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Auto Irrigate Based on The Need and Collect Irrigation Data for Data Mining Application

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Abstract: Agriculture is the backbone of the life cycle. But it's becoming hard to farmer to effectively farm in their land due to the scarcity of the water. Since water is the crucial part of agriculture, efficient watering will lead to the efficient farming, so it's a high requirement to irrigate the farm land based on the water need of the crop in order to yield efficient farming, which leads to more profit. And reduce the excess usage of water and save it from being wasted. Nowadays data is major thing running around to derive the conclusion, collecting the farm data will allow one to analyze the collected data and use it for data mining applications to derive the more profitable way of farming.This paper aims at automating the irrigation to the farm land depending on the soil and crop need and it also enable one to collect the environmental data by spending very less budget.

Keywords: efficient farming, data mining applications.

I. INTRODUCTION

In the world of advance Technology, life of human beings should be simpler hence to make life convenient and simpler, we have made "SMART IRRIGATION SYSTEM". A model of controlling irrigation facilities to help millions of people. This model uses sensor technology with Arduino board to make a smart switching device. The model shows the basic switching mechanism of Water motor using sensors from any part of field by sensing the moisture present in the soil. This system also collects the data logs of irrigation in a micro SD card, later which can be used for data mining application. This model incorporates with a access to cloud application, where the collected data can be visualized.

Water is the core resource for Agriculture, Its a important need to come up with a device for irrigating smartly, which can save a huge amount of water being wasted by controlling the excess flow of water to the agriculture field.

The main aim of this prototype is to provide a proof of concept for building the effective irrigation system which water the agriculture field depending on the need. And this also collects the irrigation data for analyzing the environment, and it can be used for data mining applications in order to study the agriculture field parameters collected and deriving the effective ways of farming to increase the profit to farmers

II. LITERATURE SURVEY

Smart irrigation system means It is a system which controls and automate the irrigation in the farm fields. Watering the farm land on the need will reduce the intervention on human activity and also reduces the waste and overflow of the water in the farm land. This system uses the 'Arduino Nano' as the core control board. Each form area will have the soil moisture sensor and a Solenoid valve associated, which will be connected to Arduino Nano mini control board.

Efficient farming means by developing new, more precise methods of farming where we can use technology to help farmers become more successful and also automating the irrigation to the farm land depending on the soil and crop need and it also enable one to collect the environmental data by spending very less budget.

III. PROPOSED METHODOLOGY

As mentioned above this paper propose a complete methodology of smart irrigator and data mining. This methodology mainly concerns on using the low cost hardware, in order to make it easily available for the farmers, the overall cost for this implementation will be less than □2000, and this also collects the real-time data which can be further used for data mining applications, in order to do an algorithmic farming.

The main core hardware parts used are Arduino Nano, which is a small computing device, using which we can write the program to collect the sensor data and write decision centric condition and load it to the board. It keeps looping the implementation logic until it's powered off. It is also coupled up with the Real Time Clock (RTC) module, so that we can keep track of the time when the board gets the power cut. A LCD module is coupled up with the board to display the data to the user. The core sensors used in this methodology are Soil moisture sensor and Temperature sensor. The data are read from this sensor and they are collected on interval based. A threshold is set for the moisture level, whenever the moisture level goes below the threshold value, the bard

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sends the turn on signal to relay board which turns on either the Pump or the Solenoid vale connected. Following are the images of the decoupled hardware's used.

