INTERNET OF THINGS (IOT) USING IN AGRICULTURE AND SMART FARMING

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Abstract

Agriculture has been practiced for more than 20,000 years. The Neolithic period, when agriculture first appeared, also saw the beginning of civilization. India is an agrarian nation, so the majority of its agriculture is reliant on rains, soil, moisture, and environmental difficulties. Our farmers switched to the most cutting-edge agricultural technologies available today. The phrase "smart agriculture" refers to a broad category of agricultural and food production methods supported by big data, advanced analytics, and the Internet of Things. IoT mainly refers to the addition of analytics, automation, and sensor technology to contemporary agricultural processes. It is now necessary for Indian farmers to implement smart agricultural systems in order to increase crop productivity. The farmer can monitor agricultural fields' productivity by compiling data from sensors, actuators, and contemporary electronic devices. With the aid of sensors connected to the processing module Arduino-UNO, smart agriculture can forecast weather data by turning on the pump motor and recognizing the dampness of the soil in terms of moisture levels. With the use of networking technologies, the smart farm system may be operated from any location. When Smart Agriculture and Artificial Intelligence are combined, cutting-edge technologies for data compilation and resource optimization may result. The pest and insect controls that guard against crop damage and also optimise resource utilization can be groundbreaking.

Key word -Smart Agriculture, sensor, monitor, Internet, Artificial Intelligence

Introduction

The discovery of smart farming methods that can improve the traditional agriculture sector, which is in decline. A surefire way to enhance production per acre of land is to use clever techniques like precision farming, effective water management, soil moisture monitoring, and humidity monitoring. Precision agriculture allows the farmer to use the land in accordance with its quality and natural attributes by preventing the inappropriate and excessive application of pesticides and fertilisers. At a time when India's water tables are rapidly evaporating as a result of enormous demand from the agricultural and industrial sectors, precision farming could help. Farmers in India continue to put off or be stubborn about using ancient techniques, which could further lower India's GDP. Recent skill-acquired migrants from all over India who returned to their hometowns during the Pandemic Covivirus-19 have chosen farming as their profession and have no desire to return. These migrants can now move closer to adopting smart agriculture systems because it does so more quickly than it does to persuade traditional farmers to do so.

Agriculture continues to be the primary source of income for the majority of rural residents. Food crop production is exclusively based on indigenous agricultural knowledge that is passed down from generation to generation via experience and careful observation, not on any formally acquired farming information. Farmers who lack resources, particularly those in rural areas, use traditional farming techniques to grow their food crops, which are specially adapted to their circumstances. The majority of farm labour is provided by family members, with men often handling the ploughing while women handle the majority of the planting, weeding, and harvesting tasks.

Traditional farming is riskier, more labor-intensive, and might lead to suicidal thoughts owing to poor yields or acts of God. Big fish and the business community, who are unaware of the smart agriculture system, are benefiting from its advantages. Small farmers. Due to Pandemic COVID-19 returning the migrants to their various villages and leaving them without a means of support, they are thankfully willing to return to their old employment of farming. Currently, small players in farming can include the Smart Irrigation System, an IoT-based gadget that automates the irrigation process by detecting the moisture of the soil and the climate situation (like raining), and enjoy high yield profit generating. Internet of Things (IOT) development aids in agricultural society information on conditions such as atmosphere, temperature, and soil production. Harvest web surveillance engages area of weed, level of water, bug recognition, animal interference in the field, modify improvement, and cultivation. With the use of wireless sensor networking (WSN) systems and remote sensor frameworks, farmers can learn specifics about farm conditions while seated at home or in another location.

METHODOLOGY

a) Application of Wireless Sensor Networking

A wireless sensor network that is being developed for smart and precise agriculture can be used to continuously track changes in environmental factors like weather, soil moisture from rain, humidity, and temperature. It can act as a controller when supplying the inputs for seeds, fertiliser, insecticides, etc. as a process input. The WSN application will help with data collecting for the farmers' use in cultivation and as an input feeder control system for agricultural machinery. Information security and other failures and breakdown concerns, such as sensor and power supply problems, could be a problem in wireless sensor networking systems.

b) By turning the pump on and off with a relay, we maintain the water level and flow as needed. In a field, soil moisture sensors are fixed underground. At first, decisions are made in accordance with the water level reading. To obtain an overall reading of the soil temperature, a temperature sensor (DTH11) is mounted in the middle of the field. We will receive the readings from Arduino, which is connected to these sensors. All sensors will provide data to Arduino, which will then transmit the data to WSN systems. The crop will determine the threshold value. The threshold value will be marked based on the specifications and predefined crop requirements for each sensor in the Raspberry Pi.

