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Enriched Agronomy Via Automized Sensing Element Network Stationed Using Iot

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ABSTRACT

There has been a rise in the number of governments across the world adopting the practise of meticulous cultivation in recent years, making it one of the most important uses of IoT in the agriculture business. In vast areas in particular, the use of and management systems presents a number of difficulties because of the reliance of older instruments on separate and connected solutions. Increased productivity with fewer human overseers is a major incentive for researchers to redirect their attention to the potential of automated farm activities made possible by IoT devices. Checking the inside and outside of the field for signs of pests and diseases and keeping an eye on how well the linear move irrigation system is working are both essential if you want to get the most out of your harvest as soon as possible. The steps required to establish variable-rate irrigation, including a layout of the infrastructure and specifics of a wifi sensitive unit system and network code for real-time in-field sensing, are detailed here. To get the information gathered by the network of sensors to the farmer, GSM technology is employed. This paper shows how a distributed wireless network may be set up with Arduino Microcontrollers, GSM, and moisture sensors to facilitate machine-driven irrigation at a low cost and with minimal learning curve. In arid and desert regions, several farming techniques may fail without careful water management. Distributed in-field sensor irrigation systems are becoming increasingly popular as a viable option for farmers interested in increasing yields and reducing water use through more precise control of irrigation at individual fields. The Internet of Things allows for more aggressive farming practises, which assist farmers boost output.

Keywords: Cultivation, Iot devices, GSM technology, Water management, Aggressive farming

INTRODUCTION

Researchers can now analyse a plethora of agricultural elements with the use of the rapidly growing wireless intuition element networks. Due to the uneven natural distribution of rain water, farmers have a hard time comprehending and managing the spread of water to cultivation fields across the entirety of the farm or in line with the needs of the crop. The vast majority of research favours a wireless sensing element network, which aggregates data from numerous sensors and transfers it to a centralised server using a wireless protocol. Several issues, including the assault of insects and pests, can be mitigated by spraying the crop with the appropriate bug powder and pesticides. Additionally, when the crop is ripe, it is susceptible to attacks from wild animals and birds. The risk of theft increases around harvest time. However, even after harvest, farmers still have difficulties with food storage. As a result, it's crucial to create a consolidated system that can guarantee productivity throughout the entire process, from planting to harvesting to post-harvest storage, to ensure that any and all issues are dealt with. Therefore, this work proposes a technique for keeping track of both general operational dominance and domain-specific competence, leading to greater flexibility. This research was conducted with the goal of improving economic development using IoT and automated processes. A wireless sensor network and gateway have been developed as a complement to the traditional stationary watchtower. Here, the approach's novel, wireless, and uncomplicated nature allows for higher spatial and temporal resolutions. Device to device communication has become increasingly common in recent years as a means through which machines (devices, objects, etc.) can connect to a server or cloud service and share data with one another.

Simply put, the document is organised as follows: In Section 2, we'll discuss the challenges and problems brought on by the IoT, and in Section 3, we'll take a look at the many cultivation techniques that utilise the IoT, discussing the pros and cons of each. Implementing the system is the focus of Section 4. Results from the system are shown in Section 5. Section 6 contains the paper's conclusion and bibliography.

LITERATURE SURVEY

Soil characteristics like pH, humidity, wetness, and temperature were proposed in a paper by ***Sonali et al. (2015).*** The motor pump in this system is controlled automatically, turning on and off in response to the soil's moisture content. The farmer does not know how the field is doing at the moment. It was proposed in a publication by ***Balaji et al. (2016***) that solar cells be used to convert sunlight into electricity for the system. There is no need for electricity with this setup.

Automatic irrigation was presented by ***Karan kansara et al. (2015),*** who suggested using humidity and temperature sensors to monitor soil conditions, with a microcontroller then adjusting watering accordingly. The GSM system will be used to contact the farmers. The soil's nutrient levels are not tracked by this system. A Zigbee-based smart wireless sensor network was proposed by ***Karnade et al. (2014)*** to track various environmental metrics. These nodes wirelessly transmit data to a centralised server, which then aggregates, saves, analyses, and sends the results to the client's mobile device, as well as any other interested parties. This technique does not predict weather or nutrient levels.

With the use of IoT, humidity, temperature, and pH sensors, ***Parameswaran et al. (2016)*** presented a smart drip irrigation system. In order to keep the server or local host up to date on the irrigation system, computers are used. Without connectivity to the internet, a farmer has no way of knowing how their fields are doing. A system for autonomous irrigation based on the Internet of Things was proposed ***by Reshma et al. (2016***), which makes use of wireless sensor networks and a variety of sensors to measure soil properties. Remote monitoring and management are made possible through a user-friendly web interface. There is no way to track the weather in this system.

