Smart Irrigation and Tank Monitoring System

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Abstract: Water, which is regarded to be one of the most important part for the growth of plants in agriculture should be utilized properly. The paper is focused on the smart irrigation of farms as well as monitoring the tank automatically so as to make better irrigation system and tank monitoring which will be beneficial in conserving water and irrigating fields in a smart way. For this project purpose we are integrating different sensors like DHT11, Soil Moisture sensor Ultrasonic sensor, etc. These sensors communicate with the micro controller. Micro-controller performs its action as per its instructions. The proposed framework may prompt upgrade the cultivating rehauers, overcoming the water crises and developing upgraded agricultural system for the country.

Keywords :Arduino, GSM, Soil Moisture Sensor, Ultra Sonic Sensor, DHT11 Sensor etc.

1. INTRODUCTION
Agriculture is considered as the back-bone of Indian economy. Around 70 % of the population still depends on Agriculture. 33% of the National economy comes from Agriculture. The development in agrarian creation has been still for as long as quite a long while. The importance of farming is: 1) Contribution to National Income, 2) Main wellspring of Food,3)Agriculture and Industrial advancement, 4) Sources of Revenue, 5) Source of Foreign exchange. 6) Transport, 7) Source of sparing, 8) Capital arrangement, 9) International significance, 10) Way of life, 11) Effect on costs, 12) Source of work supply, 13) Economic improvement. Our property was losing its fruitfulness being put to development persistently for a considerable length of time together. So we have perused all the current framework and their working and we have discovered that there is no framework that uses the small scale controller, various sensors, information mining and mobile phone to communicate with gsm modem all together. So we are consolidating all the current framework to get the half and half framework. Sensor-Based water and irrigation system framework has been contemplated in much application. These sensors send constant esteems to microcontroller and microcontroller send these qualities to PC by means of serial channel. The system suggests an economical and easy-to-use Arduino-based automated irrigation system and tank monitoring system that utilizes the GSM modem to impart and send and get instant message as status of the incorporated framework. The data received as a text message from the Arduino is displayed on the User mobile as well as on the LCD screen.
tank is monitored based on the water level of the tank and the system also proposed of preventing the motor from damage in case of continuous running due to leaking.

2. METHODOLOGY AND COMPONENT

The Smart Irrigation and Tank Monitoring System provides a smart way to monitor the water tank and irrigate the crop field automatically. This proposed system reduces the man power of farmers like supplying water to plants and controlling the motor to fill tank. This system uses different components like DHT11 sensor, Soil Moisture sensor, Gsm Modem, ultrasonic sensor etc. and according to this sensor parameters farmer are provided an automated way to irrigate their fields and monitor the tank. By the help of this proposed system we can even get the current status of the soil, motor, tank as well as the status of the different components.

Hardware:
1. **Sensors:** We use sensors like
   - **DHT11:**
     DHT11 is a Humidity and Temperature Sensor, which creates aligned advanced yield. DHT11 can be port with any microcontroller like Arduino, Raspberry Pi, etc. and get sudden results.
   - **Soil Moisture Sensor:**
     The Soil Moisture Sensor uses capacitance to measure the moisture content of soil (by evaluating the dielectric permittivity of the soil, which is a part of the water content). Basically embed this rough sensor into the soil to be tested, and the volumetric water substance of the soil is accounted for in percent.
   - **Ultrasonic Sensor:**
     An Ultrasonic sensor is a device that can quantify the distance to a body or object by utilizing sound waves. It evaluates and measure distance by sending a sound wave at a particular recurrence and tuning in for that sound wave to skip back. By recording the past time between the sound wave being produced and the sound wave bobbing back, it is conceivable to figure the distance between the sonar sensor and the body.

2. **Microcontroller:**
   It is heart of system, implies it control all task of framework. For this task we are utilizing Arduino Uno. The Arduino Uno is a microcontroller board in light of the ATmega328 (datasheet). It contains 14 digital Input/yield pins (of which 6 can be utilized as PWM yields), 6 Analog sources of info, a ceramic Resonator of 16MHz, a power jack, a USB association, an ICSP header, and a reset catch. It contains everything which is required to help the Microcontroller basically interface it to a PC with a USB link or power it with an AC-to-DC connector or battery to begin.

3. **Gsm:**
   A GSM Module is fundamentally a GSM Modem (like SIM 800A) associated with a PCB with various sorts of yield taken from the board – say TTL Output (for Arduino, or any other microcontroller) and RS232 Output to connect specifically with a system or PC. The board will likewise have sticks or arrangements to append mic and speaker, to take out +5V or different estimations of energy and ground associations.

