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# Sensor Based Smart Monitoring and Controlling System for Cultivation using Labview

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***Abstract*: Agriculture is the most important back bone of India. Now a day's farmers are reduced because of various problems like water problem, real estate, technology etc. Here our proposed system is to make use of existing technology to improve the farming percentage, gardening and nursery in a smart, effective and accurate method. Our proposed design is an automatic smart monitoring and controlling field system based on IoT which is implemented with NI LabVIEW and NI myRIO interfacing device. NI LabVIEW is a tool for testing, automation, measurement and monitoring system. NI myRIO is an embedded hardware where sensors like Temperature sensor, Moisture sensor, Rain sensor, Humidity sensor, Motor and communication protocols are interfaced with the help of LabVIEW. In this paper, we proposed ground water harvesting though that rain water is stored in the water tank which can be used in future for sprinkling water when soil moisture is less. This proposed design is the best way of economical accuracy and low-cost maintenance system. The concept of IoT in this paper is to monitor the status of the field like water level indicator in the tank, temperature of the field, to know the moisture of the field and detection of rain by using mobile phone or PC or Tab form any part of the world. This research will help the small-scale, mid-scale and high-level forming lands and it will increase the yield percentage and save the agriculture.***

***Index Terms*: IoT, NI LabVIEW, NI myRIO, Sensors, Monitoring and controlling system.***

## I. INTRODUCTION

In order to make smart field system which helps the farmers for easy farming technique, we used LabVIEW for better programming and accuracy of sensor values [1-2].LabVIEW is a virtual instrument were sensor readings and data's can be monitored and controlled [3]. NI myRIO is an embedded device was we have interfaced all the sensors and myRIO is programmed with LabVIEW. This is the automation process and closed loop system were Moisture sensor, Rain sensor, IR sensor, Temperature sensor and Motor are inter linked with LabVIEW and IOT.

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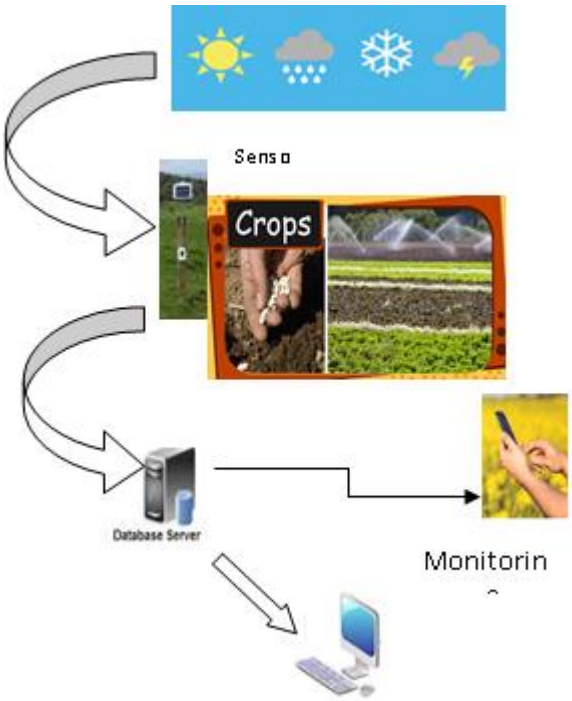


**Figure 1: Smart Field System using IoT**

In Figure 1 shows the smart filed system integrated with sensors and system. The farmer will get the immediate message from data base server about the weather condition in real time monitoring from remote locations. Based on the information he can able to do the work in the field. This smart field system using IoT reduce the burden of the farmer in weather monitoring and will yield more crops in their fields in better way [4].

## II. SENSORS

Thingspeak is clouds sever where you can store you real time data and can be monitored and controlled from any part of the world [5-6]. NI myRIO: NI myRIO is an embedded hardware where sensors like Temperature sensor, Moisture sensor, Rain sensor, Humidity sensor, Motor and communication protocols are interfaced with the help of LabVIEW [7].

