IoT based farmers Eco-friendly system

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Abstract:
Agriculture sector in India is diminishing day by day which affects the production capacity of the field. There is an exigent need to solve the problem in the domain to restore vibrancy and put it back on higher growth. This paper proposes a farmer eco-friendly system which delivers a necessary alert to farmers such as (a) to make a water resource efficiently (b), providing knowledge of weather predictions and so on. A various IoT field sensors are used to collect field data and these data are transferred to the server with the help of Ardino-Uno. The field data are collected and analyzed using embedded C. The necessary alerts will be sent to the farmers based on the analyzed. The system overcomes limitations of traditional agricultural procedures by utilizing water resource efficiently and also reducing production cost. Using the proposed system, farmers can get the necessary advisory services throughout the entire farming cycle.

Keywords:
IoT, Farmers eco-system, Embedded C

1. INTRODUCTION

India is basically an Agro based country and the development of agricultural sector would ultimately contribute towards the economical growth of the Nation. Hence, this study contributes towards suggesting a suitable model to improve the irrigation system. It is imperative to improve irrigation system and help farmers and any initiative which is not technology based would fail. Therefore keeping in mind the technology, irrigation system in mind a proposed framework is formulated enabling the farmers to take suitable decision in farming. In this study, the fields are monitored continuously with the use of sensors and help the farmer fraternity. There are lot many technologies that prevail in current scenario to improvise the irrigation system, but intelligence irrigation system plays a pivotal role in today's agricultural world. The researchers of this paper have attempted to keep in mind the technology that would suit the farmers in helping them to have an intelligent irrigation system through a proposed framework. Technology plays a dominant role in agriculture development off late agricultural biotechnology; It is possible to grow crops in deserts. Using technology, plants have been monitored frequently and live on in drought condition and moreover different kinds of technologies are used in agriculture from sowing the seed to harvesting crop. Most of the farmers grow crop which needs a lot of water and they manage to grow crop using irrigation methods improved by advanced technology. In big farms, advanced water sprinklers are used to watering the plant so that the crops get enough water which is essential for their growth. Few farmers mix nutrients in this water to improve the growth of the crops and enrich their yielding These aspects are the basis of this study ensures of evolving intelligence irrigation system cater to the need of the farmers. In most of the cases, automated systems have been evolved in helping the farmers indicate the issues but a full-fledged system where the stakes concerned are beneficial is yet to be witnessed. There are varied research projects which have evolved intelligent irrigation system to control and monitor the water level and the time slots at which the watering should be done depending upon the saturated soil in order to enrich the crop yielding. There are also initiatives that are evolved by researchers in helping the farmers with micro controllers wherein through the interrupt signal motor, the temperature is monitored and signalling is indicated to the stakes as per the programmed inputs. Similarly, in a broader perspective – researchers have been working on initiatives that would benefit the end user especially the farmers with waste clean water conversion so that irrigation system is ensured uninterruptedly. A similar study to this research is that of an android based irrigation system where a sensor is enabled with the help of the algorithms developed keeping the readings of the water level, soil moisture.

2. TECHNOLOGY IN AGRICULTURE

There are lots of advantages available for farmers for them to use technology in agriculture. They may be as follows: 1) Technology reduces the time 2) Advanced machines help the farmers to produce high yield 3) Increase the price and demand of the products. 4) Helps in food transportation 5) Useful for sowing seeds 6) Helps in harvesting crop in large area 7) Effective use of natural resources etc., Coincidentally there are a lot of disadvantages that also exists while using technologies in agriculture. They are listed as follows: 1) using machines often may lead to environmental damage and unemployment of daily workers. 2) Though the efficiency is considered the side effects become the ill effect. 3) Lack of practical knowledge of farmers in handling the machines appropriately 4) Maintenance cost of machines are also high.5) Most of the farmers in rural area are illiterates and unable to use the advanced machines. In recent years there are technologies evolved using wireless design irrigation system in which Y Zhou et al (2009) had proposed. This framework on a longer run may be developed and the usage may be envisaged for the best use of farmers.

