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# Fabrication of an Intelligent Irrigation Monitoring System Using Wireless Network

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## Abstract:

The paper real time atomization of agriculture environment for social modernization of Indian agriculture system using ARM7 and GSM is focused on atomizing the irrigation system for social welfare of Indian agriculture system.

The is implement by using advanced processor ARM7TDM which is a 32bit ARM microcontroller, GSM sever as an important part as it is responsible for controlling the irrigation on filed and sends them to the receiver through coded signal. GSM operates through SMSs and is the link between ARM processor and centralized unit.ARM7TDMI is an advanced version of ARM microcontroller and forms the heart of system.

Our project aims to implement the basic application of the irrigation field by programming the components and building the necessary hardware. This project is used to find the exact field condition. GSM is used to inform the user about exact field condition. The information is given on user request in form of SMS. GSM modem can be controlled by standard set of AT (Attention) command.

These commands can be used to controlled majority of the function of GSM modem.In this paper we proposed a low cost and efficient wireless sensor network technique to acquire the signal moisture and temperature from various location of farm and as per need of crop controlled take a decision to need irrigation system ON or OFF.

## Key words:

LPC2148, Temperature sensor, Humidity sensor, GSM network, Mobile Phone.

## I. INTRODUCTION:

Agriculture continuous to play a major role on Indian Economy Sector is charging the socio-economic environment of the population due to liberalization and globalization. Irrigation system in India has given a high priority in economic development. Many new concepts are being developed to allow agriculture automation to flourish and deliver its full potential. To take full advantage of these technologies, we should not consider the implementation of developing a new signal technology but should look at the wider issues for complete development of a system.

Another important reason of this is due to unplanned use of the water due to which a significant amount of water goes waste. At present era the farmer have been using irrigation techniques in India through the manual control in which the farmer irrigate the land at regular interval. This process sometimes consumes more water or sometimes reached late due to which crop get dried. All these problems can be perfectly resolved by using an automatic drip irrigation system in which the irrigation will take place only when there will be requirement of water. The irrigation system uses Relay switch to ON and OFF the irrigation water pump.

Temperature sensor that are currently being used are liner with temperature, 0.05mV/0C scale factor, with 0.5 0C accuracy guarantee able (at +25 0 C). Low cost is assured by trimming and calibration at the wafer level. It works on principal of conductance of electricity, when two electrodes A and B are placed parallel to each other in medium and electric current passed; the resistance to the flow of electrically is proportional to the moisture content in the medium. As the moisture level increases, conductivity decreases and sensor is calibrated to output the moisture level.

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The current works aims to develop to a Wireless sensor network based low cost soil temperature and moisture monitoring system that can track the soil temperature and moisture of the filed in real time and there by allow water to be dripped on to the field if the soil temperature falls below a prescribed limit depending in the nature of crop grows in the soil. The sensors take the inputs like moisture, temperature and provide these inputs to the ARM microcontroller.

The ARM microcontroller covert these inputs into its desired form with the program that is running on it and gives output in the mode of regulation of water flow according to the present input condition. The complete system is implementing for smart Irrigation Application using GSM module and field sensors like temperature, humidity and also soil moisture sensors. The system is designed using ARM microcontroller and GSM module. The system can control relay for irrigation.

## II. RELATED WORK:

The objective of the proposed system is to design and implement a modern agriculture industries are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variable atmospheric circumstances these conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually. It is observed that for the first time an android phone-control the Irrigation system, which could give the facilities of maintaining uniform environmental conditions are proposed. For such an environment, such as radiation, pollution, dangerous, distributed environment where the staff is not easy to reach, it is difficult to complete data collection and real-time monitoring through the traditional manual method.

Drip irrigation is an artificial method of supplying water to the roots of the plant. It is also called micro irrigation. In past few years there is a rapid growth in this system. The user communicates with the centralized unit through SMS. The centralized unit communicates with the system through SMS which will be received by the GSM with the help of the SIM card. The GSM sends this data to ARM7 which is also continuously receives the data from sensors in some form of codes.

After processing, this data is displayed on the LCD. Thus in short whenever the system receives the activation command from the subscriber it checks all the field conditions and gives a detailed feedback to the user and waits for another activation command to start the motor. The motor is controlled by a simple manipulation in the internal structure of the starter. The starter coil is indirectly activated by means of a transistorized relay circuit. When the motor is started, a constant monitoring on soil moisture and water level is done & once the soil moisture is reached to sufficient level the motor is automatically turned off &a massage is send to subscriber that the motor is turned off. The water level indicator indicates three levels low, medium, high and also empty tank.

### a. ARM-7 MICROCONTROLLER :

The LPC2148 are based 32bit ARM7TDMI-5TM CPU with real time emulation and embedded trace support, together with 512kb of embedded high speed flash memory. A 128 bit wide memory interface and unique accelerator architecture enable 32 bit code execution at maximum clock rate. With their compact 64 pin package low power consumption, various 32bit TIMERS, 4 channel bit ADC, USB port, PWM channel, 46 GPIO line with 9 external interrupts pins these microcontroller are practically suitable for industrial control, medical system, access and point of sale. With a wide range of serials communication interface, they are also very well suited for communication gateways, protocol converts and embedded soft modems as well as many other general purpose application.