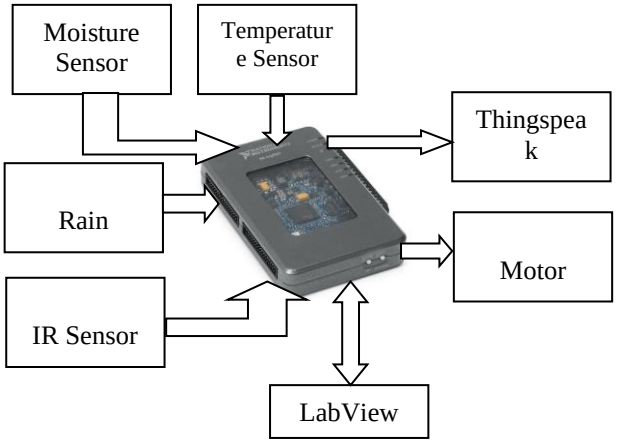


**Figure 2 : Block diagram of Interfacing unit**

**In Figure 3** in our proposal, we used rain sensor to detect weather it is raining or not. If it is raining ground water must be stored in the tank and sprinkler should be off if it is on. Behalf of it we are measuring the rain level and monitored through IoT.

**Figure 3: Rain Sensor-HL**

**In Figure 4,** Soil moisture sensor is to detect the moisture of the soil and gives the reading to myRIO. myRIO will send data to cloud.

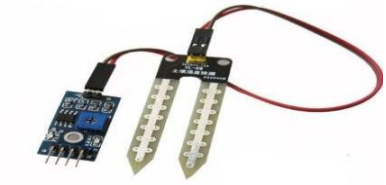

**Figure 4: Moisture Sensor-YL69**

**In Figure 5,** our proposal we used IR Sensor to check the tank level. If tank level is less than the threshold value motor is on to fill the water if water reaches the threshold IR sensor will detect and send signal to myRIO to stop the motor.

**Figure 5: IR Sensor**

The effective distance range 2 ~ 10cm working voltage of 3.3V-5V.The detection range of the sensor can be adjusted by the potentiometer, with little interference, easy to assemble, easy to use features, can be widely used robot obstacle avoidance, obstacle avoidance car assembly line count and black-and-white line tracking and many other occasions.

**In Figure 6, t**he purpose of tank motor is to fill the tank when water level is less than 90%. If it is raining the tank motor will be off.

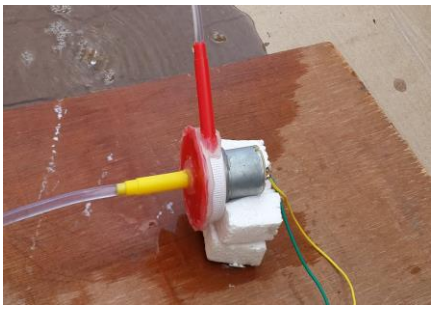

**Figure 6: 5v DC Motor**

**In Figure 7, t**he purpose of sprinkler is to sprinkle the water automatically when the soil moisture is less than the threshold level.

**Figure 7: Sprinkler**

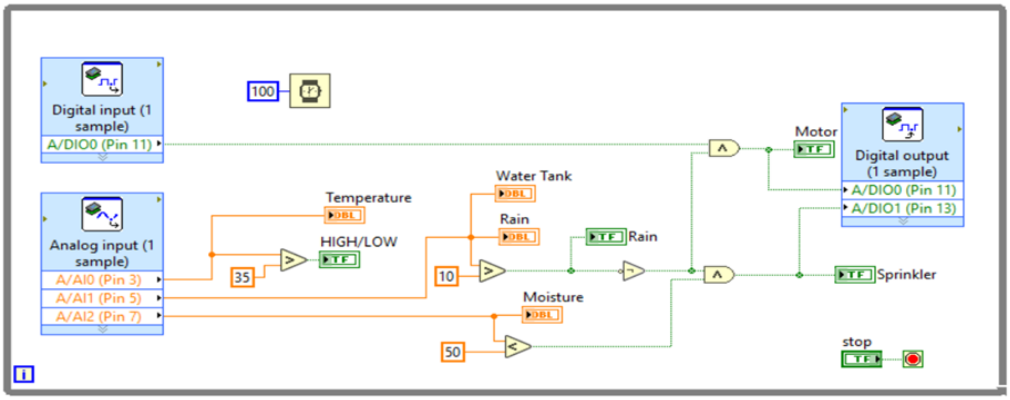


**Figure 8: LabVIEW Interface for Proposed Model**

## I. PROPOSED TECHNIQUE

In Figure: 8 the block diagram of LabVIEW Interface for smart field system is shown. It will give graphical analysis of the rain sensor, temperature 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. LabVIEW is a tool which uses Graphical programming language for testing, measuring, monitoring and automation. NI LabVIEW is used to program myRIO to interface sensors [7].

The following steps are the proposed system undergoes.

