

Embedded based Agriculture Automation using Mobile Technology

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Abstract— Agriculture plays the major role in economics and survival of people in India. Nowadays Indian agriculture faces a two major problem. They are as follows we know government has promoted a free supply of electricity for farmers to run their motors and pumps for irrigation purpose. But it is found that the farmers misusing the electricity to run their home appliances such as radio, TV, fans, etc. This misuse of electricity has brought a considerable problem for government to supply free electricity. The main aim of this project is to design low cost Automated Irrigation System using a Wireless Sensor Network and GPRS Module. The Purpose of this project is to provide embedded based system for irrigation to reduce the manual monitoring of the field and get the information in the form of GPRS. This proposed system recognizes whether the free electricity has been used other than electric motors for pumping water and if so electricity is being misused, it shuts the total supply for the farmers through a tripping circuit. By using wireless networks we can intimate the electricity board about these mal practices. The development of this project at experimental scale within rural areas is presented and the implementation was to demonstrate that the automatic irrigation can be used to reduce water use.

Keywords– PH,HUMUNITY Sensor, Embedded Architecture.

I. INTRODUCTION

Agriculture plays the major role in economics and survival of people in India. Nowadays Indian agriculture faces a two major problem. They are as follows; know government has promoted a free supply of electricity for farmers to run their motors and pumps for irrigation purpose. But it is found that the farmers misusing the electricity to run their home appliances such as radio, TV, fans, etc. This misuse of electricity has brought a considerable problem for government to supply free electricity. Since most of the farmers have less knowledge about the nature of their soil and its fertility, they cannot find the right seeds for their fields to be sowed.

To avoid these problems a microcontroller based embedded system has been proposed in this project. This proposed system recognizes whether the free electricity has been used other than electric motors for pumping water and if so electricity is being misused, it shuts the total supply for the farmers through a tripping circuit. By using wireless networks can intimate the electricity board about these mal practices.

This system also helps the farmers to find their soil fertility. In this paper also use humidity sensor to identify humidity of the soil where as this senses automatically water will pumped to certain field.

The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants. In addition, a gateway unit handles sensor information, triggers actuators, and transmits data to a web application. An algorithm was developed with threshold values of temperature and soil moisture that was programmed into a microcontroller-based gateway to control water quantity.

The development of the automated irrigation system based on microcontrollers and wireless communication at experimental scale within rural areas is presented. The aim of the implementation was to demonstrate that the automatic irrigation can be used to reduce water use. This gateway permits the automated activation of irrigation when the threshold values of soil moisture and temperature is reached. Communication between the sensor nodes and the data receiver is via the GSM.

The without internet connection allows the data inspection in real time , where the soil-moisture and temperature levels are graphically displayed through an application interface and stored in a database server. Because of its energy autonomy and low cost, the system has potential use for organic crops, which are mainly located in geographically isolated areas. The already existing system uses simple water pumps to supply water to the crops as and when required by manual control with WI-FI.

Another disadvantageous method is the discontinuous monitoring of the water level by using WI-FI technology. But, the proposed system uses automatic control by using continuous monitoring by GSM. The use of binding coils for communication purpose is practically impossible. This is because when long distances are involved, it leads to damage of the coils and also disruption in communicating information between the field and the centre and the use of coils for communication purpose is economically not possible.

The development of the automated irrigation system based on microcontrollers and wireless communication at experimental scale within rural areas is presented. The aim of the implementation was to demonstrate that the automatic irrigation can be used to reduce water use. A microcontroller for data acquisition, and transceiver; the sensor measurements are transmitted to a microcontroller based receiver.

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GSM wireless system on the agricultural land by regulating with the use of micro-controller. Thereby the use of wireless communication for the monitoring and controlling on the agricultural land is highly essential

This gateway permits the automated activation of irrigation when the threshold values of soil moisture and temperature is reached. Communication between the sensor nodes and the data receiver is via the GSM. This receiver unit also has a duplex communication link based on a cellular Internet interface, using General Packet Radio Service (GPRS) protocol, which is a packet oriented mobile data service cellular global system for mobile communications (GSM).

The GSM connection allows the data inspection in real time on a mobile, where the soil-moisture and temperature levels are graphically displayed through an application interface and stored. This access also enables direct programming of scheduled irrigation schemes and trigger values in the receiver according the crop growth and season management. Because of its energy autonomy and low cost, the system has potential use for organic crops, which are mainly located in geographically isolated areas where the energy grid is far away.

The potential and current transformers are used for avoiding the misuse of electricity. Both the transformers are allows particular current for agriculture applications. If it is used for other applications beyond agriculture the information is intimated to the Electric Boards.