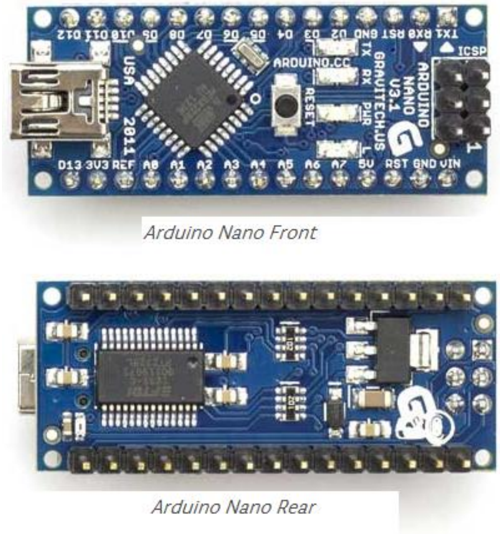

Fig 1. Arduino Nano – ATmega 328

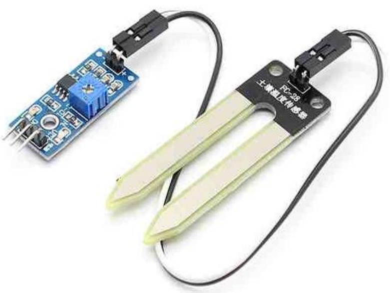

Fig 2. Soil Moisture sensor

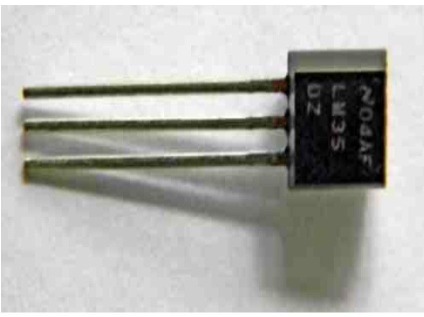

Fig 3. Temperature Sensor – LM35

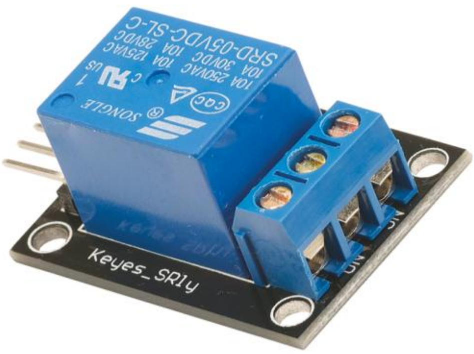

Fig 4. Relay board

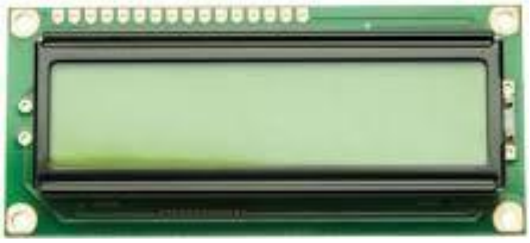

Fig 5.16x2 LCD Display

The code for the decision logic is written in the Arduino C language, and the data collected from each interval will be written on the coupled SD card reader, this collected data can be visualized through any programs the user is convenient, as a default we have also created a cloud application to read the collected data, parse it and visualize in the form of table and charts.

IV. ARCHITECTURE OF PROPOSED METHODOLOGY

Following figure depicts the high level architecture of the methodology, where arrows depicts the data input and output lines. All the sensors acts as the data input provider, whereas LCD display, SD card acts as the user display consoles, and the relay board takes the logic output and performs on/off depending on the logic levels given by the Arduino board.

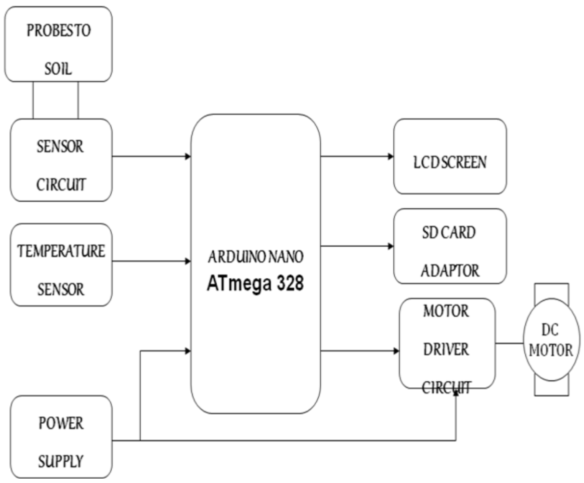

Fig 8. Architecture showing proposed methodology

V. CODE IMPLEMENTATION FLOWCHART OF PROPOSED METHODOLOGY

Following figure depicts the flowchart for the decision logic implanted on the Arduino board. Each time the board is turned on, it need to be initialized before running on any code, in the initiation phase we will define what lines are using for User outputs and what lines are used for reading the sensor data. And synchronize the clock of the module with the current clock data obtained from the RTC module. Once the device is initialized, we segregate the process logic into 3 parts, each one for Sensor data reading, Data display for User and for Decision making and logging.

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The very first parts keeps on reading the sensor data for every second. The second thread keeps on waiting for the data in the display queue, as soon as data arrives in the display queue, it shows up the data to user via LCD display module.

The third part is the important step in this methodology which is the decision maker and logger part. This step makes use of the defined threshold value and the sensor data collected in the first thread. And if that moisture value is less then the threshold value then, we will send the high logic level for the relay board for 5 seconds, which turns on the either of the pump or the solenoid valve connected, for 5 second, if the read value is more than the threshold then will just keep the task idle for 5 second, after that we will write the state data to the SD card and will loop the same procedure again and again until the board is powered off..

