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GSM BASED SECURED AGRICULTURE MONITORING SYSTEM

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Abstract

Agriculture sector being the backbone of the Indian economy deserves security. Security systems which are being used now days are not smart enough to provide real time notification after sensing the problem. The integration of traditional methodology with latest technologies as GSM and Wireless Sensor Networks can lead to agricultural modernization. This scenario is based on design tested and analyzed a GSM based device which is capable of analyzing the sensed information and then transmitting it to the user. Hence the project aims at making agriculture smart using automation and wireless technologies. The highlighting features of this project include mobile based Human & animal identification, moisture, pollution identification analysis data trained and Store data. After collecting and analyzing the data, algorithm is designed to provide accuracy in notifying user and activation of the System. This device can be controlled and monitored from remote location and it can be implemented in agricultural fields, grain stores and cold stores for security purpose. This is oriented to accentuate the methods to solve such problems like identification of rodents, threats to crops and delivering real time notification based on information analysis and processing without human intervention. In this device, mentioned sensors and electronic devices are integrated using java scripts. Based on smart agriculture, by using information and communication technologies, GSM can provide us with a security system for private fields and farm products, thus improves the monitoring and security of pre-harvest and post-harvest grain.

Keywords*:* Environment monitoring system; Wireless Sensor Network; GSM**.**

1. INTRODUCTION

Over the past years information and communication technologies have been introduced in agriculture, improving food production and transportation. However the integration of these technologies is not yet used for security purposes. The significant challenge facing the security in agriculture is the interaction between security devices and to provide them intelligence to control other electronic devices such as animal repellers etc to enhance security in various fields. For example, a basic a grain store cannot be of use until recorded media is accessed and it also cannot process the information about what is happening at particular location. In implementation and adoption of information and communication technologies, cost is also a major factor. It is not easy to achieve exchange of information among devices and upgrading their functionality while keeping their cost to a reasonable level. So, the natural conclusion is that the security and monitoring systems must be responsible for transmitting data over network, analyzing the information and notify the user with real time information of surroundings.

2. LITERATURE SURVEY

The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers they themselves verify all the parameters and calculate the readings. [1]It focuses on devices and tools to manage display and alert the users using the advantages of a wireless sensor network system. [2]It aims at making agriculture smart using automation and GSM based technologies. The highlighting features are smart GPS based remote controlled system to perform tasks like moisture sensing, human detection and animal identification. [3] It proposes a low cost and efficient wireless sensor network technique to acquire the soil moisture and temperature from various location of farm. [4] It is designed for GSM based monitoring system to analyze crop environment and the method to improve the efficiency of decision making by analyzing harvest statistics. [5] System from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the system.

3. PROPOSED WORK

Agriculture sector being the backbone of the Indian economy deserves security. Security not in terms of resources only but also agricultural products needs security and protection at very initial stage, like protection from attacks of rodents or insects, in fields or grain stores. Such challenges should also be taken into consideration. Security systems which are being used now days are not smart enough to provide real time notification after sensing the problem. The integration of traditional methodology with latest technologies as Internet of Things and Wireless Sensor Networks can lead to agricultural modernization. Keeping this scenario in our mind we have designed, tested and analyzed an 'Internet of Things' based device which is capable of analyzing the sensed information and then transmitting it to the user. This device can be controlled and monitored from remote location and it can be implemented in agricultural fields, grain stores and cold stores for security purpose. This is oriented to accentuate the methods to solve such problems like identification of rodents, threats to crops and delivering real time notification based on information analysis and processing without human intervention. Other parameters like the temperature, humidity, moisture and the PIR sensors shows the threshold value and the water level sensor is used just to indicate the level of water inside a tank or the water resource.

4. HARDWARE USED

PIC16F877-MICROCONTROLLER:

The PIC microcontroller 16F877 is one of the most popular microcontrollers in the industry. It is user convenient and easier to handle. The coding or programming of this controller is also easy. The program that is coded can be easily erased due to the flash memory technology. The microcontroller has wide range of applications used in many huge industries. It is used in security, remote sensors, home appliances and industrial automations. An EEPROM is also featured which is used to store the information permanently like transmitter codes and receives frequencies and some other related data.

