A Review on Unmanned Crop Detection Techniques

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Abstract: The programmed water system frameworks are received as of late to provide support to the agriculturists in turn reducing the manpower and improving cost effective techniques. In this paper, a detailed survey is done analysing the crop detection techniques which are in existence. This paper provides an insight study on pH level monitoring in the soil, water and soil nutrients management techniques, temperature and humidity measurement, surveillance of crop field and other smart irrigation techniques utilized for monitoring the farmland. This paper discusses about the effective methodology with enhanced technique that could be implemented in future to attain better performance and user-friendly for the farmers.

Keywords: pH monitoring, temperature measurement, humidity measurement, detection techniques

1. Introduction

In India, agribusiness assumes a significant part for advancement in food creation. The water system is utilized in agribusiness field. Web of Things (IoT) is an achievement in the progress of headway. The IoT is a multidisciplinary imagined that merges a wide degree a few turns of events, application spaces and operational procedures, and so forth The progressing IoT research rehearses are made towards the definition and plan of rules and open models which is still have the issues requiring a general comprehension before the last strategy.

'Internet of Things' is all over castoff in relating gadgets and social event insights. Horticulture is perhaps the most water-devouring exercises. The framework utilizes data from soil dampness sensors to inundate soil which assists with forestalling over water system or under water system of soil accordingly dodging crop harm. The homestead proprietor can screen the cycle online through a site. Remote observing of field diminishes the human force and it likewise permits client to see exact changes in harvest yield. As the framework is totally robotized, it doesn't need total consideration of rancher's without fail. The robotized adroit water framework in the field of development improves the field creation furthermore staying away from the wastage of water thought about. The relapse calculation helps in anticipating the measure of water needed for water system. This encourages more productive, additionally limits the expense of arrangement and systems of support. There can be extensive advancement in cultivating with the utilization of IoT and computerization.

The target of this paper is planning to defeat the difficulties and provide a effective technique, to monitor the whole system in microcontrol base also, can be worked from far off area through remote
transmission so there is no compelling reason to worry about water system timing according to harvest or soil condition. Soil nutrients and water flow monitoring systems are reviewed in detail. This paper analysis the soil moisture, temperature, air moisture, pH level monitoring techniques adopted by farmers in recent days. The automated technology of irrigation and the human intervention are reviewed in the following sections.

2. Survey on existing technologies

In recent times various researches are carried out relating to the development and implementation of agriculture supportive modules. Thus pH measurement are used for the pH level of the soil, water flow meters are utilized for the water flow management to the farmland, Direct soil EC tester component are used to measure the soil nutrients, PIR sensors are used to detect the motion of animals in the agricultural land, Solar panels are implemented for enhanced solar power smart irrigation, Raspberry pi and cameras are used for surveillance of the agricultural land, DHT 11 sensors are implemented to monitor the temperature and humidity of atmosphere, Soil moisture sensors are used to measure the moisture level of the soil in the farmland. All the modules are implemented separately where else there is no particular availability of any single module or device to monitor the entire factors. In order to overcome this drawback and the investigated research gap can be rectified by adopting the proposed system discussed in this article.

2.1. pH Measurement

Dr. M. Newline Rajkumar et.al implemented IoT Based technology to increase plant growth and to water management. Mechanized control with the most recent electronic innovation utilizing microcontroller which turns the siphoning engine on or off on unmistakable the wetness setting of the earth and GSM telephone lines is utilized in the wake of assessing the temperature, dampness, and soil [1]. Sujit Thakare and P.H.Bhagat planned an Arduino based controlled water system framework utilizing a WiFi module. This framework identifies the dampness content in the dirt, pH level of soil, and temperature. The drenched quality level of the soil is detected and as per that water system should be possible. The benefit of the framework is that the proprietor can distantly screen their homestead on IoT [2]. Nor Adni Mat Leh et.al utilized IoT with Arduino Mega 2560. The extent of this examination is centered around cultivating harvests and planting. The pH sensor is utilized to gauge the pH appraisal of water. The temperature sensor is used to evaluate the sogginess and clamminess of the earth [3].

![Soil monitoring system diagram]

**Figure 1.** Soil monitoring system[3]
2.2. Water flow management

Anusha Kumar et al. developed a regression algorithm on the brilliant water system framework. It also recognizes the water substance in the earth and helps in the brilliant usage of water assets. This project additionally quantifies the dampness content in the dirt and measures the water drops and water course through lines [4]. Shweta and Dhanashri proposed a framework dependent on IoT that utilizes continuous data sources. A shrewd ranch water system framework is observed by the utilization of an android application. Zigbee is utilized to impart between the sensor hubs and the base station [5].

