IoT Based Crop Loss Prediction, Assessment and Evidence Collection

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Abstract— Agricultural zone being the backbone of the Indian economy justifies security. Security not in terms of capitals only but also agricultural yields needs security and guard at very early stage, like safeguard from assaults of rodents or insects, in grounds or grain stores. Such tasks should also be taken into consideration. Security systems which are present used now a day are not smart enough to provide real time notification after recognising the delinquent. The integration of outmoded approach with modern technologies as Internet of Things and Wireless Sensor Networks can lead to agricultural modernization. Keeping this situation in our mind we have implemented, verified and estimated an 'Internet of Things' based device which is capable of analysing the sensed information and then transmitting it to the user. This scheme can be controlled and supervised from remote location and it can be employed in agricultural fields, grain stores and cold stores for security tenacity.

Keywords: IoT, Wireless Sensor Network, Smart Agriculture

I. INTRODUCTION

Agriculture is considered as the source of life for the human lives as it is the main source of food and other raw materials. It plays a very essential part in the growth of country's economy. It also Subsidise supplementary Service chances to the people. Inappropriately many farmers still use the same old traditional.

Methods of farming which results in the low yield of crops. But however automation had been employed and human beings had been replaced by automatic machineries. Hence there is a need to appliance the modern science and technology in the agriculture sector for cumulative the yield. Crop loss can be summarized as the difference between the attainable yield from the healthy crop and that obtained from the disease crop and is expressed as percentage mostly in terms of money.

Various attempts have been made to utilise damaged assessment data for estimation of loss. However such conversion is not easy, there is no straight forward way to determine the amount of loss. In this project we can propose a model which helps to gather the evidence of the crop loss based on the reports composed. In this model, the insurance company or government or public sectors will indicate how much amount of money should be appealed by the farmers.

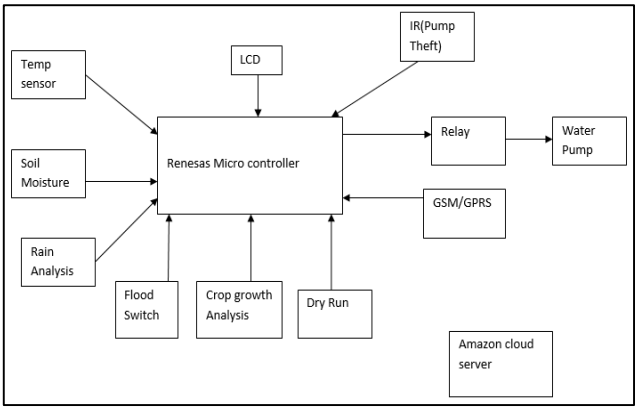
II. PROPOSED SYSTEM

The proposed system object is to make agriculture smart using automation and IOT technologies. It also identifies dry run state of water pump and send alert message to the farmer. Evidence collected based on the information is stored in the cloud through GPRS.

III. SYSTEM DESIGN

Many embedded systems have considerably different designs according to their roles and utilities. In this project design, structured modular design concept is accepted and the system is primarily composed of a single microcontroller, LCD, GSM/GPRS, Dry run sensor, water pump .The microcontroller placed at the centre of the block diagram forms the control unit of the whole project. Embedded inside the microcontroller is a program that aids the microcontroller to take action based on the inputs given. Microcontroller will monitor the status of the water pump and it will apprise on the cloud server. The dry run sensor is used to perceive no flow of water through pipe when motor is working. Dry run sensor will be placed at end of pipe. When dry run is detected sensor will send signal to the controller and the microcontroller will send attentive message to farmer through GSM also it will inform on server through GPRS. The IR sensor will continuously observe the pump if any pump theft occurs, it will detect and send the signal to microcontroller and it will send the alert message to farmer via GSM. Soil moisture sensor will detect the land status if its dry it automatically turn on pump in auto mode but in case of manual mode farmer only decide to pump on and off. In crop growth analysis we use the ultrasonic sensor to calculate the height of crop growth. Crop may be spoiled due to some diseases, and we can't explain this on the basis of crop height. Hence, we implement a method of image processing technique using SVM classifier. We have extracted some of the features to show whether the crop is healthy or diseased one. The entire things (evidence for loses) report will be stored in IOT through GPRS based on this reports the insurance company will decide the how much amount of money to claim the farmers and what are the main aspects crop loss.