3. LITERARY REVIEWS

There seems to be a growing need for intelligence irrigation system not only how to use the invaluable resource water but the avenues in which the agricultural issues are resolved. Hence, this paper like other research papers that showcases on sensor based irrigation system, intelligence irrigation system, The conference paper titled "Sensor based Irrigation System: A Review" by Priyamitra Munoth et al (2016) [1] showcases the ways in which oil moisture sensors in irrigation is reviewed and solutions are proposed through the sensor system. In addition application efficiencies for irrigation systems are also suggested in their study which enables all the other researchers in this field to have an in-depth insight. Similarly, Kumar, Gaurav (2014) [2] in his paper submitted in a conference proceeding has indicated of need to evolve fuzzy drip irrigation in the place of traditional drip irrigation system. This is one such initiative in irrigation system where the basis for technology. There were other studies based on IIS mainly the paper by Hussein M. Al-Ghobari& Fawzi S. Mohammad (2011) [3] highlights of integration of smart controllers with intelligent irrigation and using microclimatic data to schedule irrigation water. The main objective of their work was to evaluate the use of intelligent system with sprinkle and drip irrigation systems and field crops with different scheduling techniques in arid region, such as Saudi Arabia. The farmers'challenges are highlighted elaborately in the research study by Matenge GR., (2017) [4] keeping the cited work on automated drip irrigation system, proven water efficient means of optimizing agricultural production and fustigation process is discussed envisaging a clear understanding on the usage of intelligence irrigation system and other resources that help the agricultural stakeholders. Agriculture based on Intelligence was published by Journal of Innovative technology and Explosive engineering by K.sumathi et al, (2019) [6].

K.Nagarajan et al[9] introduced an approach which includes deployment of sensors to monitor the whole cultivation area, fixing appropriate cameras and detecting motions in the agro field for Agro field surveillance. In this paper a model is developed and trained leveraging technologies such as google Colab environment that runs entirely in the google cloud that requires very minimal setup and evaluated using test set which contains 200 captured events, more than 60,000 images. K Sumathi et. al [10] proposed a Data analytics platform to reads data from different heterogeneous data set and to analyze the data after preprocessing and to visualize the predicted/output data to the outside world.

4. PROPOSED ECO-FRIENDLY IDEAS

The framework of eco-friendly system for irrigation system is proposed in this paper and this system offers Automatic Irrigation Alert to farmers based on moisture of soil, sowing time, and weather prediction system. The framework ensures in enriching the farming efficiency and attempts to eradicate few disadvantageous effects existing in farming activities. The source of data is mainly from farmers and irrigation partners and weather prediction reports only as the focus is on irrigation based alert to farmers. Those data pertaining to farmers include sowing time, crop type, crop details, farm area, expected harvesting time, etc. The irrigation partner's data includes crop type, soil parameters and irrigation period (time) and duration. The field sensor data collected by both the Soil management sensor and PIR sensors will help the farmers to predict the moisture level, water level to the crop. It monitors every second and the data's will be transferred to the server by ARDUINO UNO. A sensor that will serve the moisture level in the land (sand) called Soil moisture sensor.

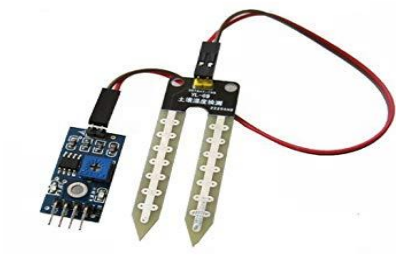
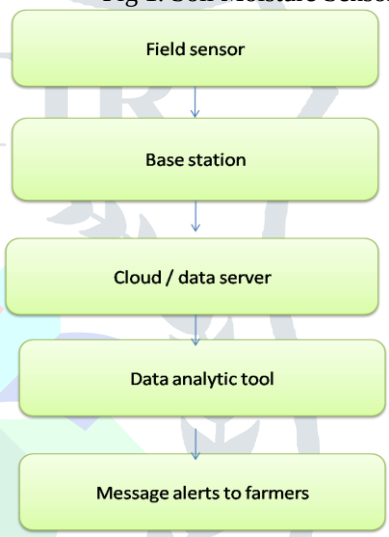


