Smart Forming System based on IoT

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***Abstract**: Farming is a major input sector for economic development of any country. Livelihood of majority of population of the country like India depends on agriculture. In this project, we proposed to develop a Smart Farming System that uses advantages of cutting edge technologies such as IoT and Wireless Sensor Network to help farmers enhance the way farming is done. Using sensors like temperature, humidity, soil moisture etc. are used to get information about the field and help farmers to take precise decisions on insights and recommendations based on the collected data. The farmers are precisely two types, educated and uneducated. So, for the farmers who are uneducated, a message is sent to the mobile phone, so that he can get the info and he can supervise the field even by sitting in home. The farmers who are educated can check the webpage regularly, and can take their steps for better yield of the crop.*

IndexTerms -- IoT, WSN, Smart Farming, Gateway, Sensors.

I. INTRODUCTION

Agriculture is the primary occupation in developing country like India.47% of the people are involved in the agriculture sector.18% of the total GDP of India is contributed by agricultural sector in 2012.

Smart Farming System is proposed in this paper which will use concept of IOT, WSN and cloud computing to help farmer plan a irrigation schedule for his farm. Proper scheduling of irrigation and fertilization is very important for proper development of crops.

The several factors which affect the amount of water required by crops in various climatic conditions are:

- Temperature
- Humidity
- Sunshine
- Wind speed

The collected and sensed climatic data from field along with weather data from web repositories can be used to take several effective decisions for increasing production of crops.

II. RELATED WORK

If climatic condition is hot, dry, sunny, windy then there is need of high amount of water for crops and if these factors are like cold, humid, cloudy, little wind then we need less water for the crops. Earlier study model conceptualized a system that consist of six parts that are monitoring, management, planning, Information Distribution, decision support and control action. And above study model does data analysis for better decision support [1].

In [2], a GSM based smart farming system was proposed for doing automation of several farming tasks. Automation is proposed by smart irrigator that moves on mechanical bridge slider arrangement. The smart irrigator receives signal from smart farm sensing system through GSM module. Then sensed data is transfer towards central database from which all crop details are analysed and transferred to irrigator system to perform automatic actions.

IoT based smart Agriculture [3] gives information about irrigation having facilities like smart control and making intelligent decision depending upon real time data from fields. All these operations will be controlled

through any smart device placed remotely and the interfacing sensors are used to perform operations along with Wi-Fi , actuators and other hardware devices.

The [4] whole system was developed using infield sensors which collects data from farm and using GPS data is sent to the base station where necessary actions are determined to control irrigation according to database available with the system. Researcher's measure soil related parameters such as humidity and moisture important for the growth of any crop. Auto mode and Manual mode are the two modes of operation of the system. System takes its own decisions and controls the installed devices and user can control the operations of system using android app or commands in auto and manual mode respectively.

Internet of Things is proven to be a cost effective and reliable technology to implement smart systems [5].In smart village system advance rural connectivity is enabled through web service and measuring different environmental factors real time.

System proposed in [6] suggests use of IoT in almost all phases like growing, harvesting, packaging, transportation. Real time data provided by sensors, RFID tags in all the above phases of cultivation of crop will help farmers and all the stake holders to have complete view of the product right from the production to sales.

Automated farming system proposed in [7] turns on the motor on/off depending on the moisture values from the moisture sensor and turn the lights in the green house on or off based on the light sensors. Actuators are used to control the motor. Automated system definitely helps farmer in increasing the yield of crops.

Paper [8] produces a agricultural model in IoT environment which is human centric. It incorporates IoT and cloud computing ubiquitously to remove the inefficiency and lack of management, which are the root of problems in agriculture.

