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Design and Implementation of Wireless Automated Irrigation System

Abu Rayhan[1], Sumi Akter[2], Monir Morshed[3], Md. Abdullah Al Mamun[4], Md. Atiar Rahman[5], Fazlul Huq[6]

[1,2,3] Dept. of ICT, Mawlana Bhashani Science and Technology University, Tangail, Bangladesh
[4,5]Electronics Division, Atomic Energy Centre, Dhaka, Bangladesh
[6]Dept. of Nuclear Engineering, University Of Dhaka, Bangladesh

Abstract: **To get sufficient amount of yield from our land there exist no alternative of irrigation. To reduce the cost of irrigation, to reduce the waste of water and to keep people save from current shocks the designed and implemented Wireless Automated Irrigation System Using Lab VIEW will play an important role. The system checks the moisture amount in the soil through soil moisture sensor. The solenoid valve will automatically pump water into the irrigation field. By using this type of moisture sensor, the nature of soil can easily find out whether the soil is wet or dry. If it is dry, it will be watered automatically. In this system, the main controlling device is microcontroller Atmega32. Here soil moisture sensor will provide the status of the soil to the microcontroller, depending on that; microcontroller will display the status of the soil on the LCD and switch on or off the pumping motor through relay. The aim of this research is to design and implement a user friendly, reliable and automated wireless watering system. The system has simpler features designed with the objective of low cost and effective with less power consumption. It also has special feature of wireless transmission and reception the sensor values; also user can monitor the sensor values from remote computer through Lab VIEW.**

Keywords: **The Groove moisture sensor, Microcontroller, LCD, Relay, Solenoid valve, Lab VIEW, Wireless network.**

I. INTRODUCTION

Agriculture is considered as key in economy and development of the country like Bangladesh. In our country, the farmers have been using manual control techniques for irrigation. Land is irrigated only at the regular time intervals. In this way, few plants will receive more water and others get dried [1].Most of the farmers use old system to water their plant in the field and also in the garden. But this process is not efficient [2]. When we will use the old traditional process for watering our irrigation system, the possibility to give watering is high or may be very low [3]. So that, few plants can drown when we provide too much water to them. The purpose of this project is to monitor and control the water flow to an irrigation system. This type of way can be achieved by the use of soil moisture sensor, which senses the amount of dielectric constant in the soil [4]. Here soil moisture sensor will give the level/status of the soil; this sensor value will be displayed on the LCD based on the microcontroller and will be switched on or off the solenoid valve through solid state relay. The solenoid valve will pump the water into the field until the field is wet which is continuously controlled and monitored by the microcontroller [5]. The sensor output is sent to a Microcontroller *atmega32* and this Microcontroller *atmega32* controls the process. LabVIEW is used for data processing in the computer and data is sent and received to the computer through wireless transmitter and receiver [6].

II. METHODOLOGY

This work is an application of a wireless sensor network for low-cost wireless controlled irrigation solution and real time monitoring of water content of soil based on soil moisture sensors. Precision water-saving irrigation automatic control

system is now a popular system for us. The wireless sensor network is used for precision agriculture where real time data of pest control in order to offset the critical conditions. The environmental characteristics are sensed and relayed to a main repository. An optimized agricultural production by carefully tailoring soil and crop management to correspond to the unique condition found in each field while maintaining environmental quality. The system sets the irrigation time depending on the soil moisture sensor and reading from sensors and type of crop and can automatically irrigate the field when anybody not present here. The sensor value is exchanged between far end and designed system through transmitter and receiver. The system block diagram and flow chart are shown in fig.1 & fig.2 respectively.