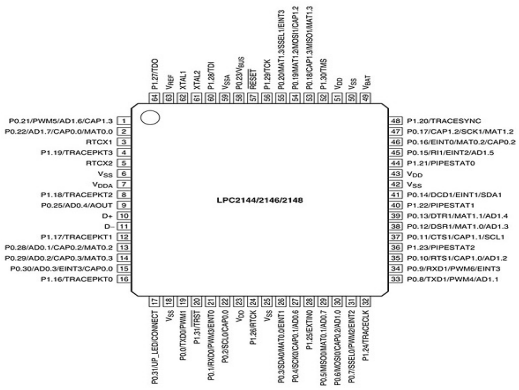


Figure -2 ARM-7 LPC2148 Microcontroller pin diagram.

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## b. TEMPERATURE SENSOR:

The current work uses temperature sensors for monitoring the soil motor is turned off. The water level indicator indicates three levels low, medium, high and also empty tank. temperature. For temperature measurement, LM-35DZ sensors have been used. The soil temperature is one of the important environment factors with a change of climate, topography, vegetation, soil type, planting time, growth and wintering. The temperature sensor LM-35DZ has output voltage that is proportional to the temperature being measured. The scale factor is 0.01 V/oC. The LM-35DZ doesn't require any accuracy of 0.4 oC at room temperature and+0.8 oC over a range of 0 oC to +100 oC.Aonther important characteristics of the LM-35DZ is that it draws only 60 uA of current from its supply and posses a low self-heating capability, the sensor self-heating causes less than 0.1 oC temperature rise in still air.

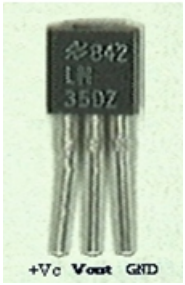


Fig -3: LM-35DZ TEMPERATURE SENSOR

## c. MOISTURE SENSOR :

A designed resistive sensor is used to sense the moisture content in the soil. It works on the principal of electrical conductivity. Resistance of the sensor is inversely proportional to moisture content in the soil. Moisture content of the soil plays a major factor determining plant growth. The moisture sensor have been developed using the basic property that the resistance of the soil between two points decreases with the increase of water content in it.We know that water is good conductor of electricity in the presence of ions. So greater the amount of electrolytes in the soil, grater will be conductivity of the soil. This means that the resistance of the soil decreases. The basic objective of irrigation scheduling is to minimize water stress of plant, that of over irrigation and under irrigation. Good irrigation water management will increase yields, improve crop quality; conserve water, save energy and decreases fertilizers requirements.

The probes are made using tow metal rods tied together using a block. The two probes are separated using smaller foam block which keeps the two probes apart. The developed sensor has two probes that are inserting into the soil.

## d. GSM NETWORK:

Global System for Mobile communication modems are specialized types of modems that operate over subscription based wireless networks, similar to mobile phone. A SIM modem accepts a subscriber identity module card, basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities.

GSM is an open and digital cellular technology used for transmitting mobile voice and data service operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. The GSM network is divided into three major systems: the switching station (SS), the base station (BS), and operation and support system (OSS). In addition GSM modems support an extended set of AT commands.

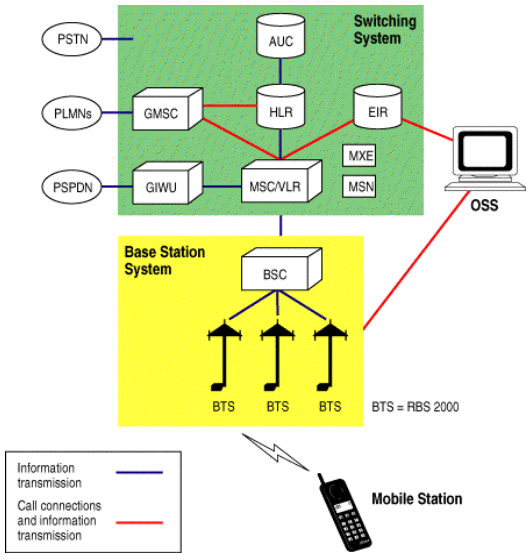


Figure -4: GSM NETWORK

## e. LCD Display module:

One of the most common devices attached to a micro controller is an LCD display.

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A liquid crystal display is special thin flat panels that can let light go through it, or can block the light. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 LCD displays. It means that 16 characters per line by 2 lines were displayed and 20 characters per line by 2 lines were displayed, respectively. Liquid crystal displays are usually abbreviated as LCD's. These displays are often used in battery-powered devices, such as digital watches, since they require very little amount of electricity consumption.