Fig 1. Soil Moisture Sensor



4. IMPLEMENTATION

Required data can be collected from farmers, field sensors and other weather prediction system. The data being collected from farmers through appropriate APIs or by asking set of standard questions. The weather information can be collected through relevant APIs and based on the moisture level; data can be collected from field sensors by using Arduino and stored in cloud for analysis. The important features of Arduino is Open-source, Interactive, Programmable, Low cost, Smart, WI-FI enabled.

Fig 2. Arduino Uno

Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9- volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

TECHNICAL SPECIFICATION

- Microcontroller: Microchip ATmega328P [7]
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 can provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g.

GENERAL PIN FUNCTION

LED:

There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it is off.

VIN:

The input voltage to the Arduino/Genuino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V:

This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.

3V3:

A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND:

Ground pins.

6. SIMPLE CODE FOR READING DATA FROM MOISTURE SENSOR

```
int wt=16; // wet
// Digital pin D0
Int dy=2; // dry
// at Digital pin D4
Void setup()
{
Serial.begin(9600);
pin model(wt,OUTPUT);
pinmodel(dy,OUTPUT);
delay(1000);
}
Void loop()
{
Serial.print("SOIL MOISTURE LEVEL:");
Value=analogRead(sense_Pin);
Value=value/10;
Serial.println(value);
If(value<80)
{
digitalWrite(wt,HIGH);
```

```
    else
    {
    digitalWrite(dy,HIGH);
    }
    delay(1000);
digitalWrite(wt,LOW);
digitalWrite(dy,LOW);
}
```

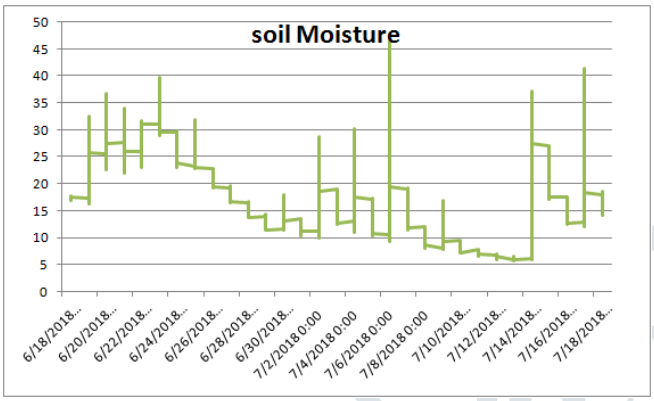


Fig 3. Soil Moisture Level

5. RESULTS AND DISCUSSION

The proposed guided Eco-friendly system keeps the output as the basis of data submitted by farmers, the values of field sensors and weather prediction data. This takes farmers data such as sowing time, crop type, location details, crop details, expected harvesting time, etc., Irrigation partners data which includes crop type, soil parameters and irrigation period and duration. The output of IoT based on Eco-friendly system is monitored continuously, based on the output of field sensors and weather prediction data, necessary alerts regarding irrigation sent to the appropriate farmers to save the natural resource.

6. CONCLUSION

In this paper our main focus is on how to enhance the yielding for the farmers by availing this IoT based system which automates the irrigation alerts to farmers. Hence, this system can help the farmers with necessary irrigation based on advisory services on continuous basis. This Eco-friendly system accept farmer's information such as farm area and location, soil type, sowing time, sowing seed details, etc., details through the farmers Application Programming Interface (API). Once they have submitted the data, Eco-Friendly system will offer irrigation based alerts to farmers whenever necessary. The focus is streamlined towards irrigation system alone for advising the farmers to yield the crops, whereas there are other issues that need to be identified apart from this aspect.

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