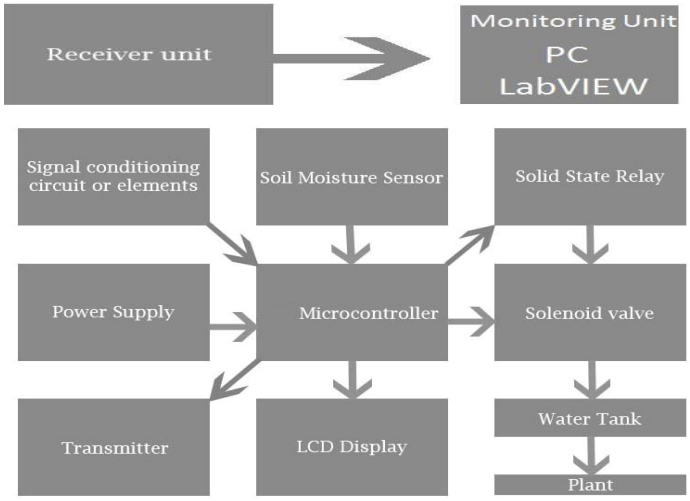

Fig. 1 Block Diagram of the designed system

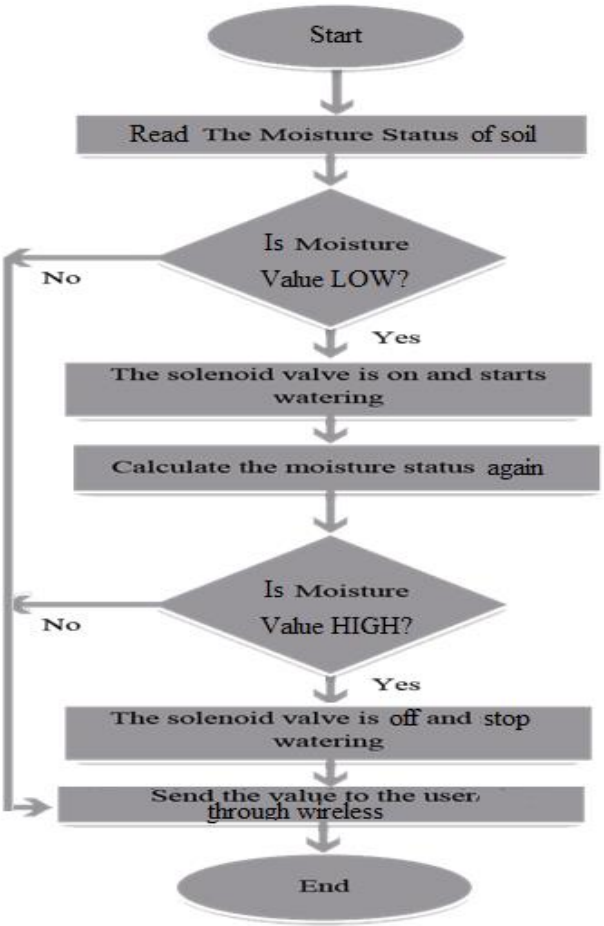

Fig. 2 Flow chart of the system operation

A. Hardware Design:

Here, the experimental part describes the complete design and implementation procedure of the system.

Schematic diagram and PCB (Printed circuit board): These are designed for this system by Proteus professional electronics design software. PCB is usually used for placing capacitor, resistor, crystal, microcontroller, push, led etc. This board controls the main functionality of this system.