Fig.5. LCD module

### f. Buzzer:

The paper related to finger based voting system uses a buzzer module for audible alerts when any wrong finger print was detected. The buzzer or beeper is an audio based signaling device. It is mainly designed as mechanical, electromechanical, or piezoelectric. There are many typical uses of buzzers and beepers which include alarm devices, timers and also based on confirmation of user inputs such as a mouse click or keystroke.

Fig.6. Buzzer

## III. SOFTWARE DESIGN OF PORTABLE DEVICE:

### Flow Chart:

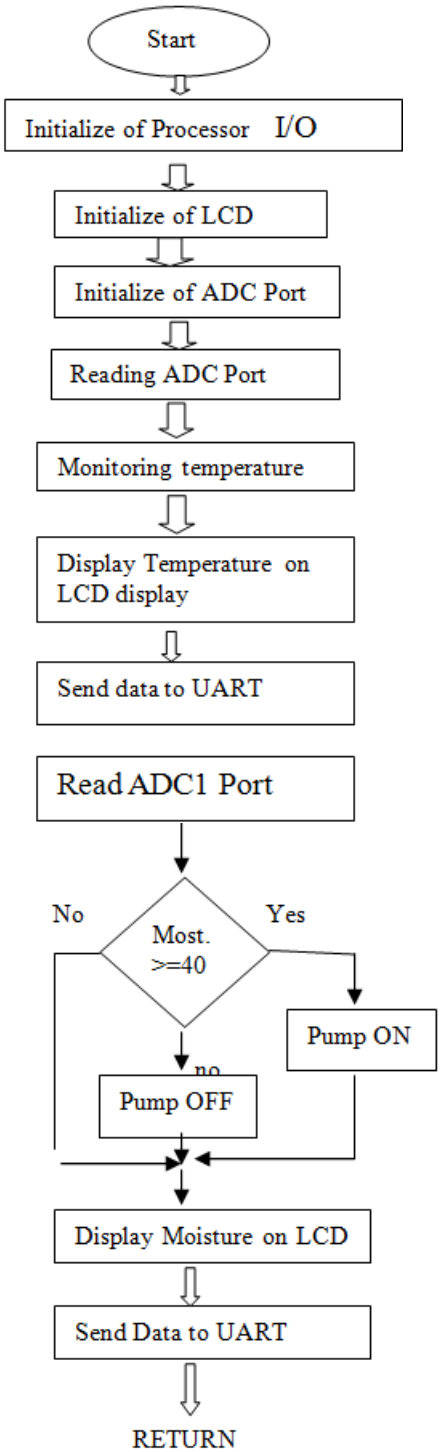


Figure:4 flow chart

The GSM modem is compatible to ARM microcontroller, the control action taken in the field station only by the ARM microcontroller. Here the data coming from the field is given to the ARM microcontroller and this display on LCD. The data coming from the field is less 40% then the irrigation system is start ON Pump and if moisture above 80% then the irrigation systems OFF the Pump.

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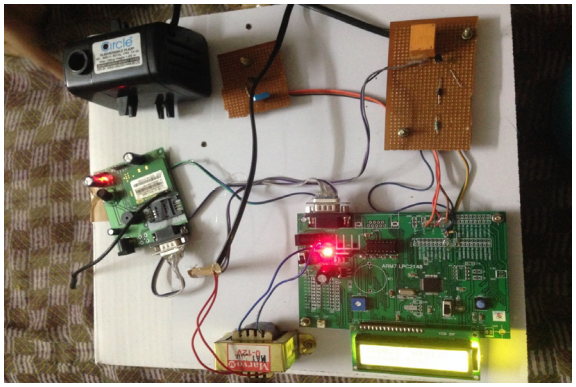

Figure -1 Transmitter circuit.

## Advantages:

» Real-time response, monitoring and controlling.

» Checking the weather conditions and intimating to user.

» It will protect each and every issue regarding plant growth.

» Controlling and managing whole system.

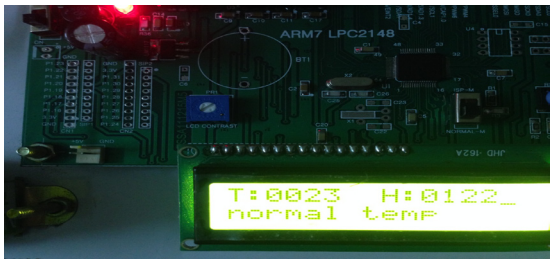


Fig.7. ARM-7 Microcontroller interfacing with LCD

## IV CONCLUSION:

In our country, water is the most important input for increasing crop production and the saved water can be utilized for other crops too, the current work aims to develop a smart irrigation system using soil temperature and humidity sensor. Automation helps in utilization of water for irrigation as per requirement of crop result in better yield of crop compared to normal practices carried out by farmers. The proposed system enables irrigation of the field only when it is needed and thus serves to conserve water. Also proposed system eliminates the intervention of human being for irrigation purposes. The project is thus carried out using ARM7TDMI core with the help of GSM technologies.

This project finds application in domestic agricultural field. In civilian domain, this can be used to ensure faithful irrigation of farm field, since we have the option of finding out moisture level of soil in a particular area.

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