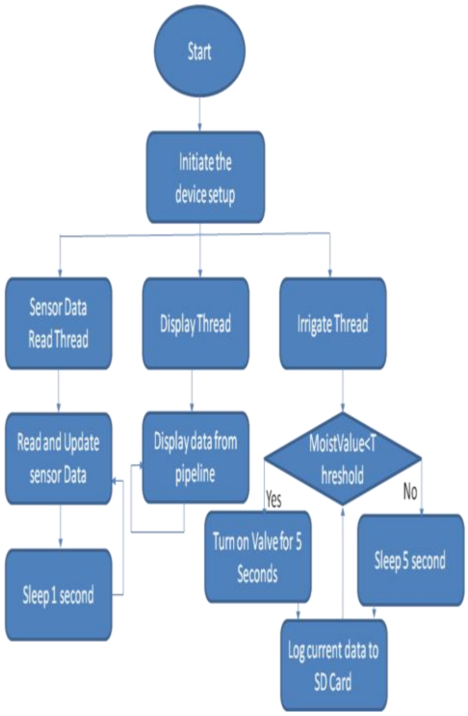


Fig 9. flowchart of proposed methodology

VI. IMPLEMENTATION RESULTS

Following are the screenshots of the implemented prototype with the proposed methodology.

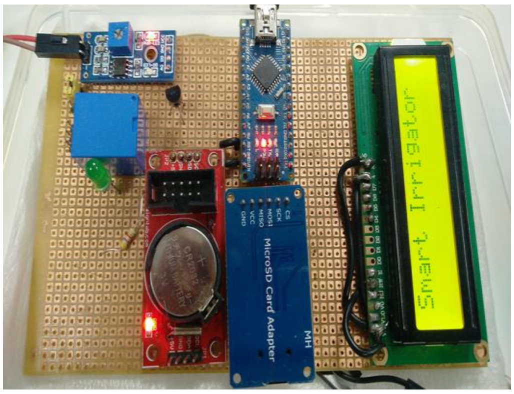
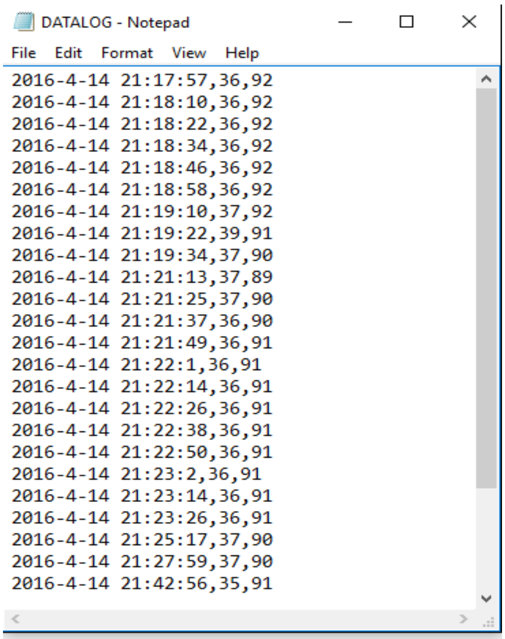


Fig 10. Implemented device

VII. EXPERIMENTAL RESULTS

Following are the result data collected from the prototype board, which are stored as CSV data in the SD card. These data are later fed into the visualization tool hosted in the cloud, Fig 11 depicts the sample visualization.



DATALOG - Notepad

File Edit Format View Help

2016-4-14 21:17:57,36,92
2016-4-14 21:18:10,36,92
2016-4-14 21:18:22,36,92
2016-4-14 21:18:34,36,92
2016-4-14 21:18:46,36,92
2016-4-14 21:18:58,36,92
2016-4-14 21:19:10,37,92
2016-4-14 21:19:22,39,91
2016-4-14 21:19:34,37,90
2016-4-14 21:21:13,37,89
2016-4-14 21:21:25,37,90
2016-4-14 21:21:37,36,90
2016-4-14 21:21:49,36,91
2016-4-14 21:22:1,36,91
2016-4-14 21:22:14,36,91
2016-4-14 21:22:26,36,91
2016-4-14 21:22:38,36,91
2016-4-14 21:22:50,36,91
2016-4-14 21:23:2,36,91
2016-4-14 21:23:14,36,91
2016-4-14 21:23:26,36,91
2016-4-14 21:25:17,37,90
2016-4-14 21:27:59,37,90
2016-4-14 21:42:56,35,91

Fig 11: Data collected in the device

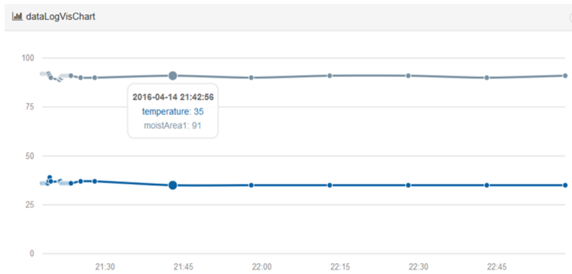


Fig 12: Data visualization

VIII. CONCLUSION

In present days especially farmers are facing major problems in watering their agriculture fields, it's because they have no proper idea about when the power is available so that they can pump water. Even after then they need to wait until the field is properly watered, which makes them to stop doing other activities. Here is an idea which helps not only farmers even for watering the gardens also, which senses the soil moisture and switches the pump automatically when the power is ON.

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