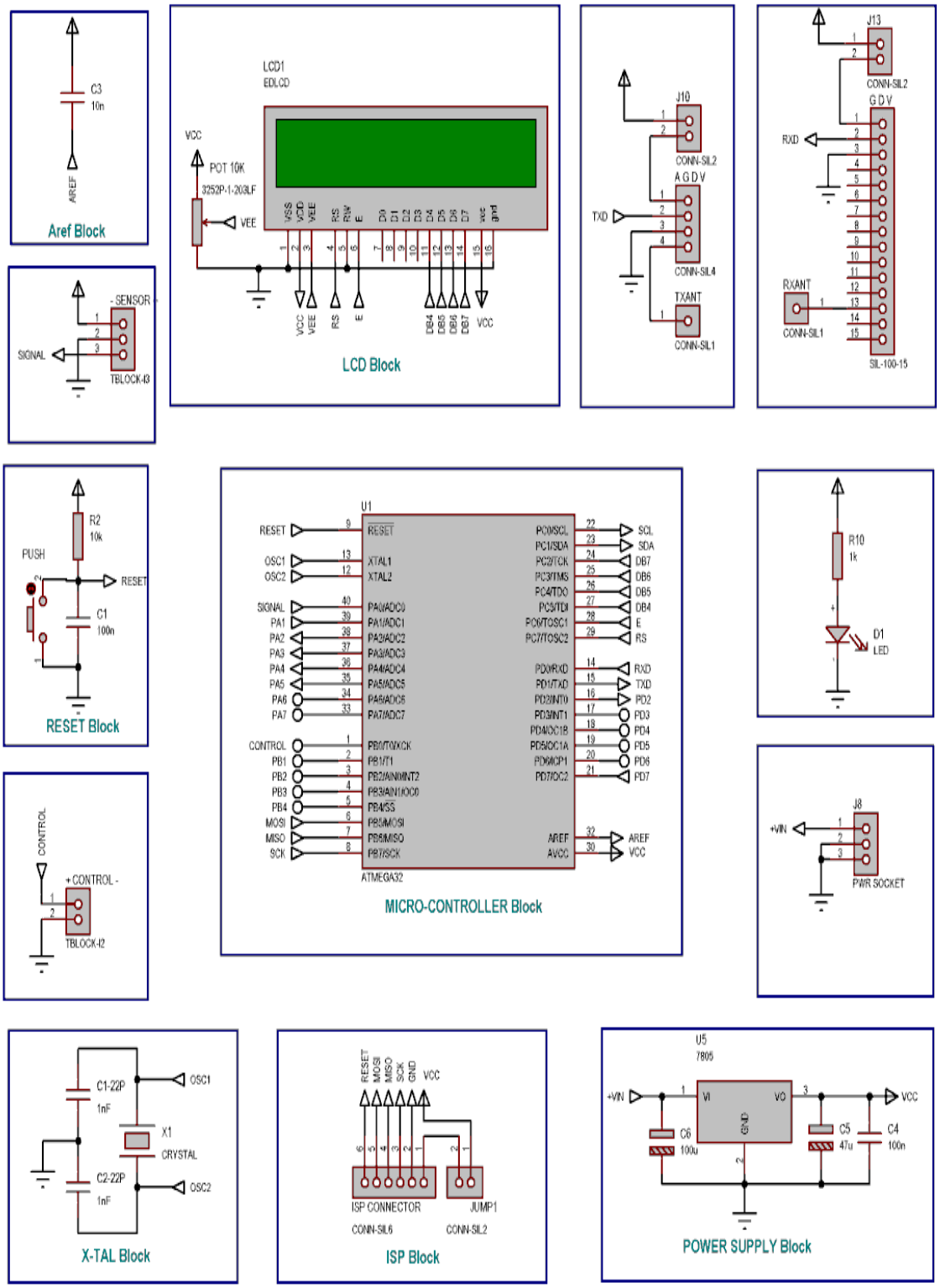

Fig. 3 Schematic diagram of the designed system

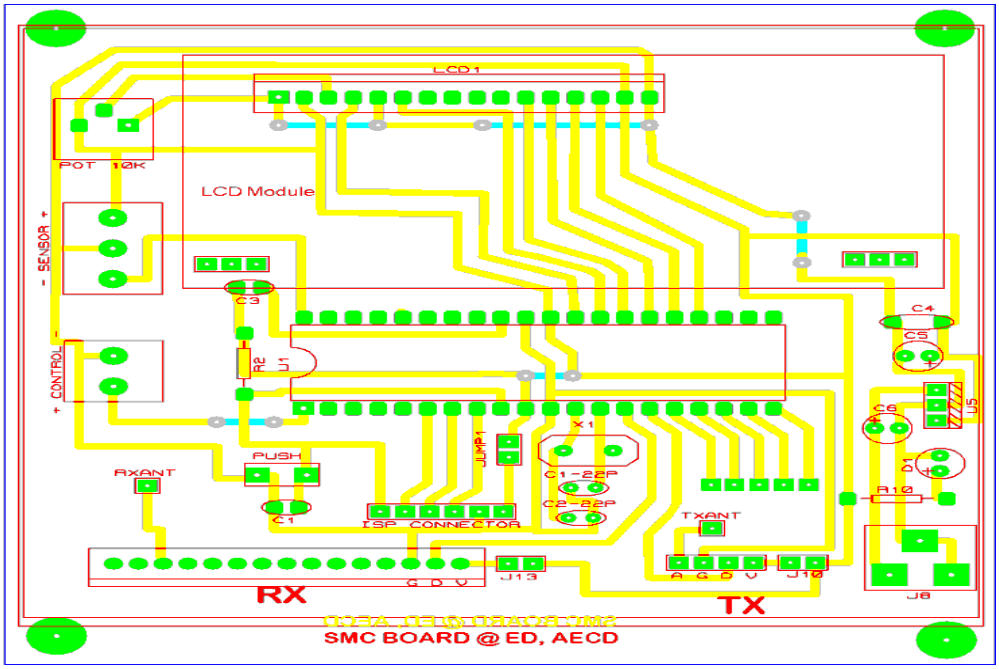

Fig. 4 Printed Circuit Board

The main component here is the Atmega32 microcontroller, which synchronizes all the module operations. The CPU use calibrated 16 MHz external Crystal Oscillator. The microcontroller is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega32 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed [7]. LCD module (Qy-1602A) has been used for local real-time data display. The dot matrix alphanumeric LCD is configured in 4-bit mode with read-write control (WR) pin grounded. This configuration requires less number of I/O pins of microcontroller, typically 6 only. UART to Wireless TX (KST-TX01) Converter is used to convert for wireless communication.