IV. BLOCK DIAGRAM



V. WORKING

A prototype module will be implemented for the project. It comprises individual PCB boards for all interfaces according

to the block diagram. Every PCB will be inter-connected with jumper wires.

A. Temperature Sensor

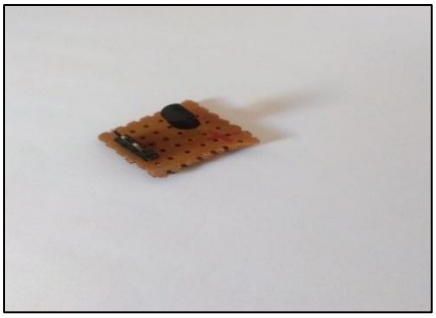


Fig. 1: Temperature Sensor (LM35)

When the temperature of the device exceeds a user-defined temperature HIGH then the output VOUT is active. The output will rests active until the temperature drops below user defined temperature LOW. Based on the temperature the farmer can decide which crops can grow during that period of time. The temperature information will be displayed on the LCD through microcontroller

B. Pump Theft

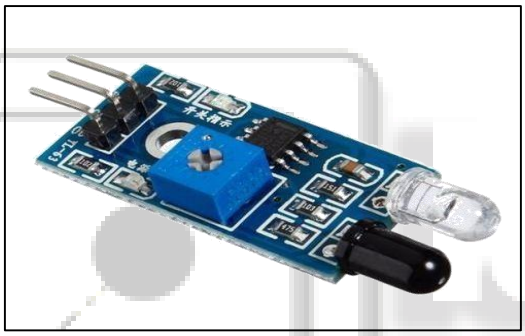


Fig. 2: Infrared sensor

The IR Sensor will be placed near the pump, the work of sensor is to sense the signal if any person tries to displaces the pump. An alert message will be send to the farmer through GSM as "pump theft detect" and it is displayed on the LCD. For every time of displacement, we consider the loss count to be 5. If pump theft repeats again the loss count will be increased accordingly to the count of 5.

C. Rain Analysis

Fig. 3: Rain sensor

We use rain sensor for rain analysis work. According to our project rain analysis is referred to sense whether the rain has occurred low, medium, or high. Some threshold value will be given for every level. If the value is less than 120 then it is considered to be low rain, if the value lies between 120 to 150 then it is considered to be medium rain, if the value exceeds 150 then it is heavy rain. These messages will be displayed will be LCD as "LOW","MEDIUM","HIGH". Due to heavy rain the crop might be lost. This loss is measured by giving a value of 5 to calculate the loss.

D. Soil Moisture

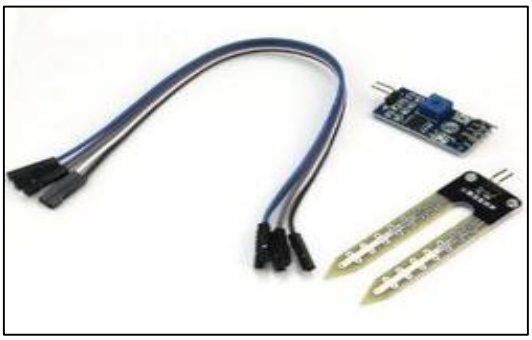


Fig. 4: Soil Moisture sensor

Soil moisture sensor will detect the land status whether it is wet or dry, if it is dry it automatically turn on pump. This can be done in two ways, manual mode and automatic mode. We have incorporated the automatic mode in our model. Farmer can also choose manual mode such that he can manually on and off the pump whenever required. The threshold value is 300, if the sensor senses less than threshold value then it will display as "land wet" if the value show more than 300 then it displays as "land dry".

