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FIELD MONITORING SYSTEM

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Abstract: Indian agriculture is diverse, ranging from destitute farm settlements to technologically advanced farms. Farmers will be able to tackle a number of problems by promoting the use of current information technology in agriculture. Having inaccurate information and communicating poorly can result in loss of production. Crop growth refers to the growth of grain seedlings and the state and tendency of their growth. In the previous two decades, it has become one of the most essential parts of agricultural remote sensing. Before harvesting, a large-scale evaluation of crop growth conditions might be useful for field management and give crucial information for early crop yield estimation. Both real-time monitoring and cultivation process monitoring are systems that provide an intelligent monitoring platform framework and system structure for IoT-based agro ecosystems.

Keywords: Internet of Things, Arduino UNO, Crop monitoring, Image processing, Crop growth prediction.

I. INTRODUCTION

As the globe moves toward new technology and applications, agriculture must follow behind. A lot of research is done in the field of agriculture. The majority of projects indicate the usage of a wireless sensor network to gather data from various sensors installed at various nodes and transfer it through wireless protocol. The gathered data provides information on numerous environmental conditions. Monitoring environmental variables is not a full strategy for increasing agricultural productivity. There are many other factors that can significantly reduce productivity. Therefore, to overcome these problems, we need to implement automation in agriculture.

II. OBJECTIVE

The main objective of our project is to monitor the field whether water is to be supplied or not with the help of sensors. In addition to that, Crop growth is also predicted using Image processing.

III. METHODOLOGY

Crop Monitoring

This system consists of sensors like moisture sensor, Temperature sensor, ultrasonic sensor and rain sensor. Moisture sensor is used to detect the water content present in the soil. Basically, the fork-shaped probe works as a variable resistor (like a potentiometer) whose resistance varies depending on soil moisture content. We can measure the moisture level by measuring the output voltage of the sensor according to the resistance.

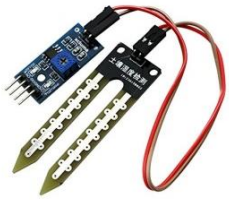

Fig 1 Moisture Sensor

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Fig. 2 Temperature Sensor

Temperature sensor is used to measure the temperature in the environment. This sensor consists of a humidity sensor, an NTC temperature sensor (or thermistor), and an IC. Humidity is measured using the humidity sensor, which consists of two electrodes with a moisture-holding substrate between them. Thus, with the change in humidity, the resistance between electrodes or the conductivity of the substrate changes. It is measured and processed by an IC. Thermistor is a variable resistor whose resistance changes with temperature. Ultrasonic sensor is used to measure the water level in the well. It emits ultrasonic sound waves and converts the reflected signals into electrical signals to determine the distance between two objects.

Fig. 3 Ultrasonic Sensor

Fig. 4 Rain Sensor

Rain sensor is used to detect the rain. Copper traces are mounted on the sensing pad, each of which acts like a variable resistor or potentiometer. Depending on the amount of water that falls on the surface, the sensing pad resistance will change. Hence, the resistance is inversely proportional to the volume of water. The conductivity is better and there is less resistance when there is more water on the sensing pad. In the same way, if the surface pad has little water, the conductivity is poor and the resistance is high. The sensor output is therefore determined primarily by the resistance

Fig 5 Water Motor

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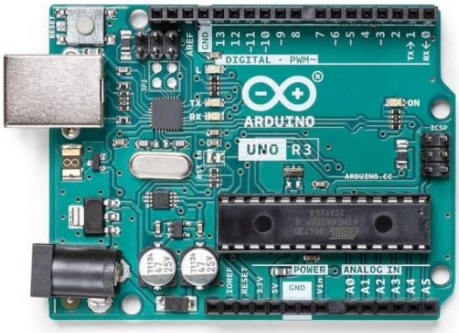

Fig 6 Arduino

Servo motor is used to extract the excess amount of water present in the field. Water motor is used to pump water into the field. To monitor the environmental factors such as temperature and moisture, Coding will be dumbed to the Arduino using the cable.

Fig 7 Servo Motor

When temperature exceeds the normal value and moisture content is low, then the ultrasonic sensor senses the water level in the well. If water is detected, then the motor will pump the water and supply to the agricultural land. For all other conditions, the water motor will be in OFF state[7]. In addition to that, When rain is detected, servo motor extracts the excess amount of water and the excess water will be sent to the well[1]. All the above results will be displayed on the LCD and Node MCU is used to connect objects and transfer data using Wi-fi protocol.

Fig 8 Liquid Crystal Display

Fig 9 Node MCU

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The results can also be seen through cayenne application which will update you with the current situation in the agricultural field.