Sensor module: Grove - Moisture Sensor (SEN92355P) is used to detect the moisture of soil or judge if there is water around the sensor. They can be very easy to use, just insert it into the soil and then read it. Its measuring technique is based on soil resistivity measurement [8]

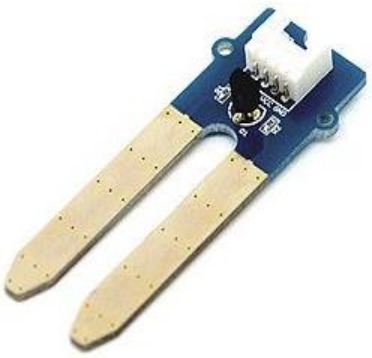

Fig. 5 Sensor Module

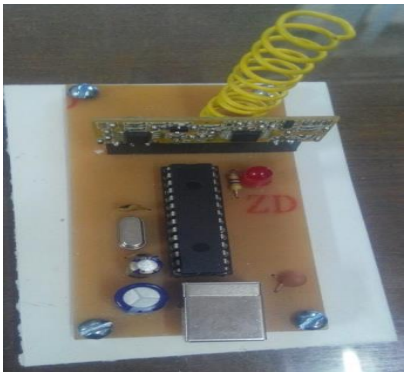

Fig 6. Wireless USB Receiver Module

Wireless USB Receiver Module: This board is used in PC side for receiving the transmitted signal (Status of soil moisture and watering) from the system board. This board is USB interfaced to the computer.

Solid state relay & Solenoid Valve: It is used for control the on-off system automatically. The relay takes the signal from relay board and then it control the on and off according to the value of dielectric constant on soil. The solenoid valve is used for the purpose of controlling water flow. Using these two devices a relay controlled water flow board has been developed.

Water Tank: A water source is essential for watering the irrigation field, that's why a water tank is used as a source of water. Some water is stored in the tank and when soil moisture sensor reading is LOW then the relay is on and the water is come from the tank to the irrigation field.

B. Software Design:

Application Software: Lab VIEW is used to show the current status of soil moisture and watering of the system. This is mainly used for graphical presentation of the system. This has addition advantages to log the data for future analysis. The design is given below.

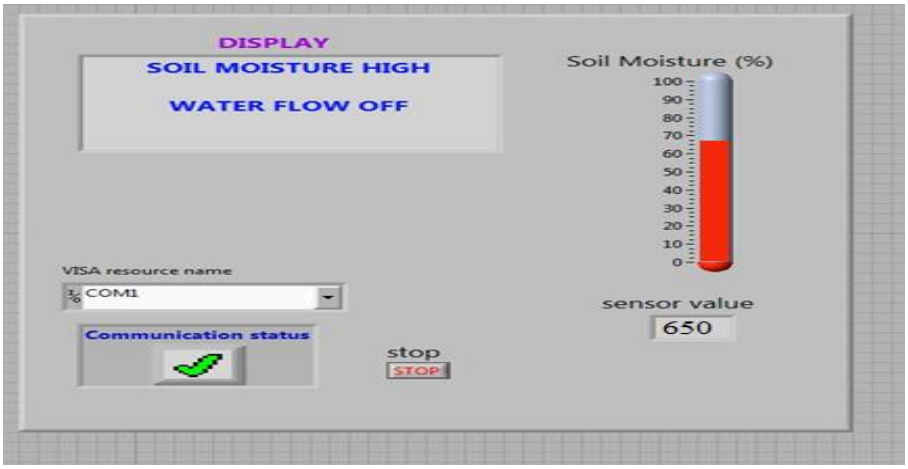

Fig. 7 User Interfac

***BASCOM-AVR*:** BASCOM- AVR is a very powerful and easy-to-use compiler for the AVR series of micro controllers. The AVR is used to make a programming code that was loaded on the microcontroller.

Proteus 7.7 professional: The PCB and schematic board is designed with this software. This software also supports the simulation of the designed system which will offer more accurate system design.

III. RESULT AND DISCUSSION

We got the maximum value of the sensor 800 mV when we have used it on water. So we are using 800 mV as the maximum value. We can find the percentage value with the equation,

Moisture value (%) = (Sensor Value/800) *100;

When the soil is dry, the sensor output value is about 0-199 mV. The voltage 9 V is given to microcontroller Board. This voltage is enough to drive and turn on the relay. Also, the "Solenoid Valve" is ON.

Similarly, when the soil is wet, the sensor output voltage is from 200-800 mV. Then the relay is turned off. Also, the "Solenoid Valve" is OFF. Table 1 show the reading obtained from sensor value relay status and soil nature. The sensor will sense the moisture of the soil in every period. The measuring values are shown in Table 1.