MATERIALS NEEDED

Arduino UNO sensor

The Arduino Uno serves as the primary component of the system architecture schematic. Essentially, it is the engine at the system's core. Using the terrain's resistance is crucial to the Sensor design. Similar to the LM393 Driver, the LM393 Driver compares the sensor voltage to a fixed-value voltage source. This sensor's outcomes are consistent between the numbers 0 and 1023. When it comes to precipitation, a value of 0 denotes the wettest conditions, while a value of 1023 represents the driest. The LM35 is a Malaise Sensor, a type of precision IC, and its output voltage scales linearly with temperature. The LM35 operates effectively between -55 and +120 degrees Celsius. The LCD screen displays land prominence (Dry, Moist, and Soggy), pump interpretation, and pump prominence.Sensor authorizations for water availability have been finalised.

Once a sufficient amount of water has been gathered, the pump will turn itself off. The pump is powered by a circuit that previously powered the relays. Unlikely, the Water is Unreachable; a Cyclopedia will be Your Means of Transportation. A reed-magnet confined in a glassy water button, encircled by a swaying electromagnet. After being collected, watercomportments. TheArduino discredits the all-powerful Sensor. In the event that the soil is dry, the ensuing actions are carried out. Using this formula (1) , we can determine the maximum temperature.

$$X = \frac{(Sensor\ value)*1023.0}{5000}\ Temperature\ in\ celsius\ (\frac{X}{10}) \qquad (1)$$

GSM

Using GSM, the user is informed of the precise field status. Distributed data collection, delivery, and exploration in agricultural settings can benefit greatly from wireless sensor network technologies.

Microcontroller

The automatic distribution of water to plants or other cropland was a main motivation for this development, and a microcontroller-based system was developed to that end (Arduino Uno). Either hardware or software could make up part of the process.

IMPLEMENTATION METHODOLOGY

Soil wetness sensors, the subject of extensive study, report on the actual state of land humidity at any given time and place. Sprinkler frequency, start time, and runtime can be adjusted on some controllers. Thus, by focusing on the aforementioned challenges, we have established the new domain of Cultivation, namely, Automation in Cultivation. Wireless sensor network technology is well-suited for usage in the distributed data collecting and monitoring of potentially hazardous environments like a greenhouse or a crop field. The study's main goal is to advocate for the application of wireless sensor field of agriculture, which may cause a departure from some conventional agricultural techniques in rural areas. Conventional instrumentation, which relies on wired and discrete solutions, can be problematic for measurement and control systems, especially when applied to large regions. There is a current need for conservatory-based modern horticulture in many facets of Indian agriculture. This technology allows for the accurate regulation of plant humidity. This study discusses the planning, development, and evaluation of a fleeting, event-focused network for environmentally friendly soil moisture monitoring. Our solution's responsiveness to its surrounding conditions is a novel aspect of it. Measurements are taken more frequently during wet periods, when soil moisture is quickly changing, and less frequently during dry intervals, between rainfalls. Future improvements are recommended, and field trajectories representing the network's responsiveness, durability, and stability are shown and evaluated. Here, Arduino-controlled moisture sensors are dispersed around the field to collect data on the soil's moisture content. These measurements will be compared to the field's predetermined threshold moisture level, which will reveal whether or not watering is necessary. If you insert a GSM module and tell Arduino to turn it on or off, the relay will respond accordingly, turning on or off the syphon stimuli as needed. Water distribution systems can also be managed from a user's smartphone thanks to GSM. Through the GSM network's Wi-Fi service, a simple phone command can remotely activate or deactivate the tap. Because of this, our gadget is both powerful and user-friendly. The device requires no particular orders to operate, so farmers can use it with ease to water their crops. By controlling the quantity of water used for irrigation, we can protect the topsoil and reduce the amount of water that runs off into the drains. By watering the crops in the cultivated areas just when they need it, we can improve both water conservation and agricultural yield. The architecture of proposed model is shown in below fig1