**Step 1:** Data Initialization and power supply to interface devices - **START**

**Step 2:** Read the Temperature(T) range.

**Step 3:** If T <= Fixed threshold value, the pump in OFF mode i.e, No irrigation in the field.

**Step 4:** if T > Fixed threshold value, the pump in ON mode i.e, Start irrigation in the field.

**Step 5:** Read the Moisture (M) level

**Step 6:** If M > Fixed threshold value, no need to irrigation, the pump will be off.

**Step 7 :** Read Rain (R) Also if it's raining, repeat step 6.

**Step8: :** if T > Fixed threshold value, and no rain conditions the pump in ON mode i.e, Start irrigation in the field.

**Step 9:** Initialization of pump and displaying data on LabVIEW interface and Thingspeak. GUI can also control the motor manually.

**Step10:** Once the process is completed, it returns back to original state (step3).

**Step11:**Process **STOP.**

In LabVIEW front panel all the indicators are placed so that farmer can know what is happening in the field through mobile phone. When moisture of the soil is very less the sprinkler motor will automatically starts and prays the water till the moisture of the soil is above threshold point. When there is a rain, the rain sensor will detect the rain and stops the sprinkler motor if it is on and stores the rain water into the water tank through ground water harvesting. IR sensor is used to detect the water level in the water tank, if the water in the tank is less than 90% the motor with automatically on to fill the tank. This project is a feedback system in which all the sensors interfaced with myRIO will communicate with each other and works accordingly. The Table 1 shows the different range of setting used in the LabView module for the simulation.

**Table 1: Simulation Parameters**

| Sl.No | Parameters | Range |
|---|---|---|
| 1. | Digital Input | 0 or 1 Logic |
| 2. | Analog Output | 0 to 5 V |
| 3. | Temperature Sensor | 0 to 5 V |
| 4. | Rain Sensor | 0 to 5 V |
| 5. | Moisture Sensor | 0 to 5 V |
| 6. | Water Tank | 0 to 5 V |
| 7. | Motor | 0 or 1 Logic |
| 8. | Sprinkler | 0 or 1 Logic |

## II. RESULTS & DISCUSSIONS

Table 2 shown the experimental setup connected to myRIO and sensors.

**Table 2: Experimental Output**

| Type of Soil | Time | Dry Condition (V) | Wet Condition (V) | Temperature (C) |
|---|---|---|---|---|
| RED | 9:20:25AM | 4.34 | 1.23 | 30.65 |
| | 12:40:12PM | 4.77 | 1.53 | 32.52 |
| | 01:35:4PM | 4.81 | 1.86 | 33.32 |
| BLACK | 9:23:27AM | 4.45 | 1.32 | 29.52 |
| | 12:30:15PM | 4.78 | 1.36 | 30.34 |
| | 1:45:34PM | 4.56 | 1.67 | 29.67 |
| CLAY | 9:15:29AM | 4.56 | 1.28 | 30.61 |
| | 1:15:18AM | 4.71 | 1.31 | 31.78 |
| | 02:05:34PM | 4.83 | 1.89 | 33.26 |

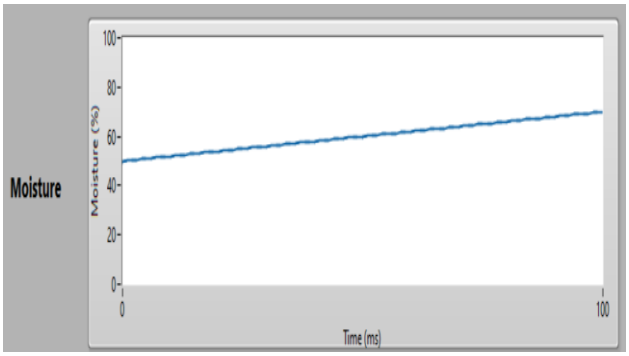


**Figure 9: Experimental setup**

In Figure 9 graph indicates the soil moisture percentage range with respect to time, when its percentage range is less than 40% the sprinkler will automatically switch on, when the moisture percentage is more than 40% the sprinkler will be automatically switched off.

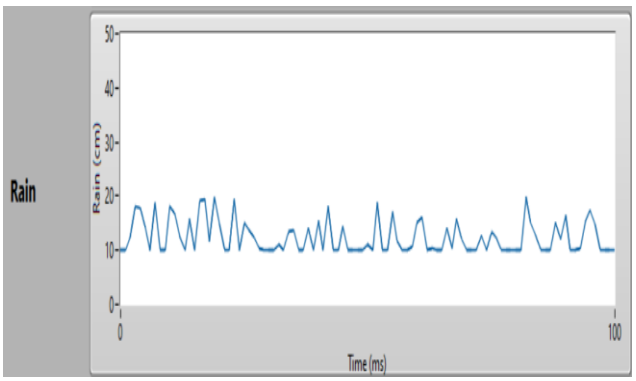


**Figure 10: Experimental setup**

In Figure 10, graph indicates the detection of rain. When there is rain there will be change in graph or else constant line will be displayed.