II. SYSTEM ARCHITECTURE

A. BLOCK DIAGRAM

Figure 1: shows the block diagram for automated irrigation system.

The features of the proposed system are,

- ☐ Intelligent monitoring of electricity misuse
- ☐ Controls the malpractice
- ☐ Misuse can be intimated to EB.
- ☐ Soil type recognition.

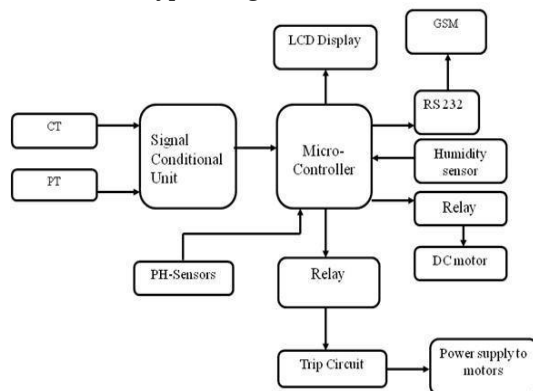


Fig.1 Block diagram of automated irrigation system

A (Existing system)

Block Diagram

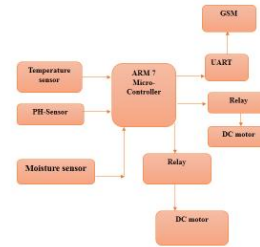


Fig.2(Proposed System)

B. SENSORS

Figure 2: The temperature sensor used to measure the temperature at the field is LM 35. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade). The LM35 does not require any external calibration or trimming to provide typical accuracies of degree C at room temperature and degree C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.



Figure 3: Temperature Sensor

Figure 3: A humidity sensor also called a hygrometer, measures and regularly reports the relative humidity in the air. A humidity sensor senses relative humidity. This means that it measures both air temperature and moisture. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature. The most common type of humidity sensor uses what is called "capacitive measurement." This system relies on electrical capacitance, or the ability of two nearby electrical conductors to create an electrical field between them.

The sensor itself is composed of two metal plates with a non-conductive polymer film between them. The film collects moisture from the air, and the moisture causes minute changes in the voltage between the two plates. The changes in voltage are converted into digital readings showing the amount of moisture in the air.



Figure 4: Humidity Sensor

C. ARM7 LPC2148 MICROCONTROLLER

IC ARM7 LPC2148 is an 8-bit microcontroller with 8k×14-bit flash program memory, 368 bytes of RAM and many other extra peripherals like ADC, universal synchronous asynchronous receiver transmitter, master synchronous serial port, timers, compare capture and pulse-width modulation modules, and analogue comparators. It is based on the reduced instruction set computer (RISC) architecture. 18

The microcontroller processes the sensor output to compute the temperature in degree Celsius. The internal ADC of the microcontroller is used to convert the analogue output of the sensor into its equivalent digital value. The internal ADC of the microcontroller has eight channels of analogue input and gives 10-bit digital output. In this project, the reference voltage to the ADC is the same as the supply voltage to the microcontroller, i.e., 5V. The resolution of the ADC can be calculated as follows: Resolution = $V_{ref} / (1024 - 1)$... (as it is a 10-bit ADC) = $5 / 1023 = 4.887 \text{ mV}$ It means that for 4.887mV change in the analogue input, the ADC output changes by binary „1“ with a reference voltage of 5V. Analogue output of the sensor at its pin 2 is connected to Port A at RA 0 for conversion into digital equivalent LCD Display. The LCD Display is used to provide the user with the digital values converted by the PIC microcontroller. LCD driver is a link between the microcontroller and LCD. It is necessary to interface the LCD according to the driver specification. To understand the algorithm of LCD interfacing user must have datasheet of both LCD and LCD driver. In LCD initialization you have to send command bytes to LCD.

MAX 3232

The MAX3232 cable is used for the purpose of serial communication. The output signal of ARM7.A is in TTL level from 0V to +5V. But for COM port on PC, it needs both positive and negative voltage levels. Therefore, a MAX3232 Level Converter is necessary to perform +5V.

D. UART

In LPC2148 we are having only one UART which is UART0. Generally MAX3232 is used as the UART0. In Every UART input is to receive the data and output is to transmit the data i.e. Receiver we will receive the input data and transmitter will output the data. TXD pin of UART0 is connected to 8th pin of port0 which is TDX1 of the processor and RXD pin of UART0 is connected to 9th pin of port0 of the processor.