III. BLOCK DIAGRAM

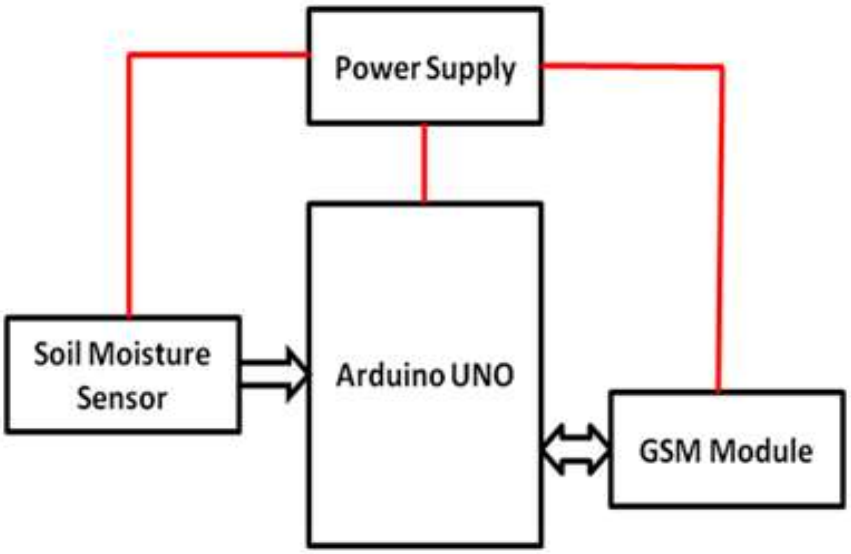

Fig: System Architecture

IV. SYSTEM DESIGN

Architecture of the system consists of hardware – different sensors like temperature, humidity, moisture sensor, GSM module, Aurdino uno, A-D converter, L293D, DC motor.

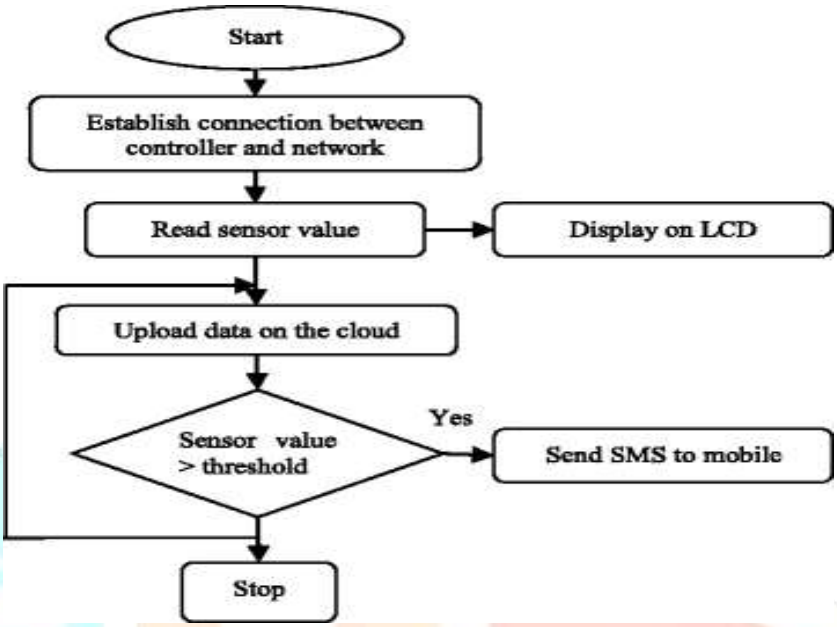

Fig: Data Flow Diagram

The DHT sensor and the soil moisture sensor sense the values of temperature and humidity and soil moisture content and store them for the purpose of future.

The A-D converter and the Aurdino uno help to convert these analog values to digital values. The Aurdino uno is used for the purpose of storing the analog values and the A_D converter converts these stored analog values to digital values and stores them in the memory of raspberry pi as digital values.

The DC Motor is used for the automatic pumping of water and automatic switching off of water whenever needed. The L293D is used in support with the DC Motor.

The GSM Module is used to send the messages to the farmer whenever the values are beyond the threshold values and whenever an accident occurs.