4. **LCD:**
   LCD stands for Liquid Crystal Display. LCD screen is an electronic display module and locate an extensive variety of uses. We are using a 16x2 LCD, it can display 16 characters in a line and there are 2 rows of lines. It has two registers which are Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction fetched to LCD to do a defined task like initializing it, clear the screen, sets the cursor position, controls the display etc. Data are stored in data register which are to be displayed on the LCD. The data is the ASCII representation of the character to be displayed on the LCD.
5. Relay Switch:
A relay switch is a switching device used electromagnetically that open or close circuits. Relays consist of armature that is moved by an electromagnet which control one electrical circuit by opening and shutting contacts in another circuit. As shown in fig below there is open contact when a relay contact is normally open and the relay is not empowered. It provides isolation and amplifications and is straightforward.

Software:
1. **Windows system**
   - (GHz) gigahertz or above, 32-bit system processor (x86) or 64-bit (x64) system processor.
2. **Linux system requirements**
   - 700 MHz processor, 512 MB RAM or above, 5 GB of hard-disk space and above.
3. **Arduino IDE:**
   Arduino is a software tool which is an open-source IDE (Integrated Development Environment) platform used for writing Arduino code. It is used to programme physical Arduino circuit board often called microcontroller that runs on the PC, used to write and upload computer code to the Arduino board.

3. PROPOSED SYSTEM

Fig. 1. Proposed System

**Working:**
This project is about a moisture detecting of soil programmed using Arduino UNO which is used in irrigating the fields. The framework peruses the moisture substance of the dirt utilizing soil moisture sensor and switches ON the motor when the moisture is underneath as far as possible. Right when the clamminess level rises above the set point, the system switches off the pump.

The tank monitoring system uses ultrasonic sensor to measure the level of water inside the tank which is automated and switches on and off the motor comparing to a threshold level which has been set and it also use DHT sensor which prevent the motor in case of leakage as the temperature will increase which switches off the motor going beyond certain level. The system uses GSM modem to communicate with user by sending and receiving text message as status of the integrated system. The status of the moisture, temperature, tank, engine and the dampness level will be shown on a 16×2 LCD show. The logic described behind the algorithm is helpful in understanding the overall working of the system. It initializes the sensors and read the values using Arduino Uno which helps to performs actions.

We uses Relay Circuit board to turn on and off the motor which is used to irrigate the field automatically as soon as the moisture content in the soil goes down a certain fixed level based on the crops requirement and turns off the motor when the field gets irrigated at a defined level. Also the farmer s would be able to get the value of the soil moisture level on their mobile phone through the use of GSM modem which helps in receiving the status of the farm. This helps to remotely monitor the status of the farm. On the other side, the project also focuses on monitoring the tank through the use of sound wave ultrasonic sensor which is integrated with the system that measures the level of water inside the tank. As the water level goes beyond a certain level it switches on the motor using the relay circuit board and turns off as it become full. Also the motor can be prevented by using a DHT11 sensor at the end which can turn off the motor after sensing the high temperature and heat value.
Gradually this system enables to ensure that the moisture content and availability of water in field is well maintained and the tank and motor is monitored and protected respectively.

4. RESULT

The system described in the paper can be accessed anywhere, anytime provided gsm network available for communication between user and the system.

Soil Moisture Sensor:

| Data from moisture sensor | Condition of soil |
|---------------------------|-------------------|
| 0-300                     | Soil is dry       |
| 300-700                   | Soil is partially wet |
| 700-1020                  | Soil is wet       |

Based on the data provided by the soil moisture sensor its values lies between the ranges of 0-1020 which helps in determining the soil type of field in terms of moisture content. The below tables shows the moisture content and status of the soil and the temperature and humidity along with operating voltage.
Humidity:

| Parameter                  | Min | Typical | Max | Unit |
|----------------------------|-----|---------|-----|------|
| Accuracy (25°C)            | -   | ±4      | -   | %RH  |
| Accuracy (0-50°C)          | -   | -       | ±5  | %RH  |
| Measurement range (25°C)   | 20  | -       | 95  | %RH  |
| Response time: 1/e (63%)   | 6   | 10      | 15  | S    |

Temperature:

| Parameter                  | Min | Typical | Max | Unit |
|----------------------------|-----|---------|-----|------|
| Accuracy (25°C)            | ±1  | -       | ±2  | ℃    |
| Measurement range          | 0   | -       | 50  | -    |
| Response time /e (63%)     | 6   | 30      |     | S    |

Humidity and Temperature analysis:

The setup provides a better option of knowing the details and status of all the sensors which comprises the complete system. The details like soil moisture content value, water status, relay status and the operation mode can be monitored through the GSM modem. The important thing is that the soil moisture value will be updated to the board for every second. It also enables to supervise the system automatically.