E. Dry Run

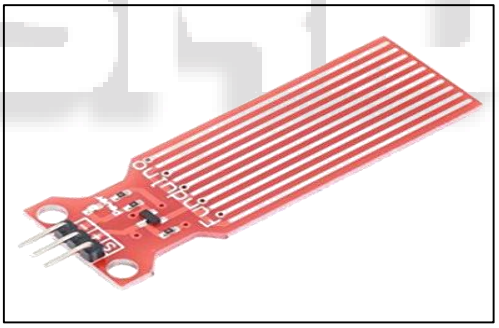


Fig. 5: Dry Run sensor

The Dry Run Sensor will be placed at the outlet of the water pipe. When the water pump gets on the dry check is done with the help of sensor. If the water does not flow through the pipe within five counts then it will display a message as "dry check" then the water pump will gets off automatically. So that the motor will not be damaged.

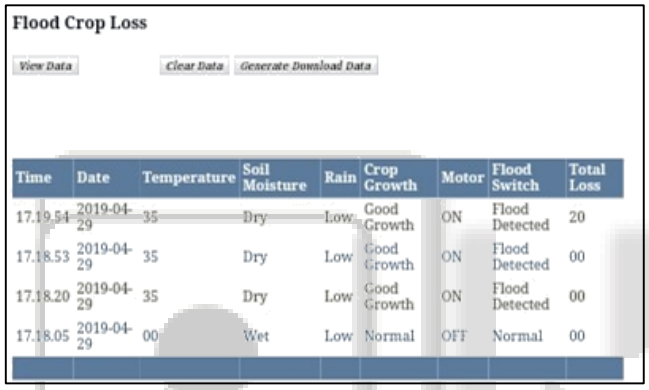
F. Crop Growth Analysis

Fig. 6: Ultra Sonic sensor

We are using the ultrasonic sensor to measure the height of crop growth, the digital value 0 and 1 is assumed for the evaluating the growth of the crop. If the value is displayed as "G0" then there is no proper growth of crop, if it display as "G1" then it is said to be normal growth of the crop. The loss count of 5 will be taken into consideration when there is no proper growth even at the final stage of the crop. Crop may be spoiled due to some diseases, and we can't explain this on the basis of crop height. Hence, we implement a method of image processing technique using SVM classifier. We have extracted some of the features to show whether the crop is healthy or diseased one. Some of them are texture feature and color feature extraction. Finally the information will be sent to the server through GPRS and it will be stored in the cloud.

VI. Result

The information gathered from sensors are stored in the cloud, which can be used as evidence for claiming refund amount from insurance company or any private sectors. The collected information is as shown in the table.


Flood Crop Loss

View Data | Clear Data | Generate Download Data

Time	Date	Temperature	Soil Moisture	Rain	Crop Growth	Motor	Flood Switch	Total Loss
17.19.54	2019-04-29	35	Dry	Low	Good Growth	ON	Flood Detected	20
17.18.53	2019-04-29	35	Dry	Low	Good Growth	ON	Flood Detected	00
17.18.20	2019-04-29	35	Dry	Low	Good Growth	ON	Flood Detected	00
17.18.05	2019-04-29	00	Wet	Low	Normal	OFF	Normal	00

VII. Advantages and Disadvantages

A. *Advantages*

- It saves time.
- Manual operation has been condensed to main extent.
- A reduced amount of man power required.
- Easy to use.
- Proficient and reliable.
- Receiving all types of government profits will be easy.
- Vendor or Suppliers materials will be verified in better way.
- Government can easily upkeep for the suffered farmers.

B. *Disadvantages*

- System failure may occur due to tampering
- System failure may also take place in the absence of power.

VIII. Applications

- This can be used in agriculture fields which is very helpful and useful for the farmers.
- Similar methods can be implemented for cold storage departments.
- All APMC yards can be implemented with this method.
- Evidence collection system can be implemented in vehicles to solve insurance claim issues.

IX. Future Scope

To make this project as user friendly and robust, we need to make it dense and cost effective. Going further, most of the units can be embedded along with the controller on a single board with change in technology, thereby reducing the size of the system.

X. Conclusion

The project is designed using structured modelling and is able to provide the desired results. It can be fruitfully implemented as a Real Time system with certain modifications. Science is discovering or creating major revolution in various fields, and hence technology keeps changing from time to time. Going superfluous, most of the units can be fabricated on a single along with microprocessor thus making the system compact thereby making the existing system more effective. To make the system applicable for real time purposes components with better choice needs to be implemented.

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