E. GPRS

GPRS stands for General Packet Radio Service. GPRS is one of the technologies to improve 2G phones to enable them for transferring data at higher speed. GPRS allows mobile phones to remain-- connected to network and transfer requested or sent data instantly, e.g. if you receive MMS from other mobile phone, you do not need to press a button to check if you have any new MMS. GPRS technology can provide you up to 32 kbps to 48 kbps. One of the features of GPRS technology which makes it even more useful and practical is that data can transfer during the call and there is no requirement of disconnecting call to receiving incoming or outgoing data.

F. RELAY

A relay is an electrically operated switch. The relay is used here to switch the motor to ON /OFF position according to the water requirements. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw switches.



Figure 5: Relay

G. DC MOTOR

A DC motor is a mechanically commutated electric motor powered from direct current (DC). The stator is stationary in space by definition and therefore its current. The current in the rotor is switched by the commutator to also be stationary in space. DC motors have a rotating armature winding but non - rotating armature magnetic field and a static field winding or permanent magnet. Different connections of the field and armature winding provide different inherent speed/torque regulation characteristics. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. Modern DC motors are often controlled by power electronics systems called DC drives.

III. RESULT AND DISCUSSION

The automated irrigation system is designed and simulated in PATIENT Simulation software. Figure 5 shows that overall design of automated irrigation system in patient software.

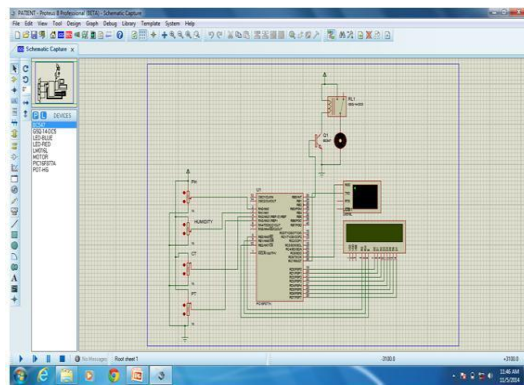


Figure 6: Overall design of automated irrigation system

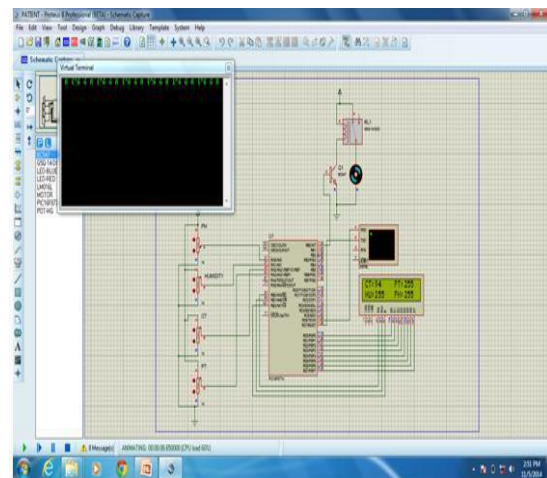


Figure 7 shows when the pH value get increased then the motor automatically go into ON state.

Figure 7: Motor in ON state.

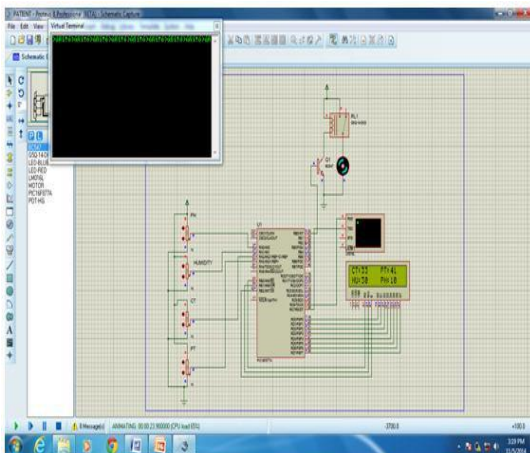


Figure 8 shows when the pH value get reduced then the motor automatically go into OFF state.

Figure 8: Motor in OFF state.

IV. CONCLUSION

The automated control is implemented here to avoid damage of crops due to surplus or deficit usage of water. The already existing system uses simple water pumps to supply water to the crops as and when required by manual control. Another disadvantageous method is the discontinuous

monitoring of the water level by using GSM (global system for mobile communications) technology. But, the proposed system uses automatic control by using continuous monitoring.

Thus the continuous monitoring of the agriculture was designed and developed using various microcontrollers by using GPRS. In existing method, only discontinuous was obtained by the use of GSM which led to inefficient use of water and electricity. Hence by incorporating this method, the water and electricity was used efficiently. Compared with the existing method it gives better performance. So we can avoid these problem in a very efficient and innovative manner with the help of micro controller (arm 7), with the help of wireless technology protocol through very sensitive sensors.

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