Ultrasonic Sensor:

| Power Supply | Quiescent Current | Ranging Distance | Resolution | Frequency |
|--------------|-------------------|------------------|------------|-----------|
| 5V DC        | <2mA              | 2cm-500cm        | 1cm        | 40k Hz    |

Operating Voltage:

| Parameter       | Min | Typical | Max | Unit |
|-----------------|-----|---------|-----|------|
| Working Voltage | 3   | 5       | 5.5 | VDC  |
| Working Current | 0.5 | -       | 2.5 | -    |
| Sampling interval | 1  | -       | -   | S    |

Figure 4. Operating specs

The person can decide at a certain time if the relay should be ON or OFF and it can be controlled using the GSM itself. The overall system control and the system details are also displayed on a 16*2 LCD.
5. **Conclusion**

The purpose of this paper is to apply the functionality integrated architecture in the field of agriculture such as Smart Irrigation to provide optimum use of fresh water and better crops production. The Smart Irrigation and Tank monitoring system implemented is feasible and cost effective for using water resources in an optimised way for production of agriculture. The setup was carried out using Arduino UNO board, Soil moisture sensor, ultrasonic sensor, dht11 sensor and relay. The Arduino with soil moisture sensor takes the reading of water content in the soil and perform specific actions based on its value. This proposed system reduces the man power of farmers like supplying water to plants and controlling the motor to fill tank.

The system has successfully completed four objectives but could not complete two objectives i.e., weather forecasting and controlling system through android app in mobile. It uses low cost sensors and other devices which makes the system cheap. As the system is completely automated, it does not require complete attention of farmer’s every time, so it saves the time. Overall this system can be used in the place with water scarcity and where human interference is less. The system is incredibly versatile and economical. It doesn't need individuals on duty as it is so easy and reliable.

**REFERENCES**

[1] X. Wang, W. Yang, A. Wheaton, N. Cooley, and B. Moran, “Ecient registration of optical and IR images for automatic plant water stress assessment”, Comput. Electron. Agricult., vol. 74, no. 2, pp.

[2] Albert Mayan J, Dr. T. Ravi, “Optimized Regression Testing using Genetic Algorithm and Dependency Structure Matrix”, International Journal of Applied Engineering Research, Vol:9, Issue:20, pp: 7679-7690, Nov 2014, ISSN: 1087-1090

[3] Prof. B. T. Salokhe, Miss Shilpa G. Gadekar, “A wireless application of drip irrigation automation supported by soil moisture sensors”, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, Issue 4, April 2015

[4] Albert Mayan J, Sharmila Latha T, Kislav Sinha, "Security Analysis of Three Factor Authentication Schemes for Banking", ARPN Journal of Engineering and Applied Sciences, Vol:10, Issue 8, pp: 3504-3509, May 2015, ISSN: 1819-6608.

[5] Bhagyashree K. Chate, Prof. J. G. Rana, “Smart Irrigation System Using Raspberry Pi” International Research Journal of Engineering and Technology (IRJET), vol. 03, Issue 05, pp.1, May-2016.

[6] G. Merlin Suba, Y. M Jagadeesh, S. Karthik and E. Raj Sampath, “Smart Irrigation System Through Wireless Sensor Networks”, ARPN Journal of Engineering and Applied Sciences, vol. 10, pp. 1, no. 17, September 2015.

[7] Venkata Narayana Eluri, K. Madhusudhana Rao, A. Srinag, “Wireless Solution for Water Saving In Agriculture Using Embedded System”, International Journal of Computer Science and Business Informatics, ISSN: 1694-2108 — Vol. 2, No. 1, JUNE 2013

[8] S. V. Devika, Sk. Khamuruddeen, Sk. Khamurunnisa, Jayanth Thota, KhaleshaShaiK, “Arduino Based Automatic Plant Watering System”, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 10, pp. 2-3, October 2014.
[9] Asha P, Albert Mayan J, Canessane A (2018), "Efficient Mining of Positive and Negative Itemsets Using K-Means Clustering to Access the Risk of Cancer Patients", Communications in Computer and Information Science, ICSCS 2018, Kollam, 2018, pp.373-382.

[10] Chandankumar Sahu, Pramitee Behera, “A Low Cost Smart Irrigation Control System”, IEEE Sponsored 2nd International Conference on Electronics and Communication System (ICECS 2015).

[11] P. Jabez J, Gowri S, Vigneshwari S, Albert Mayan J and Srinivasulu S (2018), "Anomaly Detection by Using CFS Subset and Neural Network with WEKA Tools", Smart Innovation, Systems and Technologies, Vol.107, pp. 675–682.

[12] Kamalesh M. D., Albert Mayan J., Felix Y., Sumanth B. S., & Sai Tej B. (2018), "Magrisys: A Smart And Ubiquitous Controlled – Environment Agriculture System " , 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) , pp: 1-5 , 2018