V.IMPLEMENTATION

Sensors sense all the physical parameters and convert the analogue value to digital value. Temperature and humidity sensors are used to measure the temperature and humidity respectively on field. Soil Moisture Sensor are of capacitive type, and are used to measure the moisture of the soil.

IoT based smart farming system is used to generate decisions regarding irrigation using real time data. First of all, farmer logs in to the system using his credentials such as username and password from an Android app. He is then allowed to select the crop for that season. System is implemented in three phases.

1. Sensing
2. Processing
3. Information distribution.

MODULES DESCRIPTION:

1.SENSING PHASE:

In sensing phase, various sensors like temperature, moisture, humidity are attached to the Arduino Nano board to sense the soil, air and water characteristics of the field .They sense the real time environmental values and transfer it to the gateway using NRF24L01 module. NRF24L01 module is a single chip 2.4 GHz transceiver which is suitable for low power wireless applications.

2.PROCESSING PHASE:

IoT gateway gathers the data from all the sensors and transfers it to the cloud for further processing. Data received by the cloud can be visualized in many forms like different graphs, histograms, etc. In the next phase of processing, data on the cloud is processed to generate some useful results. In this system, proper irrigation schedule is generated, which will help farmer in increasing his crop yield. Weather data from the meteorological department also needs to be monitored for planning irrigation schedule. Irrigation is an important step in farming on which growth of crop depends.

Based on the location of the field and environmental conditions prevailing there till date (past data), threshold values for temperature, humidity and moisture are set. This threshold values will play a major role along with the weather data, in generating schedule.

Real time values on the cloud can be compared with these threshold values and weather data .If these values are greater than the threshold values then whether or not, irrigation is required, can be decided.

3. INFORMATION DISTRIBUTION PHASE:

Information distribution is the last phase of this system. The generated schedule of irrigation is displayed on the mobile application where farmers can see and take appropriate action on it. It is also possible for the farmer to request for irrigation schedule from the app. All the data from the field is also shown in the form of graphs/visualization on mobile app which is more understandable and readable.

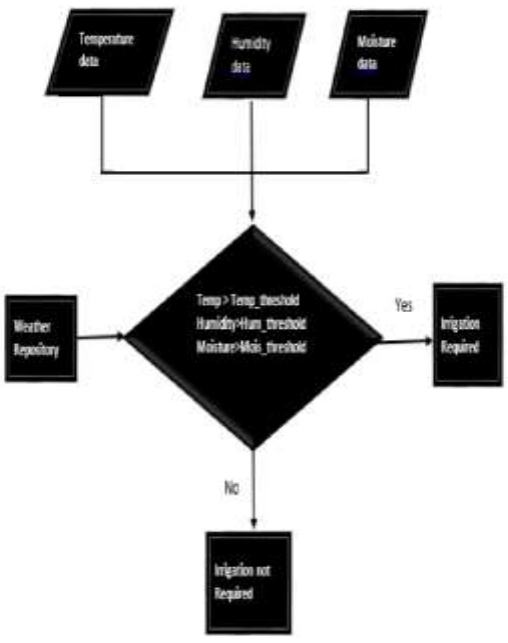

Fig: Irrigation Display on Mobile Application

VI. CONCLUSION

IoT based smart farming system can prove to be very helpful for farmers since over as well as less irrigation is not good for farming. Threshold values for climatic conditions like humidity, temperature, moisture can be fixed based on the environmental conditions of that particular region. This system generates irrigation schedule based on the sensed real time data from field and data from the weather repository. This system can recommend farmer whether or not, is there a need for irrigation.

VII. FUTURE SCOPE

One of the limitations of this system is that continuous internet connectivity is required at user end which might prove to be costly for farmer. This can be overcome by extending the system to send suggestion via SMS to the farmer directly on his mobile using GSM module instead of mobile app. Weather data from the meteorological department can be used along with the sensed data to predict more information about the future which can help farmer plan accordingly and improve his livelihood.

VIII. REFERENCES

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