



Smart Field System using LabVIEW and IoT

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Abstract: Appropriate soil water level is a necessary pre-requisite for optimum plant growth. Also, water being an essential element for life sustenance, there is the necessity to avoid its undue usage. Irrigation is a dominant consumer of water. This calls for the need to regulate water supply for irrigation purposes. Fields should neither be over-irrigated nor under-irrigated. The objective of this thesis is to design a simple, easy to install methodology to monitor and indicate the level of soil moisture that is continuously controlled in order to achieve maximum plant growth and simultaneously optimize the available irrigation resources on a monitoring software LabVIEW and the sensor data can be seen on Internet. In order to replace expensive controllers in current available systems, the Arduino Uno will be used in this project as it is an affordable microcontroller. The Arduino Uno can be programmed to analyse some signals from sensors such as moisture, temperature, and rain. A pump is used to pump the fertilizer and water into the irrigation system. The use of easily available components reduces the manufacturing and maintenance costs. This makes the proposed system to be an economical, appropriate and a low maintenance solution for applications, especially in rural areas and for small scale agriculturists. This research work enhanced to help the small-scale cultivators and will be increase the yield of the crops then will increase government economy.

Keywords: IOT, LABVIEW, Rain Sensor, Moisture Sensor, Microcontroller, Arduino.

I. INTRODUCTION

Over time, systems have been implemented towards realizing this objective of which automated processes are the most popular as they allow information to be collected at high frequency with less labour requirements. Bulk of the existing systems employ micro-processor based systems. These systems offer several technological advantages but are unaffordable, bulky, difficult to maintain and less accepted by the technologically unskilled workers in the rural scenario. The Internet of Things (IoT) is transforming the agriculture industry and enabling farmers to contend with the enormous challenges they face. The industry must overcome increasing water shortages, limited availability of lands, difficult to manage costs, while meeting the increasing consumption needs of a global population that is expected to grow upto 70% by 2050. India's major supply of financial gain is from agriculture sector and seventieth of farmers and general folks rely upon the agriculture. In Republic of India most of the irrigation systems square measure are operated manually. These antique techniques square measure replaced with semi-automated and automatic techniques. The on the market ancient techniques square measure like ditch irrigation, terraced irrigation, drip irrigation, system. The global irrigation situation is classified by redoubled demand for higher agricultural productivity, poor performance and decreased accessibility of water for agriculture. These issues are befittingly corrected if we have a tendency to use machine-controlled system for irrigation.

Automating farm or nursery irrigation permits farmers to use the correct quantity of water at the correct time, regardless of the provision of labour to show valves on and off. Additionally, farmer's mistreatment automation instrumentation is able to scale back runoff from over watering saturated soils, avoid irrigating at the incorrect time of day, which will improve crop performance by making certain adequate water and nutrients once required. Those valves are also simply automated by mistreatment controllers. Automating farm or nursery irrigation permits farmers to use the correct quantity of water at the correct time, no matter the provision of labour to show valves on and off. They lack in an exceedingly featured mobile application developed for users with acceptable user interface. It solely permits the user to observe and maintain the wetness level remotely in no matter of time. From the purpose of reading and performing at remote places the developed microcontroller primarily based irrigation system will work perpetually for indefinite fundamental measure, even in sure abnormal circumstances.

Sustainability of obtainable water resource in several reason of the word is currently a dominant issue. This drawback is quietly associated with poor water allocation, inefficient use, and lack of adequate and integrated water management. Water is usually used for agriculture, industry, and domestic consumption. Therefore, economical use and water observance area unit with potential constraint for home or workplace water management system. Previous few decades many observance systems integrated with water level detection became accepted. Measure water level is an important task for presidency and residence perspective. During this manner, it might be doable to trace the particular

implementation of such initiatives with integration of varied dominant activities. Therefore, water dominant system implementation makes potential significance in home applications.

This paper is organized as follows: Section 1 gives brief introduction on IoT and LabVIEW based smart agriculture system. Section 2 comprises of brief explanation of block diagram and its components. The proposed technique, block diagram and results are presented in Section 3. Section 4 presents conclusion of the paper.

