

Advance Farm Irrigation

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Abstract: Traditionally rainfall, canal water and hand pumps are major sources of water supply for irrigation. Irrigation is the process of artificially supplying water to land where crops are cultivated. Advance farm irrigation system which automates the irrigation of land by combining various software and hardware for field irrigation.

Keywords: Traditionally rainfall, canal water, major sources, supply for irrigation.

1. INTRODUCTION

Traditionally in dry regions having no or little rainfall water so on that time another way to supply water to the land through canal, hand pumps, tube wells. But this methods had lots of problems such as increase in workload of farm labour, leaching of soil lesser yield of crop. Hence there was a need to test the soil condition before supplying water to the fields. This mechanism would reduce workload of labour and helps to maintain the proper soil conditions for improved better crop production. Hence in the advance of technology it was possible to design systems that eliminated the direct involvement of farmer with respect to irrigation of their fields. These systems automated the entire irrigation system by controlling the motors that irrigated the fields.

This GSM facility plays important role for controlling the irrigation on field and also sending the results to the farmer via sms, to a mobile device which indirectly controls the entire farm irrigation system. A GSM based irrigation system has two major technologies, primary being the GSM and secondary is the controller. GSM (Global System for Mobile Communication) is a standard set used to describe protocols for digital cellular networks.

In a day, a Bluetooth module is connected with the controller for simplifying the mobile device complications. The controller works as a central unit and its function is to automate the process after it has been initiated by the GSM based device, finally the presents output to the device. This paper contains detailed study of various GSM based farm irrigation approaches. In this paper we have study the advantages and disadvantages of various technologies.

To overcome the drawbacks of existing system like high cost, difficult in maintenance and more wired connection, we introduce a new system which will have wireless connection between server and nodes. We introduce a new design of embedded web server making use of GSM network technology in this paper. Compared to the wired link web server system, this system is characterized by having no wires between the web server and terminal nodes. In proposed system the irrigation will take place only when there will be intense requirement of water. Irrigation system uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers. Automating farm or nursery irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labour to turn valves on and off. In the existing system farmers have to travel to fields often at odd hours just to switch ON/OFF the motor due to erratic power supply. Existing aids like auto-starters are unreliable and incapable of communicating the operating state of the motor, to the farmer, he has to run around to make sure that all the motor pumps are working when the power is available. especially when a farmer has more than one motor pump set; he has to run around to make sure that all the motor pumps are working when the power is available.

At times, motor pumps are left running for longer than what is necessary because of the effort involved in switching OFF the motor. This leads to wastage of both electricity and water. Hence our system is overcome this problem. Also this system is very useful because reduce wastage of water, reduce the human effort and reduce the time

2. HARDWARE REQUIREMENTS (MINIMUM)

- Soil moisture sensor
- Temperature sensor
- Fire sensor
- GSM
- 89S51 Microcontroller
- Display
- Valve

Humidity Sensor:



Fig. Humidity Sensor

Humidity sensor is the amount of water vapour in the air. Water vapour is the gaseous state of water and is invisible. Humidity indicates the likelihood of precipitation, dew, or fog. Higher humidity reduces the effectiveness of sweating in cooling the body by reducing the rate of evaporation of moisture from the skin. This effect is calculated in a heat index table or humidex.

There are three main measurements of humidity: absolute, relative and specific. Absolute humidity is the water content of air at a given temperature expressed in gram per cubic metre.¹ Relative humidity, expressed as a percent, measures the current absolute humidity *relative* to the maximum (highest point) for that temperature. Specific humidity is a ratio of the water vapour content of the mixture to the total air content on a mass basis.

Soil moisture sensors:



Fig. Soil moisture sensors

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

K = Boltzmann's constant

q = charge on an electron

n = a device-dependent

RS-232 Interfaces:



Fig. RS-232 Interfaces

RS-232 is a standard for serial communication transmission of data. It formally defines the signals connecting between a *DTE* (*data terminal equipment*) such as a computer terminal, and a *DCE* (*data circuit-terminating equipment*, originally defined as *data communication equipment*, such as a modem). The RS-232 standard is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors. The current version of the standard is *TIA-232-F Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*, issued in 1997.

An RS-232 serial port was once a standard feature of a personal computer, used for connections to modems, printers, mice, data storage, uninterruptible power supplies, and other peripheral devices. However, RS-232 is hampered by low transmission speed, large voltage swing, and large standard connectors. In modern personal computers, USB has displaced RS-232 from most of its peripheral interface roles. Many computers do not come equipped with RS-232 ports and must use either an external USB-to-RS-232 converter or an internal expansion card with one or more serial ports to connect to RS-232 peripherals. Nevertheless, RS-232 devices are still used, especially in industrial machines, networking equipment and scientific instruments

Liquid-crystal display:



Fig. Liquid-crystal display

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or *video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly.*

LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage. They are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in nearly all applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence.

AT89S51 Microcontroller:



Fig. AT89S51 Microcontroller

The AT89S51 is a low-power, high-performance CMOS 8-bit microcontroller with 4K bytes of In-System Programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the Industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with In-System Programmable Flash on a monolithic chip, the Atmel AT89S51 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S51 provides the following standard features: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, two 16-bit timer/counters, a five-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S51 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next external interrupt or hardware reset.

a) Working:

To keep water conservation move, we can move forward with drip irrigation. It is also named as micro irrigation or trickle irrigation. It is an efficient technique which is primarily used in hot tropical conditions. It conserves water and fertilizer. It allows water to drip slowly to the root of plants through valves, pipes, tubing etc. It is done with the help of narrow tubes which delivers water directly to the base of the plant. A study of land topography, soil, water conservation is needed to determine most suitable drip irrigation system. The major disadvantage in surface irrigation was it results to water logging, if there is not proper drainage due to which crop gets flourished hence productivity gets affected. But in this we are providing water as requirement of drop therefore there is no problem of overwatering.