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5. ARCHITECTURE

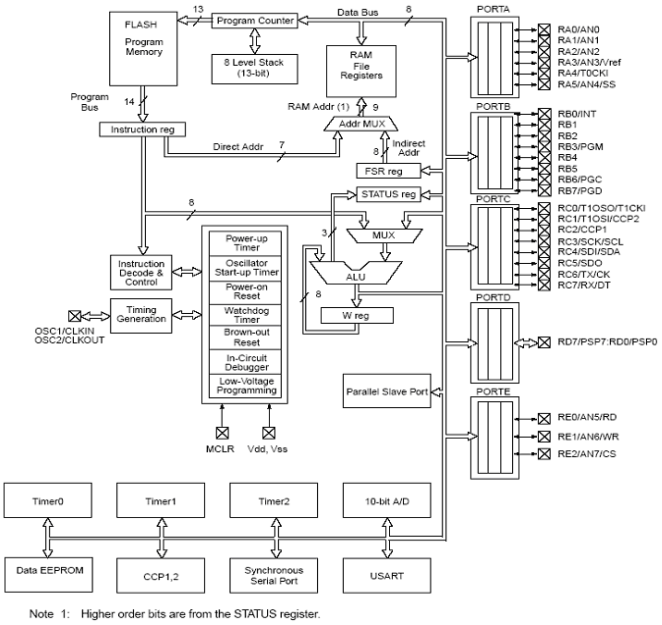


Fig 4.1 : Architecture of PIC16F877

LCD DISPLAY

A **liquid crystal display** (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs does not emit light directly. They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube (CRT) displays in most applications.

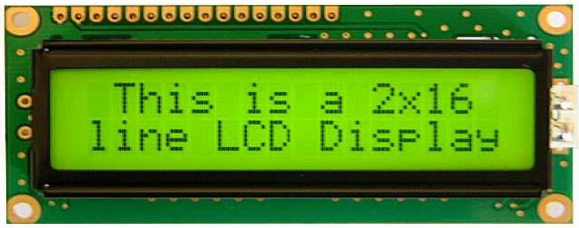


Fig 4.2: LCD Display

They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in.LCDs are more energy efficient and offer safer disposal than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically-modulated optical device made up of any number of pixels

filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in colour or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals. Worldwide sales of televisions with LCD screens had surpassed the sale of CRT units.

PIR SENSOR

Fig 4.3: PIR Sensor

All objects with a temperature above absolute zero emit heat energy in the form of radiation. It is invisible to the human eye since it radiates infrared wavelengths. PIR sensors don't detect or measure heat, instead they detect the infrared radiation emitted or reflected from an object. It is used to detect the movement of people, animals or other objects. They are commonly used in burglar alarms and automatically activated lighting systems. When a human passes in the field, the temperature at that point will rise from room temperature. The sensor converts the resulting change into a change in the output voltage and this triggers the detection.

Most PIR modules have a 3-pin connection at the side or bottom. The pinout may vary between modules so triple-check the pinout. It's often silkscreened on right next to the connection. One pin will be ground, another will be signal and the final one will be power. Power is usually 3-5VDC input but may be as high as 12V. Sometimes larger modules don't have direct output and instead just operate a relay in which case there is ground, power and the two switch connections.

TEMPERATURE SENSOR

A thermistor is a type of resistor whose resistance varies with temperature. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting over current protectors, and self-regulating heating elements.

Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also

different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range [usually −90 °C to 130 °C].