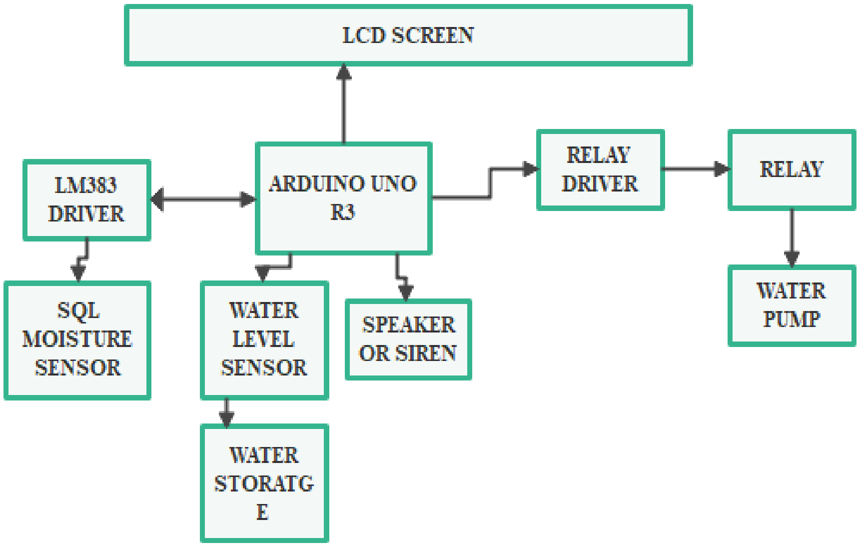

Fig 1: Architecture of proposed model

SIMULATION RESULTS

A. Analysis Findings for a Number of Crops

When compared to other ways, our process's simple procedures and low-cost equipment have a major impact. One of the unique aspects of our suggested method is that it may be used to calculate when water should be supplied to crop roots in order to maximize both water efficiency and profit.

Check out Table 1 for a breakdown of the water and moisture levels needed by different crops. Figure 2 depicts the relative humidity of a variety of crops, along with their ideal watering and temperature needs.

Table 1 Water analysis table for various crops and their moisture levels

Crop type	Level of water needed(mm)	Optimum temperature (F)	Level of moisture (%)
Corn	550-750	96	15.5
Bean	350-550	76	16
Maize	550-850	78	25
Tomato	650-850	86	11
Onion	360-780	32	11
Rice	950-3000	80	20
wheat	500-900	75	12

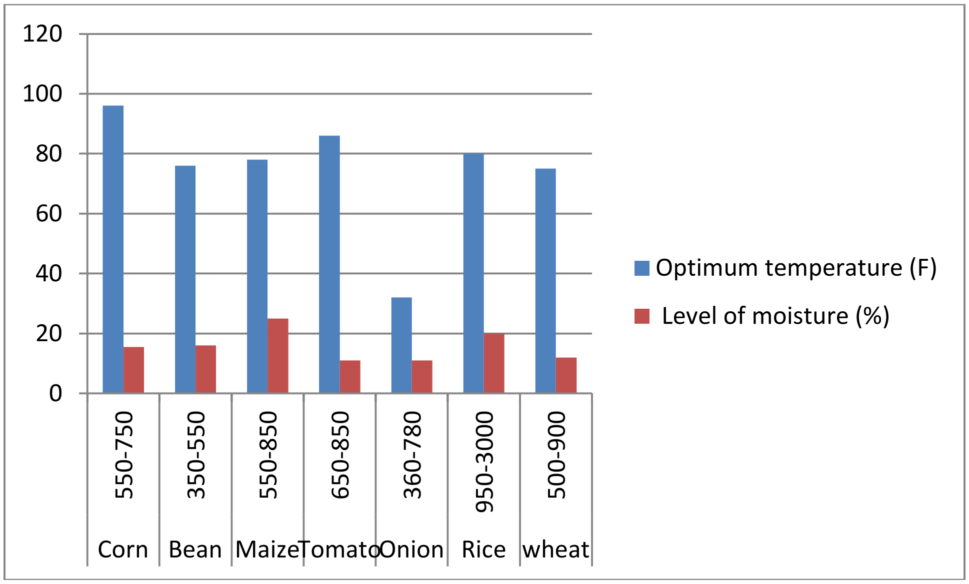

Figure 2: moisture levels, water needs, and ideal temperatures for growing a wide range of crops

B. Water Content Volume Estimation in Soil

Most sensors for measuring soil moisture rely on inferences about the soil's nonconductor persistence (soil substance constant) to determine the soil's volumetric water content. An analogy to the ability of dirt to expel electrical current is the insulator persistent. As the soil's water content increases, the soil's material constant increases as well. This reaction occurs because water has a far higher dielectric constant than other soil devices, including air. Therefore, the water content can be roughly estimated using the dimension of the non-insulating monochromatic. The outputsensor provides a signal based on the soil's moisture content and the applied voltage. For proper signal transmission, it must be bent up to an analogue pin in track. By using a monochromatic function, soil moisture sensors can reliably determine the soil's moisture content (VWC = Volumetric Water Contented). As the universally accepted proxy for soil and material moisture, this soil physical property varies significantly with water content and can be relied upon in all parts of the world. At 80 MHz, the capacitive frequency province technique does not disturb the conductor permittivity.