II. BLOCK DIAGRAM AND ITS COMPONENTS

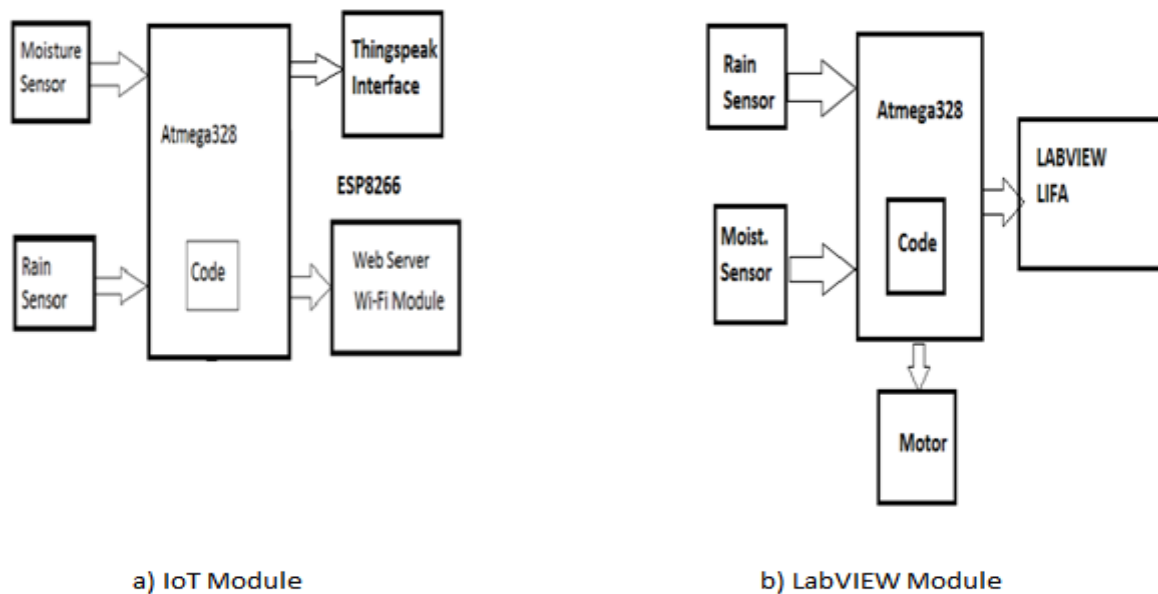


Figure 1: Block Diagram depicting a) IoT Module and b) LabVIEW Module of Smart Field Screen

Arduino Uno: This microcontroller is predicated on the ATmega 328. There square measure total of twenty pins (0-19) out of the half-dozen square measure analog inputs which might even be used as general purpose pins, a ceramic resonator of frequency 16MHz, AN USB association, an influence jack and a push. It contains everything required to support a microcontroller.

Rain Sensor: Rain Sensor module is an easy to use tool for detecting rain. It is also very precise for rainfall sensing. It can also be used as a switch when rain falls on the raining board and for measuring the intensity of rain falling on the sensor module. The module features comprise of, a rain board module and the control board also that is separate using wires for more convenience, power indicator LED is also present on the board and an adjustable sensitivity can be achieved through a potentiometer.



Figure 2: Rain Sensor-HL83

Moisture Sensor: Soil moisture level module is most sensitive to the close moisture level. It is mostly used to find the moisture level content of the soil.

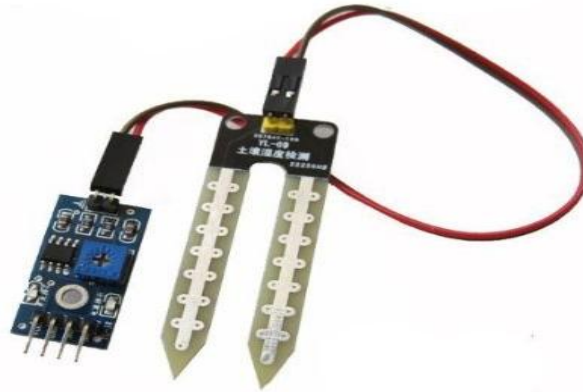


Figure 3: Moisture Sensor-YL69

Motor Pump: The output motor is connected with microcontroller, which is a motor pump for irrigation, and it consists of simple AC pump motor.

ESP8266: The ESP8266 wi- fi module may be a self-contained SOC with integrated TCP/IP protocol stack that may provide any microcontroller access to your wireless fidelity network.

LabVIEW GUI: LabVIEW (an form for Laboratory Virtual Instrument Engineering Workbench) could be a system style platform and development surrounding for a visible artificial language from National Instruments.

III.PROPOSED TECHNIQUE

In Figure 4 the front panel of LabVIEW Interface for smart field system is shown. It will give graphical analysis of the rain sensor and moisture sensor whenever the hardware module of system is connected to software. The motor can also be manually controlled in the Graphical user interface.

The status of the motor pump is also shown in the LabVIEW GUI for easy analysis of the moisture and rain sensor module.