Basic Operation

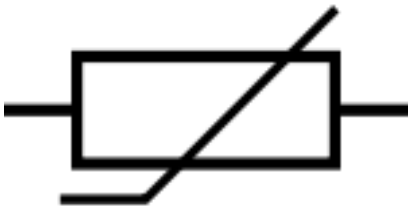


Fig 4.4: Thermistor Symbol

Assuming, as a first-order approximation, that the relationship between resistance and temperature is linear, then:

$$\Delta R = k\Delta T$$

Where,

ΔR = change in resistance
ΔT = change in temperature
k = first-order temperature coefficient of resistance

Thermistors can be classified into two types, depending on the sign of k. If k is positive, the resistance increases with increasing temperature, and the device is called a positive temperature coefficient (PTC) thermistor, or posistor. If k is negative, the resistance decreases with increasing temperature, and the device is called a negative temperature coefficient (NTC) thermistor. Resistors that are not thermistors are designed to have a k as close to zero as possible, so that their resistance remains nearly constant over a wide temperature range.

Instead of the temperature coefficient k, sometimes the *temperature coefficient of resistance* α (alpha) or α_T is used. It is defined as

$$\alpha_T = \frac{1}{R(T)}\frac{dR}{dT}.$$

For example, for the common PT100 sensor, α = 0.00385 or 0.385 %/°C. This α_T coefficient should not be confused with the α parameter below.

SOIL MOISTURE SENSOR

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple

soil moisture sensors. One common type of soil moisture sensors in commercial use is a frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilize the moderator properties of water for neutrons. Cheaper sensors -often for home use- are based on two electrodes measuring the resistance of the soil. Sometimes this simply consists of two bare (galvanized) wires, but there are also probes with wires embedded in gypsum

Agriculture measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, they are able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages.

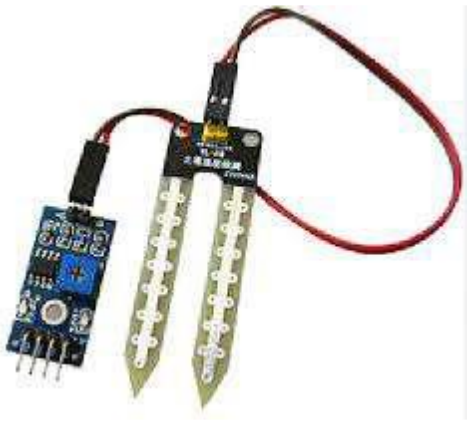


Fig 4.5: Soil Moisture Sensor

Besides agriculture, there are many other disciplines using soil moisture sensors. Golf courses are now using sensors to increase the efficiencies of their irrigation systems to prevent over watering and leaching of fertilizers and other chemicals offsite.

GSM MODULE

GSM (**Global System for Mobile Communications**) originally from (***Groupe Spécial Mobile***) is the most popular standard for mobile telephony systems in the world. The GSM Association, its promoting industry trade organization of mobile phone carriers and manufacturers, estimates that 80% of the global mobile market uses the standard. GSM is used by over 1.5 billion people across more than 212 countries and territories. Its ubiquity enables international roaming arrangements between mobile network operators, providing subscribers the use of their phones in many parts of the world. GSM differs from its predecessor technologies in that both signaling and speech channels are digital, and thus GSM is considered a *second generation* (2G) mobile phone system. This also facilitates the wide-spread implementation of data communication applications into the system.

The ubiquity of implementation of the GSM (Global System Market) standard has been an advantage to both consumers, who may benefit from the ability to roam and switch carriers without replacing phones, and also to network operators, who can choose equipment from many GSM equipment vendors. GSM also pioneered low-cost implementation of the short message service (SMS), also called text messaging, which has since been supported on other mobile phone standards as well. The standard

includes a worldwide emergency telephone number feature (112).

Newer versions of the standard were backward-compatible with the original GSM system. For example, Release '97 of the standard added packet data capabilities by means of General Packet Radio Service (GPRS). Release '99 introduced higher speed data transmission using Enhanced Data Rates for GSM Evolution (EDGE).

ULTRASONIC TRANSMITTER AND RECEIVER

Ultrasonic refers to any study or application of sound waves that are higher frequency than the human audible range. Music and common sounds that we consider pleasant are typically 12 kHz or less, while some humans can hear frequencies up to 20 kHz. Ultrasonic waves consist of frequencies greater than 20 kHz and exist in excess of 25 MHz. Ultrasonic waves are used in many applications including plastic welding, medicine, jewelry cleaning, and nondestructive test. Within nondestructive test, ultrasonic waves give us the ability to “see through” solid/opaque material and detect surface or internal flaws without affecting the material in an adverse manner.