![Figure 2. Water management system](5)

Shiv Shankar Singh applied IoT technology. The downpour sensor is utilized for controlling the water siphon and the soil sogginess sensor is used to survey the tenacity level of the earth. The storm sensor is likewise embedded to distinguish the proportion of the quantity of raindrops. The water siphon is controlled remotely by the android device through a web page via a Wi-Fi module [6].

2.3. Analysis of soil nutrients

Amogh Jayaraj Rau et al. proposed a shrewd water system framework utilizing IoT to recognize the supplements and check the plant growth and detect diseases. MATLAB based image processing is used to identify rice plant deficiency. An android application is used to monitor the weather condition. This helps to overcome the issues in water management and weather monitoring systems [7].

![Figure 3. Soil nutrients analysis system](7)
Prakhar Srivastava et.al demonstrated the productive utilization of the Internet of Things. This monitors soil moisture, temperature level, pH level, what's more, founded on the sensors, Arduino drives the servo engine and siphon. This sent data is checked and constrained by utilizing IoT [8].

![Smart irrigation system](image)

**Figure 4. Smart irrigation system[8]**

### 2.4. Motion detection
Atchaya. V et.al have proposed methods to prevent the land from wild animal attacks. This paper proposes a strategy to screen farming area and some sensors are used to emit ultrasound which distracts the animals. A fire sensor is implanted to reduce the risk of forest fire in agricultural lands. The IoT is used to intimate the animal entry and forest fire [9].

### 2.5. Solar powered smart irrigation
S. Harishankar et.al proposed a framework comprises of a sunlight based controlled water siphon alongside a programmed water stream control utilizing a dampness sensor. This framework monitors power by diminishing the use of lattice force and saves water by lessening water misfortunes [10].

### 2.6. Surveillance of crop field
Prathibha S.R et.al applied IoT technology which is equipped for giving data and their agrarian fields. This remembers checking temperature and dampness for the farming field through sensors utilizing a solitary CC3200 chip. The camera is interfaced with CC3200 to get pictures and send those pictures by Wi-Fi modules [11]. R. Nageswara Rao and B.Sridhar used Raspberry Pi with IoT which monitors crop growth. This paper proposes methods to minimize water consumption in crop development. The output is recorded in the android application. DHT11 is utilized to gauge the dampness and temperature of the dirt. The ph sensor is utilized to measures the pH level of water [12]. Ashwini B V interfaced IoT and Arduino. This paper proposed the method for the surveillance of the crop field. This paper also proposed methods for measuring the soil moisture by a soil moisture sensor. The temperature and stickiness are estimated by utilizing DHT11. The Bluetooth module is used to record the output [13].
2.7. Temperature and humidity measurement

Neha and Vishal oversaw IoT to evaluate the limits like surrounding temperature, dampness, and soil water content. This paper presents a yield checking and programmed water system framework. The output is recorded through the HTTP server (Statistical view) and the MQTT application [14]. Amarendra Goap et.al presented an open-source development based sharp structure to anticipate the water system necessity utilizing the boundaries like soil moistness, soil temperature, and natural conditions from the web. The paper portrays the structure and looks at in detail the planning results. They use the ZigBee network to record the output [15]. Wenju Zhao et.al proposed a LoRa based sharp water structure framework. The water system focus point is made out of the LoRa correspondence Module, solenoid valve, and hydroelectric generator. This middle sends information to the cloud. The system proposed is used to consider and analyze the data got by various sensors. Various sensors are utilized to quantify temperature, moistness, dampness, and light. The output can be monitored by remote (Android) [16]. Subhashree Ghosh et.al focused on drip irrigation. The monitoring system was designed and implanted with sensors like temperature, dampness, and soil dampness. This framework can screen the farm conditions includes the water essentials indirectly on the android application [18]. Mohamed Esmail Karar et.al implemented IoT technology to monitor the agricultural field and unmanned aerial vehicles. The monitoring system was designed and implanted with sensors like temperature, dampness, and soil dampness. This framework can screen the farm conditions includes the water essentials indirectly on the android application [18]. K.Kannan et.al proposed a framework utilizing IOT with a PIC microcontroller. The temperature is measured by the LM35. The dirt dampness sensor is utilized for estimating the dampness content in the dirt. GSM module is utilized to record the yield. The step-down transformer is used to reduce the 230 V to 24V [19].