TABLE I: THE SENSOR VALUE, SOIL NATURE AND RELAY STATUS FOR THE SYSTEM

Sl No.	Sensor value (mV)	Soil Nature	Relay Status
1	50	Dry (6. 25%)	On
2	95	Dry (11.87%)	On
3	172	Dry (21.5%)	On
4	215	Wet (26.9%)	Off
5	292	Wet (36.5%)	Off
6	413	Wet (51.6%)	Off
7	561	Wet (70.12%)	Off
8	693	Wet (86.62%)	Off
9	769	Wet (96.12%)	Off
10	800	Wet (100%)	Off

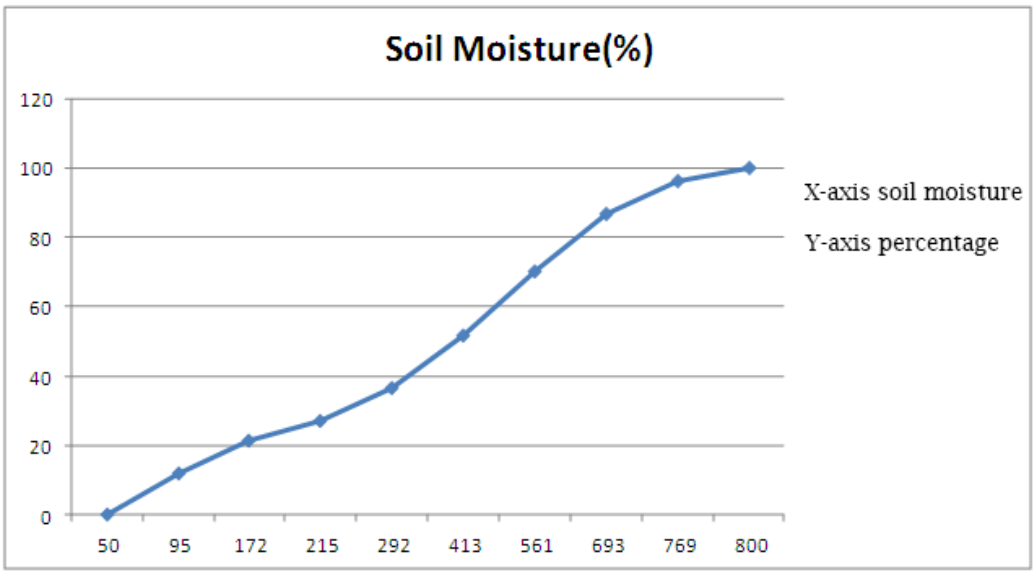

Fig. 8 Graph (soil sensor value vs. % of soil moisture)

Fig. 9 The final developed system

IV. CONCLUSION

The developed technique is designed to control the water flow (irrigation) automatically based on the soil moisture sensor value calculated by microcontroller. This advancement in soil moisture sensing, makes the commercial use of this technology, possible to automated controlling of irrigation system and monitoring remotely in PC by application software developed by Lab VIEW. This application of sensor-based irrigation system has many advantages such as preventing moisture stress of plans, measuring fertility of soil, save cost, time and money.

REFERENCES

[1] N. Dinesh Kumar, S. Pramod & CH Sravani, 2013, "Intelligent Irrigation System", International Journal of Agricultural Science and Research (IJASR).

[2] Purnima, S.R.N. Reddy, June 2012, "Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM-Bluetooth" International Journal of Computer Applications (0975 – 888).

[3] Pranita A. Bhosale, Prof. V. V. Dixit, December 2012, "Water Saving-Irrigation Automatic Agricultural Controller" international journal of scientific & technology research.

[4] Siddhiraj Pednekar , R.B lohani and Gajanan Gawde , "Soil Moisture Sense to Trigger Irrigation" Department of Electronics & Telecommunication engineering, Goa Engineering College.

[5] Sanjukumar, R.V. Krishnaiah, 2013, "Advance Technique for Soil Moisture Content Based Automatic Motor Pumping for Agriculture Land Purpose", International Journal of VLSI and Embedded Systems-IJVES.

[6] Biswadarshi Naik, Pallavi Behera , Baijayanti Mala Das, Prof. Susmita Das, 2012, "Hardware implementation of soil moisture monitoring system" Department of Electrical Engineering National Institute of Technology, Rourkela.

[7] "ATmega32 (L)"; http://www.atmel.com/images/doc2503.pdf.

[8] http://www.seeedstudio.com/wiki/Grove_-_Moisture_Sensor.