisture sensor finds out how much water is in the soil, often known as its humidity. The output module might be high when the soil is experiencing a water scarcity; otherwise, it is limited. The device keeps tabs on soil moisture and alerts users when it's time to water plants. Soil irrigation, planting, and agriculture are only a few of the many uses for it. Present in Figure 2 is the Moisture Sensor.

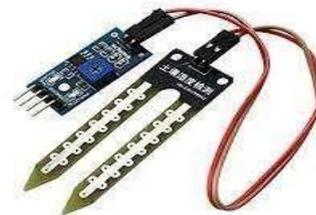


Figure 2: Moisture Sensor

C. Air Temperature & Humidity Sensor DHT11

Humidity and temperature gauge The temperature and humidity may be measured with the help of a DHT11 sensor. It takes readings from the surrounding air using a thermistor and capacitive humidity sensor. With a signal transmission range of up to 20 meters and minimal power consumption, this sensor is both affordable and efficient. The DHT 11 sensor is shown in Figure 3.

Voltage required for power supply: +5V
 Temperature: inaccuracy of ± 2 °C from 0 to 50 °C
 RH: 20-90% with a margin of error of $\pm 5\%$

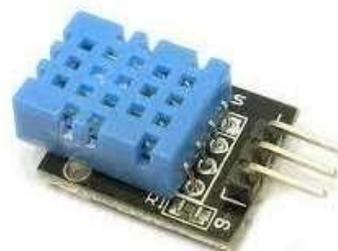


Figure 3: DHT11 Sensor

D. PIR Sensor

A Passive Infrared (PIR) sensor is a device that detects infrared radiation emitted by objects within its field of view. These sensors are commonly used in various applications for detecting motion or presence, such as in security systems, automatic lighting controls, and occupancy sensing. It has components like pyroelectric sensor, Fresnel Lens, signal processing circuitry and lens cover.



Figure 4: PIR sensor

E. Lithium-Ion Batteries

Lithium-ion batteries (Li-ion) represent one of the most common rechargeable battery types used in various electronic devices, from smartphones and laptops to electric vehicles and grid-scale energy storage systems. They are popular due to their high energy density, relatively low self-discharge rate, and lack of memory effect compared to other rechargeable batteries like nickel-cadmium (NiCd) or nickel-metal hydride (NiMH) batteries.



Figure 5. Lithium Ion Battery

IV. WORKING

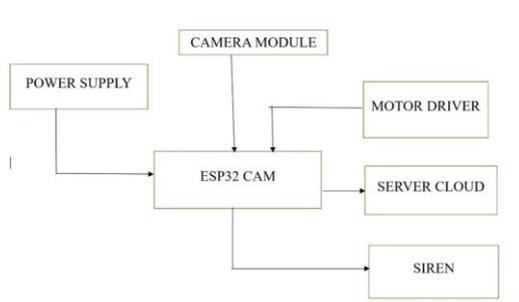


Figure 6. Upper part of Bot

From figure 6. block diagram represents a system built around an ESP32-CAM module, a popular microcontroller with a built-in camera, designed for

applications like image processing and remote monitoring. Interconnections and Data Flow: Power Supply to ESP32-CAM: Power is essential for the ESP32-CAM to function. Camera Module to ESP32-CAM: The camera sends image/video data to the ESP32-CAM. ESP32-CAM to Server Cloud: The ESP32-CAM sends data (images, video, processed information) to the cloud for storage or further processing. ESP32-CAM to Motor Driver: The ESP32-CAM controls the motor driver, enabling movement. ESP32-CAM to Siren: The ESP32-CAM triggers the siren to produce sound.

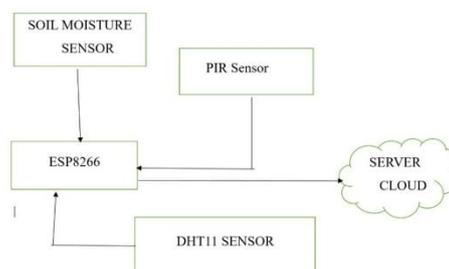
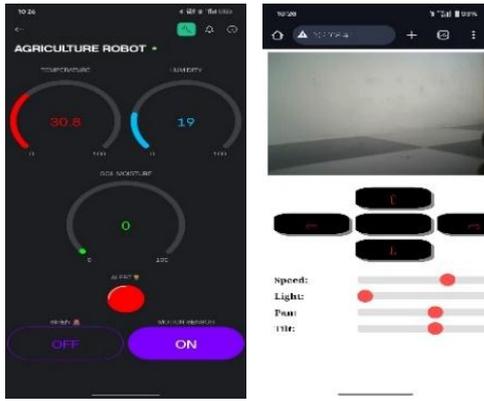


Figure 7. Lower part of Bot

From figure 7. Block diagram represents a Connections and Data Flow: SOIL MOISTURE SENSOR to ESP8266: The soil moisture sensor sends its readings to the ESP8266. This allows the microcontroller to monitor the soil's moisture level. PIR Sensor to ESP8266: The PIR sensor sends its motion detection signals to the ESP8266. This allows the microcontroller to know if there's any movement in the vicinity. DHT11 SENSOR to ESP8266: The DHT11 sensor sends its temperature and humidity readings to the ESP8266. This provides the microcontroller with environmental data. ESP8266 to SERVER CLOUD: The ESP8266 transmits the collected data (soil moisture, motion, temperature, and humidity) to the server cloud via Wi-Fi. This allows for remote monitoring and data logging.

V. RESULT





VI. CONCLUSION

In conclusion, the Agriculture Surveillance Robot with Live Monitoring Cam, built on the ESP32 platform, offers an innovative solution to enhance agricultural monitoring and security. Through real-time temperature and humidity monitoring, farmers can make informed decisions to optimize crop growth and mitigate environmental risks. The integration of wild animal motion detection ensures timely detection of potential threats to crops, enabling proactive measures to protect yield. The alert LED provides instant visual notifications, enhancing response times to critical events. Overall, this system empowers farmers with actionable insights and effective tools to safeguard their agricultural assets, thereby promoting sustainable and efficient farming practices.

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