2.8. Soil moisture measurement

K.K Namala et.al focused on methods to control water wastage and irrigation in flowering plants. Raspberry Pi is utilized in the plan of the model in making the framework minimized and practical. The dampness level of the dirt is estimated by sensors, switches, and relays that control the solenoid valve to the requirement [20].

![Function of solenoid valve](image)

**Figure 5.** Function of solenoid valve [20].
Srishti Rawal proposed a robotized water system framework that screens and keeps up the ideal soil dampness content by means of programmed watering. The arrangement utilizes soil dampness sensors to gauge the specific dampness level. IoT is utilized to keep the rancher refreshed about the situation with sprinklers. The sensor readings are communicated to a thing talk channel to produce charts for investigation [21]. Hamza BENYEZZA et.al proposed a structure on IoT stage dependent on ThingSpeak and Arduino is developed and tested. The control of the irrigation can be done by using a pc or smartphone. In this paper, the water parameter is monitored and reduces the use of water [22].

Ahmed Abdelmoamen Ahmed et.al used IoT technology which is used in the automation process of irrigation. Microsoft Azure is used for storing output. The different sensors are utilized to gauge the temperature of the air, soil dampness, and relative moistness. Android device is used to analyze the data and sends a command to take necessary actions [23]. Meghana Gupta Arakere et.al worked with the internet of things to control and observe the growth of crops. The IoT platform and solenoid valve are used to control the water flow through pipes. This paper also proposes the methods of surveillance for the crops. The output can be recorded using an android application [24]. G.Ravi Kumar et.al proposed methods to screen the dirt dampness content during its dry and wet conditions with the guide of a dampness sensor circuit, compute the comparing relative moistness and flood it dependent on its inclination utilizing a PC based LabVIEW framework, NI myRIO, IoT, GSM and a programmed water bay arrangement which can likewise screen and record temperature, stickiness, and daylight, which is continually adjusted and can be controlled in future to streamline these assets so the plant development and yield is augmented [25].

3. Proposed method

The major objective is to give a programmed water system framework in this way saving time, cash and labor. The conventional ranch land water system procedures require manual intercession. With the mechanized innovation of water system, the human mediation can be limited. Different sensors have been utilized for estimating boundaries like water stream, temperature, moistness, soil dampness and pH esteems. Shading sensors are utilized to anticipate crop sicknesses. Soil dampness sensor is utilized to gauge the dampness of soil. The DHT sensor is utilized to quantify temperature and dampness level of soil. pH sensor is utilized to gauge the pH evaluations of the earth. Water stream sensor is utilized to gauge the development of water through line. The yield can be checked by using an android application. Consequently clients can undoubtedly screen the boundaries and yields distantly. The framework will generally contribute in development in the yield of the clients and in this way diminishes the manual mediation.
In existing technique, boundaries like pH, temperature, mugginess, soil dampness, stream of water are estimated separately. All the modules are actualized independently what other place there is no specific accessibility of any single module or gadget to screen the whole factors. In this proposed framework, the above given boundaries are estimated utilizing different sensors like stream meter, DHT 11, soil dampness sensor, pH sensor which all are consolidated in a solitary module. To beat this disadvantage and the examined research hole can be corrected by embracing the proposed framework as shown in Figure 6.

4. Overall Inferences
pH level can be measured by Arduino microcontroller and Wi-Fi module using pH sensor. The motion can be detected by Arduino and web cam using PIR sensor. For surveillance, IoT, Zigbee, Bluetooth and cloud - Webpage technologies are used. Water flow can be monitored by Raspberry Pi, BOLT IoT module, Zigbee technologies using Water flow sensor. For the better achievement, a system can be implemented with ESP32 microcontroller which has integrated Wi-Fi and output can be monitored using android application (MQTT) also crop diseases can be detected using colour sensors. This method will be effective to reduce the human interventions and monitor the plant growth.

5. Conclusions
The existing technologies utilized for monitoring the pH level, temperature and mugginess level, soil dampness level, water stream, soil supplements, motion detection, surveillance of crop field, solar power smart irrigation are reviewed in detail. The complete system device module to detect and monitor the farmland is lagging. Thus from the review investigations an efficient unmanned crop detection and monitoring module can be developed and implemented in future, providing a supportive mechanism for the agriculturalist to reduce the manpower to monitor the farmland using a cost effective system.

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