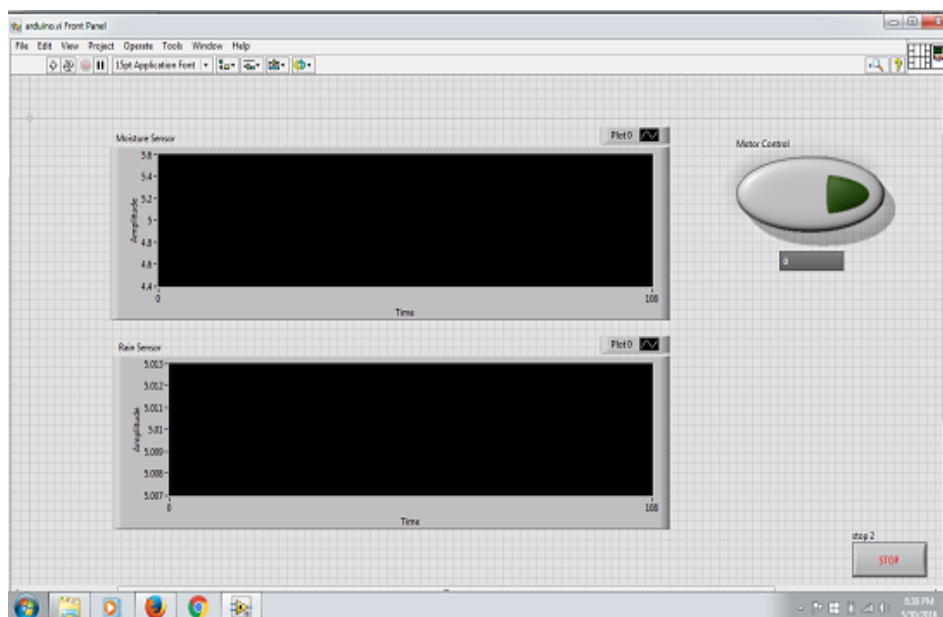


Figure 4: Front panel of LabVIEW Interface for Smart Field System

In Figure 5 the block diagram of the smart field system in the LabVIEW panel is shown. It describes the diagram being used for the implementation of the logic which will allow the system to work. The inputs from the hardware module are transferred to the pins in the block diagram and the output is generated using the logic drawn. The output is then given from the pins from of block diagram to the hardware module again.

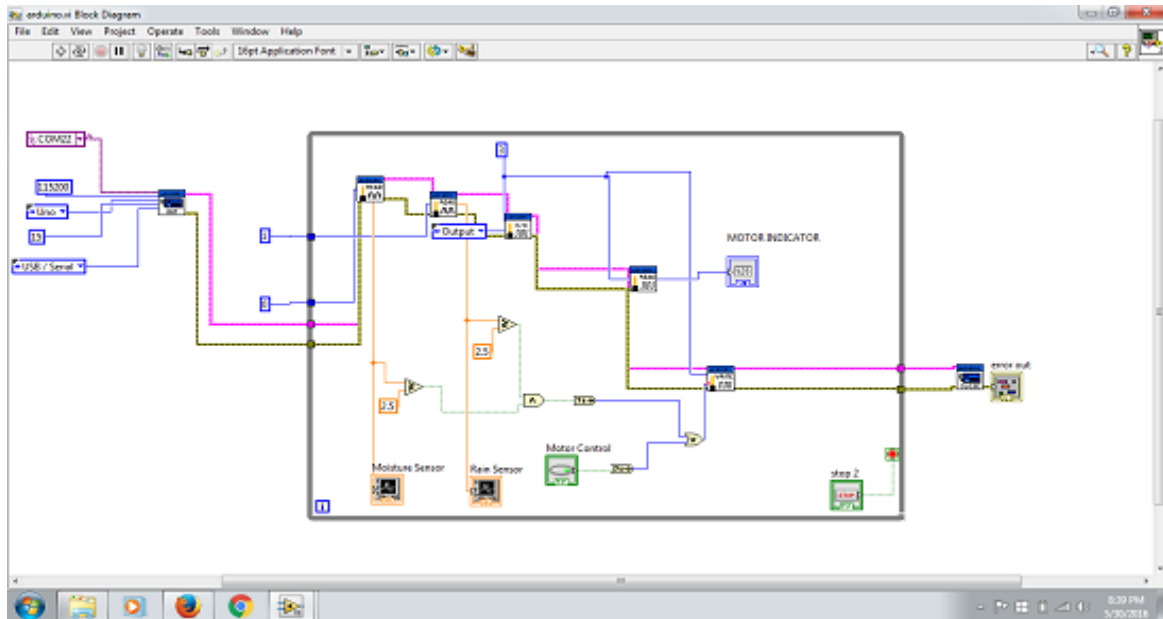


Figure 5: Block Diagram of LabVIEW Implementation for Smart Field System

Algorithm: It states the steps that the proposed system undergoes.