c) LITERATURE SURVEY

Through the extensive compilation of approaches, such as precision and conservative cultivation to meet obstacles in the field, the Internet of Things (IOT) is revolutionizing the agribusiness and engaging the farmers. For the agricultural sector, researchers have suggested many modalities with one or more technologies listed, such as an irrigation system based on soil water monitoring to determine irrigation amount of the water as described in[1]. This relies on the Bluetooth communication technology, which has its own drawbacks such a small range and device support? In order to increase energy efficiency [2], a writer suggested timing the power supply to the sensors in 2016. An author in a paper mentions the use of IoT in agriculture [3]. But it demonstrates a lack of interoperability, which is essential when discussing vast agricultural landscapes. Jinsoohan has offered a method in a study for comparing the energy consumption of two appliances [4]. 2017 publication In their article, N.K. Suryadevara and S.C. Mukhopadhyay combined techniques from pervasive computing, data aggregation, and other fields to monitor environmental parameters using Zigbee [5]. However, as more nodes have been implemented, it may pose concerns about increased power consumption and agricultural automation [6]. The approach described in the study [7], which offers the essential information but is a stand-alone system, is to give farmers real-time information about the land and crops. IoT, cloud computing, and mobile computing concepts were used in a paper on smart agriculture in 2015 [8], and Prem Prakash Jayaraman, Doug Palmer, and Arkady Zaslavsky introduced the idea of phononet [9], which is a network of intelligent wireless sensor nodes that share information with a central system and each other.

a) Sensor for Soil Moisture

A soil sensor that determines soil moisture monitors the volumetric water content in the soil and outputs the moisture level. The sensor averages both the propelled yield and the water content along the whole length of the soil environment, whether it is wet or dry. The sensors have an accuracy of 1°C and 1% and can measure temperature from 0°C to 50°C and humidity from 20% to 90% [13].

b) SENSOR FOR RAINDROP

The fundamental functioning principle of rain sensors is resistance testing, and the sensor has two distinct conduction printed leads on its entire surface. Water droplets that land on a sensor's surface complete the circuit, lowering the sensor's open circuit resistance and allowing the sensed data to be transferred to a controlling unit [9].

c) SENSOR FOR TEMPERATURE AND HUMIDITY

The electrodes on the surface of a moisture-holding substrate make up the DHT11 humidity sensor. The relative humidity has an impact on how much the resistance between the two electrodes changes. In order to function, humidity sensors must be able to detect changes in electrical currents or air temperature[13].

d) ARDUINO UNO BOARD

The DHT11 humidity sensor is made up of electrodes on a substrate that can hold moisture. The amount that the resistance between the two electrodes varies depends on the relative humidity. Humidity sensors need to be able to recognise changes in electrical currents or air temperature in order to work [13]. It has a 16 MHz quartz crystal, 6 analogue inputs, 14 digital input/output pins (of which 6 can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. Compatible with the microcontroller, it can be powered by a battery or an AC-to-DC adapter, or it can be connected to a computer via a USB cable to get started. With the UNO, you can experiment without being too concerned about making a mistake; in the worst situation, it can be quickly replaced for a low cost. Java was used to create the cross-platform Arduino Integrated Development Environment (IDE), which is available for Windows, Mac OS, and Linux. Writing in the java programming language is done with it. On the Arduino board, it is used to load and write programs[12].

e) AUTHENTICITY OF OPERABILITY

With the use of the item speak.com platform, the system was tested for functionality by checking the soil, temperature, and humidity factors. The figure shown makes it possible for the smart irrigation project to function [7].

CONCLUSION

We can improve the agriculture farm by integrating the WSN&IOT. These systems allow farmers to fix issues with irrigation, temperature, humidity, and other factors by monitoring the condition of the soil and the growth of the crop in it. The challenges faced by farmers can also be reduced with the help of the Internet of Things, wireless sensor networks communication, and the availability of sensors for agricultural parameters and microcontrollers can be easily interfaced with one another. A better communication path for the transfer of useful data between various nodes can also be achieved with the help of these technologies. Therefore, farmers can use a smartphone or computer to monitor their crops and control various agricultural equipment. These devices give users a wide range of application options that will help them advance both their expertise and crop productivity. Utilizing these methods will aid in boosting India's production of rice, wheat, maize, and other crops in the near future. With the aid of IoT, it is possible to monitor soil, temperature, humidity, and other factors, including yield and growing conditions [13].

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