In this system whenever the prescribed humidity or water level of soil decreasing below prescribed threshold level. For this purpose we use a humidity sensor and water level sensor. If the level of water increased above the prescribed level during rain, our system automatically lets the extra power and recycles them back to the water tank. This system also senses the speed of wind to predict storm and natural calamities and warns to the farmer by sending SMS using a GSM modem.

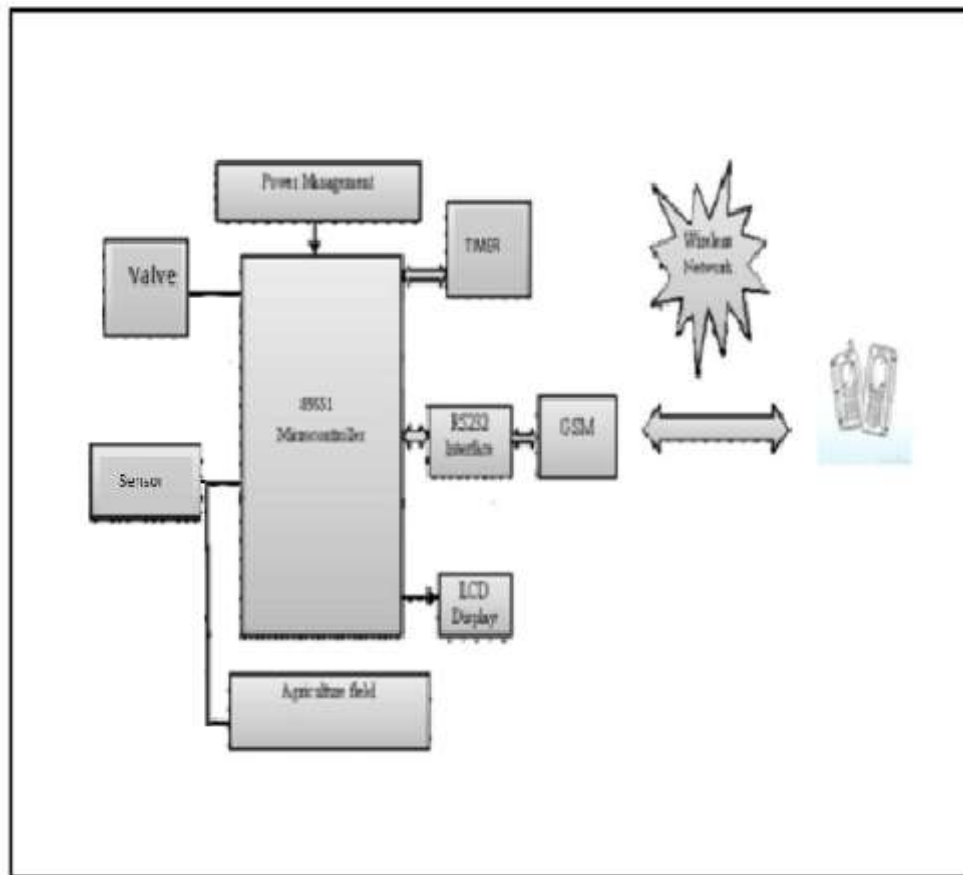


Fig1.1. Block diagram

The temperature and fire sensors are used to alert the farmer on any kind of eventualities for safety purpose. The prescribed level of water varies depending on different crops and nature of the soil, here directly feed the type of soil & automatically set the water level. The farmer easily control and monitor the field using PC through the system is shown in figure4. From figure the system includes GSM, microcontroller etc. The GSM is most popular standard for mobile phone. A unique feature of GSM is the short message service (SMS). The GSM travels across greater distances and handles many sensors. Here 8051 microcontroller is used to control the irrigation using wireless sensor network. A sensor is a device that measures physical quantity and converts it into electrical signal. For example humidity sensor, temperature sensor, water level sensor etc.

b) Construction and working:

There are three modes of operation:-

- a) **Humidity mode:** The humidity sensor checks the moisture content in the farm and accordingly provides the water required for the crops.
- b) **Automatic mode:** The timer is set and the motor turns ON/OFF automatically for a certain amount of time.
- c) **Manual mode:** The farmer has to press ON/OFF for the working of the motor

Sensor: In this project we use different type of sensor like soil moisture, temperature/fire sensor, ph-sensor, humidity sensor. Controller receive data according to sensor

Controller works as a central unit and its function is to automate the process after it has been initiated by the GSM based device, finally the presents output to the device. GSM (Global System for Mobile Communication): A GSM based irrigation system has two major technologies, primary being the GSM and secondary is the controller.

GSM is a standard set used to describe protocols for digital cellular networks. This GSM facility plays important role for controlling the irrigation on field and also sending the results to the farmer via sms, to a mobile device which indirectly controls the entire farm irrigation system.

Display: whatever data receive by controller it's displayed on display

3. CONCLUSIONS

In types of irrigation systems based on GSM. These systems were all remotely controlled systems which proposed a low cost information exchange via SMS and GSM. The result of the survey conducted has lead to a very positive approach on the impact of GSM technology in farm irrigation methods & techniques. Everyday new techniques have been implemented for minimizing the irrigation process like mobile phone and other software application for conduction of irrigation pro software application for conduction of irrigation process. This leads to a better and more efficient agricultural development for the future generations to come.

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