Step 1: Start the process.

Step 2: Initialize power is supplied to Microcontroller and other peripheral modules.

Step 3: Check the moisture level (less than or more than) and also for the rain sensor.

Step 4: If the level will be more than a fixed threshold, no need to irrigation, the pump will be off. Also if it's raining, the pump will be off.

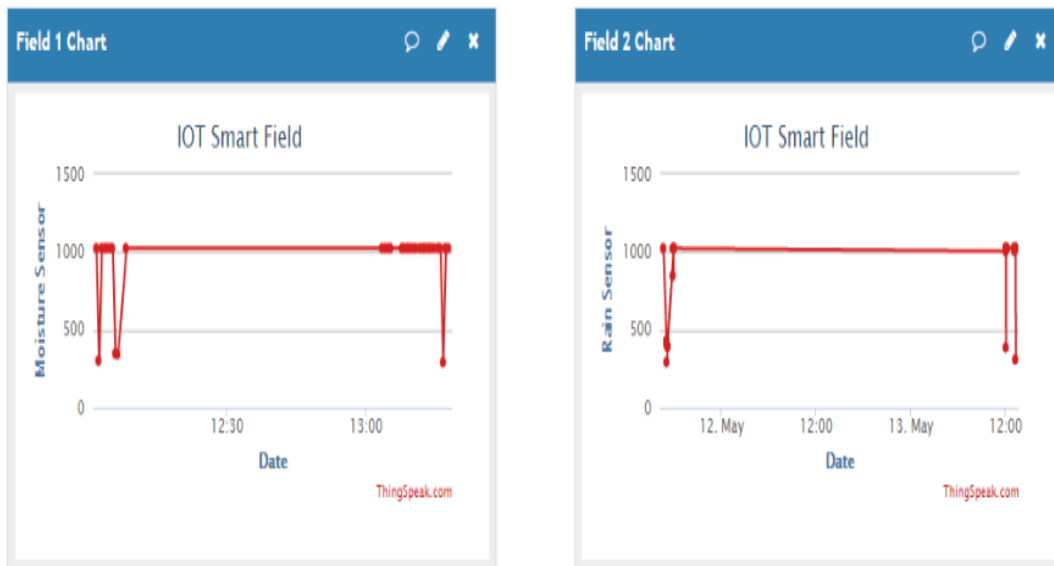
Step 5: If moisture level is less than a fixed threshold value and no rain, automatically it starts irrigation through motor pump.

Step 6: Initialization of pump and displaying data on LabVIEW interface and Web server. GUI can also control the motor manually.

Step 7: After the process is completed, it moves to original state and returns to the step 3.

Step 8: Stop the process.

IV. RESULTS



(a) Result from Moisture Sensor

(b) Result from Rain Sensor

Figure 6: IoT Implementation of Smart Field System in Thing Speak platform



In figure 6, the data available on the internet platform ThingSpeak is shown. Here we can see that a maximum value of 1000 for pure dry land and minimum 0 value for pure wet land has been taken. These values give the real time visualization of the moisture content in the soil.

In figure 6(a) we can see the moisture sensor result i.e. graph of the moisture in soil varying with time. According to the switching of the motor the moisture content variation can be seen.

In figure 6(b) we can see the rain sensor result. Here also the values ranging between 1000 and 0 tell us that the moisture in soil due to rain is changing.

V. CONCLUSION

This paper involves establishing a contemporary design technique of monitoring and controlling the moisture level of soil using LabVIEW. Providing comprehensive tools that need to build any measurement or control application in dramatically less time, LabVIEW is the ideal development environment for innovation, discovery, and accelerated results. Combine the power of LabVIEW software with modular, reconfigurable hardware to overcome the ever-increasing complexity involved in delivering measurement and control systems on time and under budget. The project also includes rain sensor, which is very important in the project to avoid unnecessary power wastage.

Measuring soil moisture is critical in agriculture to help farmers manipulate their irrigation systems more successfully. No longer only are farmers able to generally use much less water to grow a crop, they're able to increase growth yields and the satisfactory of the crop by using better management of soil moisture at some point of vital plant growth degrees. Embedded system for computerized irrigation of an agriculture subject gives an able solution to assist web page- precise irrigation control that permits producers to maximize their productivity whilst saving the water.

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