The results of the soil moisture sensor's testing in different conditions, such as dry air, water, wet soil, and soil that is too dry to support life, are graphically shown. We explain the moisture content ranges such that a graphical representation of the volumetric research can be generated with minimal effort. The output signal might be analogue, making the range of possible values from 0 to 1023. There is a correlation between soil moisture and the sensor's output voltage.

If the ground is, the output voltage falls when it's humid and rises when it's dry. Between the hours 825 and 833, the soil moisture sensor was submerged in water. Soil moisture sensors exposed to air showed a value spectrum of 463 190 1023. Wet soil is indicated by a reading between 604 and 921. The range of the soil moisture sensor is given in fig. 3; a reading of 972 indicates moist soil, while a reading of 1015 indicates absolutely dry soil.

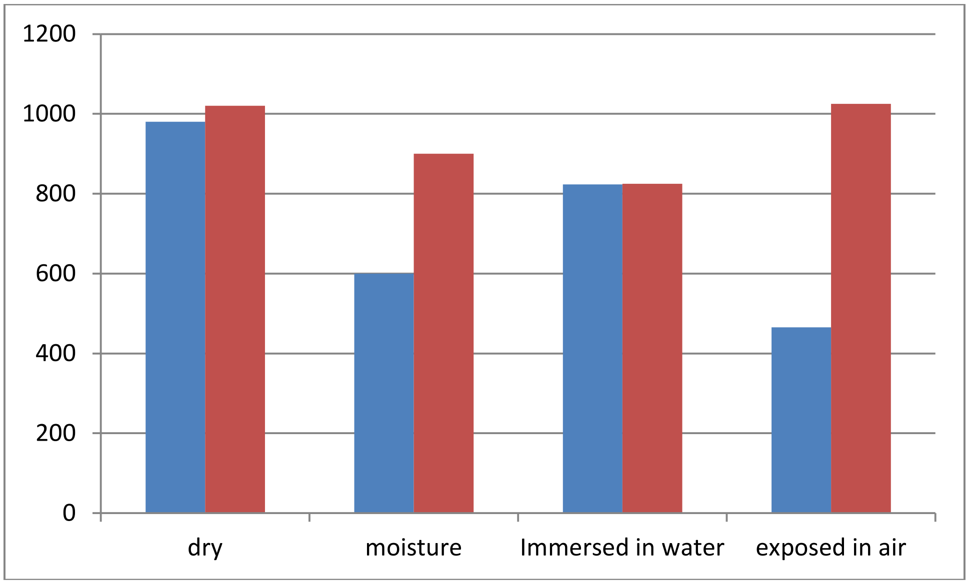

Fig 3: Readings taken from several soil moisture sensors in various methods

Either the percentage of water present relative to the unit weight of the soil sample, or the percentage of available water relative to the total volume of the soil example, can be used to represent the soil's moisture content. The water mass, which is required for calculating any of these ratios for a specific soil sample, can be obtained by drying the soil to a consistent weight and measuring its mass before and after drying. The water physique is the ratio of the wet to the oven-dry weight of a sample (or weight). The dry soil model relies on the dehydrated soil imitation, which retains its weight after baking in an oven at 100 C to 110 C. (105 oC is typical).It appears that can identify a potential drought crisis quite early on. And this warning can be disseminated to all adjacent farms so they can take preventative action before it's too late. Possible actions include switching to a different water provider or switching to a method of water conservation, such as water harvesting or utilising wastewater on crops instead of letting it go to waste. Our primary goal of doing good for the community and affecting change will be realised if we are successful in steering our country along this path. Interfacing new types of sensors to the planned sensor network, with the output being saved in the cloud, will be the primary focus of our future work.

CONCLUSION

An integral aspect of the Internet of Things, a sensor network facilitates communication with physical things. In this initiative, we are utilising the sensor network strategy that connects agriculture to the Internet of Things. Accuracy is enhanced since the link establishes communication channels between agronomists and farms. With the goal of better managing people's production and production and living and improving the interaction between human and environment, IoT applications have been expanded to a wide range of fields. Water scarcity due to drought is one of the most catastrophic problems humanity has ever encountered. We can therefore avoid the destruction caused by droughts if we are able to foresee the situation well in advance. Therefore, the project as outlined has great potential. Here, a moisture sensor is employed that has the additional utility of forewarning of an impending drought. Due to the high cost of personnel in the current system, real-time observation of agricultural fields is not currently being done; however, thanks to the Internet of Things, real-time monitoring of cultivation fields is now possible, and the process can be observed from anywhere. Therefore, if the sensor is extended to a given height, the resulting temperature distribution will be based on the boiling point of water rather than taking into account the soil's chemical and physical properties. Wet mass basis, also known as the ratio of water body to wet soil body (w), is used to express the level of moisture content in the soil.

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