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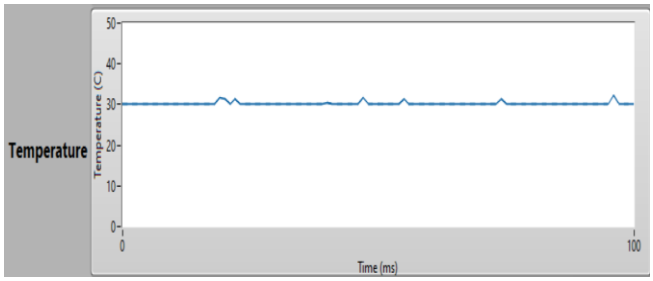


**Figure 11: Temperature monitoring**

In Figure 11 graph indicates the field temperature. Based on high /low indicator in the front panel the former can do the necessary actions to be performed.

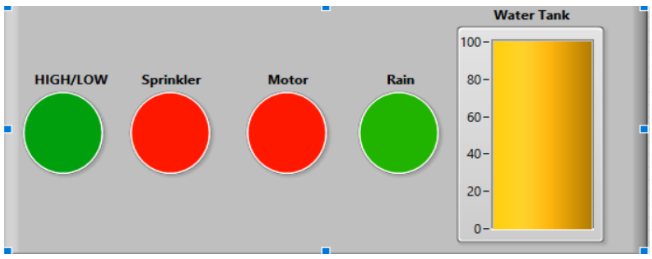


**Figure 12: Level of Indicators**

In Figure 12, different level of indicators indicates whether temperature is in range or not, sprinkler is on /off, Motor is on /off, is it raining or not and rain water and motor water will be stored in water tank.

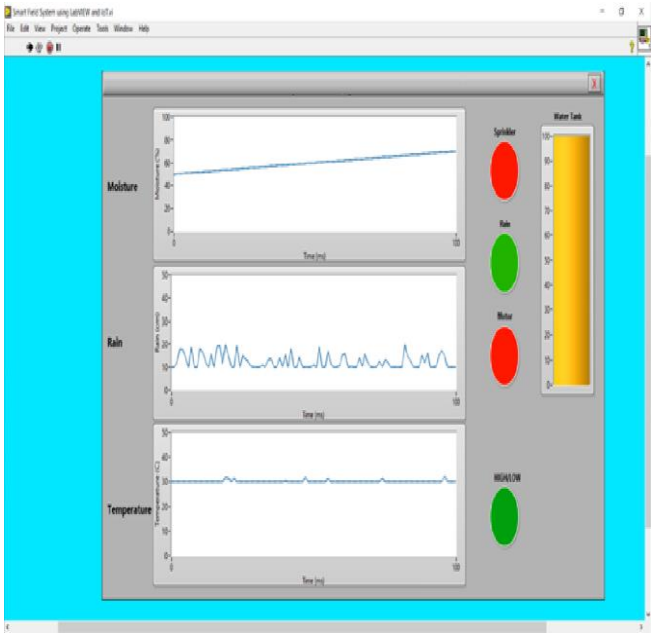


**Figure 13: Monitoring and Controlling system**

In Figure.13 the front panel screen which is displayed to farmer in mobile phone through cloud. Based on this the farmer can do agriculture from home are from office. This is the reason making this forming as smart field system.

## III. CONCLUSION

This concept is a similar design technique of monitoring and controlling the farming parameters using LabVIEW. Providing valuable tools that need to build any measurement or control application graphically in less time, LabVIEW is the unique development tool for innovation, discovery and accelerated solution for human problems. We have combined the power of LabVIEW software with reconfigurable hardware myRIO to overcome the ever - increasing complexity involved in providing measurement and control systems on right time and less cost. The rain sensor is very important to avoid unnecessary power wastage by motor as well as saving the water. Moisture measuring is critical in agriculture to help farmers manipulate their irrigation process more successfully. This paper will help the farmers to use less water to grow a crop though increase growth in yields. Embedded system for computerized irrigation of agriculture gives a real-time solution to assist web page- precise irrigation control which permits farmers to increase their productivity and develop the nation.

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