Generating and detecting ultrasonic waves requires an ultrasonic transducer. Piezoelectric ceramics within ultrasonic transducers are “struck” – similar to the way tuning forks are struck to generate an audible note - with electricity, typically between 50 and 1000 Volts - to produce the ultrasonic wave. The ultrasonic wave is carried from the transducer to the unit under test (UUT) by a coolant - typically water, oil, or gel - and is reflected back to the transducer by both external surfaces and internal defects.

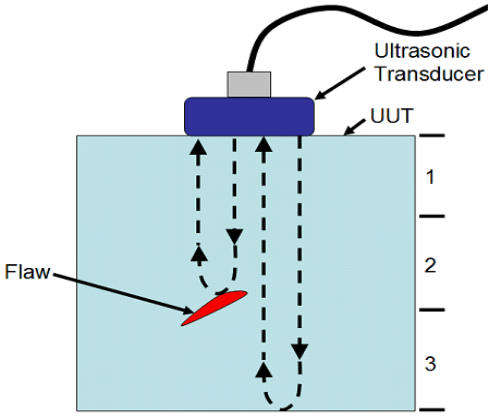


Fig 4.6:Ultrasonic transducer

A common use of ultrasound is in range finding; this use is also called SONAR, (sound navigation and ranging). This works similarly to RADAR (radio detection and ranging): An ultrasonic pulse is generated in a particular direction. If there is an object in the path of this pulse, part or all of the pulse will be reflected back to the transmitter as an echo and can be detected through the receiver path. By measuring the difference in time between the pulse being transmitted and the echo being received, it is possible to determine how far away the object is.

6. SOFTWARE USED

MPLAB

MPLAB IDE is an integrated development environment that provides development engineers with the flexibility to develop and debug firmware for various Microchip devices.

MPLAB IDE is a Windows-based Integrated Development Environment for the Microchip Technology Incorporated PICmicrocontroller (MCU) and dsPIC digital signal controller (DSC) families. In the MPLAB IDE, you can:

- Create source code using the built-in editor.
- Assemble, compile and link source code using various language tools. An assembler, linker and librarian come with MPLAB IDE. C compilers are available from Microchip and other third party vendors.
- Debug the executable logic by watching program flow with a simulator, such as MPLAB SIM, or in real time with an emulator, such as MPLAB ICE. Third party emulators that work with MPLAB IDE are also available.
- Make timing measurements.
- View variables in Watch windows.
- Program firmware into devices with programmers such as PICSTART Plus or PRO MATE II.
- Find quick answers to questions from the MPLAB IDE on-line Help.

MPLAB SIMULATOR

MPLAB SIM is a discrete-event simulator for the PIC microcontroller (MCU) families. It is integrated into MPLAB IDE integrated development environment. The MPLAB SIM debugging tool is designed to model operation of Microchip Technology's PIC microcontrollers to assist users in debugging software for these devices.

IC PROG

The PRO MATE II is a Microchip microcontroller device programmer. Through interchangeable programming socket modules, PRO MATE II enables you to quickly and easily program the entire line of Microchip PICmicro microcontroller devices and many of the Microchip memory parts.PRO MATE II may be used with MPLAB IDE running under supported Windows OS's (see Read me for PRO MATE II.txt for support list), with the command-line controller PROCMD or as a stand-alone programmer

COMPILER-HIGH TECH C

A program written in the high level language called C; which will be converted into PICmicro MCU machine code by a compiler. Machine code is suitable for use by a PICmicro MCU or Microchip development system product like MPLAB IDE.