Crop Growth prediction

Crop growth is predicted using Image processing by taking images whether the crop is ready to harvest or not. There are two phases namely Training and Testing. In training phase, both growing crop image and the Harvesting crop image will be preprocessed, convolved and trained. In the testing phase, the captured image will be sent and compares with the training phase. If it satisfies all the conditions, "Ready to Harvest "message will be displayed on the LCD, else "Not yet ready" will be displayed.

Fig 10 Growing stage of paddy crop

Fig 11 Harvesting stage of paddy crop

IV. BLOCK DIAGRAM

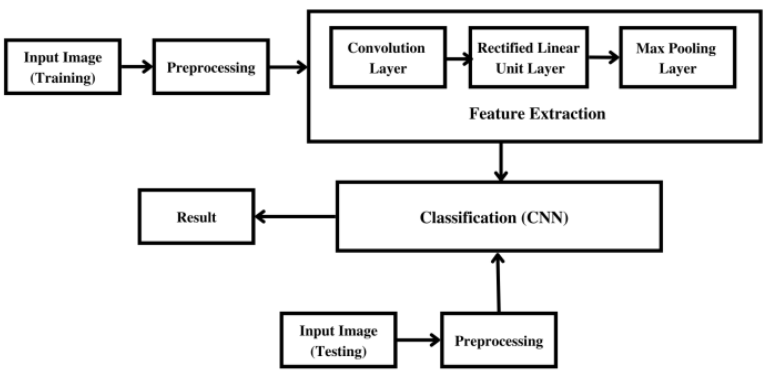

Fig 12 Block diagram of crop growth prediction

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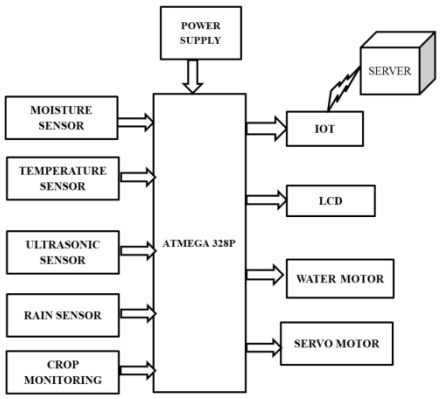

Fig 13 Block diagram of crop monitoring system

V. RESULTS

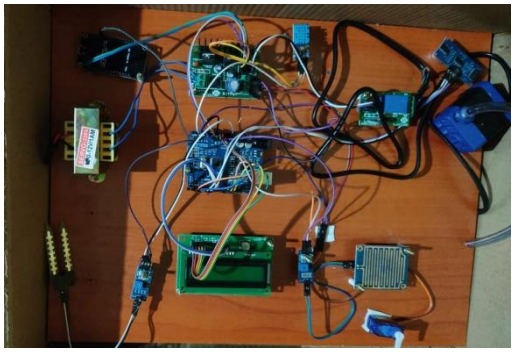

Fig 14 Hardware connection of crop monitoring system

As depicted in the above figure, the proposed farming system was designed and implemented. It consists of a moisture sensor, a temperature sensor, a rain sensor, and an ultrasonic sensor. A moisture sensor and a temperature sensor detect moisture and temperature levels in the crop field. This assists in irrigating the field in accordance with the water requirement. Instructions are given through IOT to the water motor so that it can water the field. The water level is monitored by an ultrasonic sensor and the rain is sensed by a rain sensor. If rain is detected in the field, excess amount of water has to be removed, so the servo motor is turned ON to do so. Measured parameters are transferred to IOT. These can be monitored remotely through Cayenne.In addition to that growth of the crop is also monitored using Image processing. The below image depicts that the captured image is ready to harvest. All the above results are displayed on the LCD.

Fig 15 Result of Crop growth prediction

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VI. CONCLUSION

Farmers may benefit greatly from an IoT-based smart agriculture system. Depending on the climatic conditions in a region, threshold values for climatic conditions like humidity, temperature, moisture can be established. Based on sensed real-time data from fields and from the weather records, this system generates irrigation schedules to determine if irrigation is needed. That system can also recommend whether farmers should irrigate. Crop health monitoring and crop growth is an important part of sustainable agriculture. Growing crops is very hard to observe manually. It requires significantly more work, expertise, knowledge and even high processing time. Therefore, crop growth is predicted by image processing. The study describes how to design and implement methods for evaluating crop growth such as image acquisition, image pre-processing, image segmentation, feature extraction and classifying images. Various algorithms for segmenting and extracting characteristics are included in the study.

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