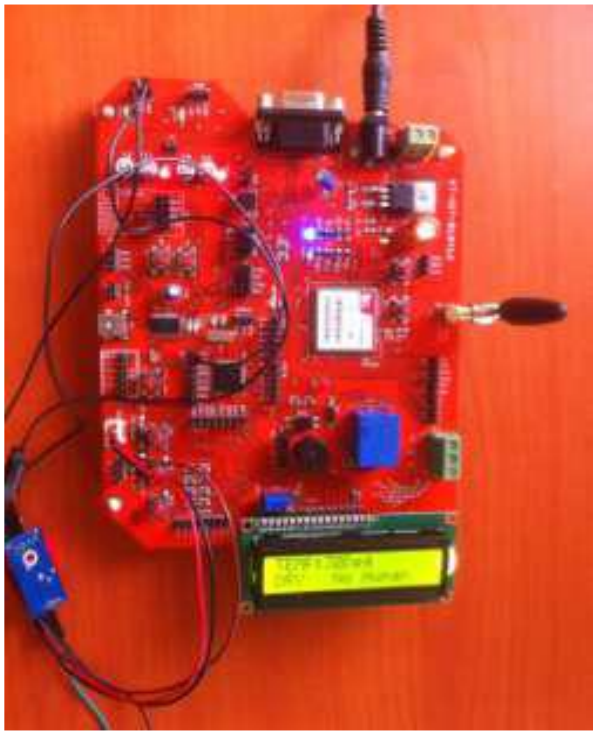
PIC START PLUS PROGRAMMER:

The PIC start plus development system from microchip technology provides the product development engineer with a highly flexible low cost microcontroller design tool set for all microchip PIC micro devices. The pic start plus development system includes PIC start plus development programmer and MPLAB IDE.

The PIC start plus programmer gives the product developer ability to program user software in to any of the supported microcontrollers. The PIC start plus software running under MPLAB provides for full interactive control over the programmer.

7. EXPERIMENTATION & RESULTS

The hardware is interfaced with all the sensors in the board. The hardware components include the microcontroller, buzzer, relay, ADC converter, GSM module and all the sensors interfaced. The board is inserted with a SIM card which is used to communicate with the owner and the recorded values. The output shown below denotes the temperature, soil moisture condition and the intruder detection. The second result is the output from the Android Application that is developed in the mobile phone. It determines the temperature, humidity, moisture and the intruder detection.



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REFERENCES

[1]. Kumar and G. P. Hancke, "Energy Efficient Environment Monitoring System Based on the IEEE 802.15.4 Standard for Low Cost Requirements", *IEEE Sensors Journal*, vol. 14, no. 8, pp. 2557-2566, Aug. 2014.

[2]. S. P. Goyal and A. Bhise, "Zigbee Based Real-Time Monitoring System of Agricultural Environment", *International Journal of Engineering Research and Applications*, vol. 4(2), pp. 06-09, 2014.

[3]. K. G. Sutar and R. T. Patil, "Wireless Sensor Network System to Monitor The Fish Farm", *Intenational Journal of Engineering Research and Applications*, vol. 3(5), pp. 194–197, 2013.

[4]. Wang, C. Chen, X. Zheng, C. Chen, C. Chuang and J. Jiang, "An Agricultural-Cloud Based Greenhouse Monitoring System", in *Proc. EFITA-WCCA-CIGR Conference on Sustainable Agriculture through ICT Innovation*, Turin, Italy, 24-27 june 2013.

[5]. R.S.Kawitkar "IOT based smart agriculture monitoring system" (IEEE 2016)

[6]. D.AboutajdineLrit "Monitoring and controlling of drip irrigation using iot with embedded linux board",(IEEE 2016)

[7]. Nikkila, R., Seilonen, I., Koskinen, K. ''Software Architecture for Farm Management Information Systems in Precision Agriculture.''(IEEE2016)

[8]. Kevin Ashton, "That Internet of Things '' RFID (IEEE 2015)

[9]. Li Wenzhong, Duan Chaoyu "wireless sensor based remote monitoring system for agriculture using zigbee and gps" (IEEE2016)

[10]. Nikesh Gondchawar, Dr. R.S.Kawitkar, "IoT Based Smart Agriculture", International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), Vol.5, Issue 6, June 2016