

Agriculture Crop Monitoring using GSM in WSN

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Abstract: Our project deals with agriculture. It consists of microprocessor, simulator with e-agriculture that may come to the farmers interest and used to control the natural source. Therefore, this problem has captured farmer’s interest to implement agro-environmental remote monitoring method in their agriculture industries. . Our main aim is to directly interact with the farmers and to make their work easy. This is done by intimating the farmers using mobile phones about soil moisture, temperature, pH level, weather condition and also about the motor level condition. We will send an alert message to farmers both as text and voice message so that they can maintain their land properly. Using this method, the farmer may feel easy and comfortable to work on his land without any stress. Using GSM, the farmer will be able to monitor whenever he is unavailable to maintain his land. The farmers can access their land from anywhere. He will be asked to monitor using GSM so that it will avoid placing the substitute for his land. He can also monitor his crop by control over his mobile phones.

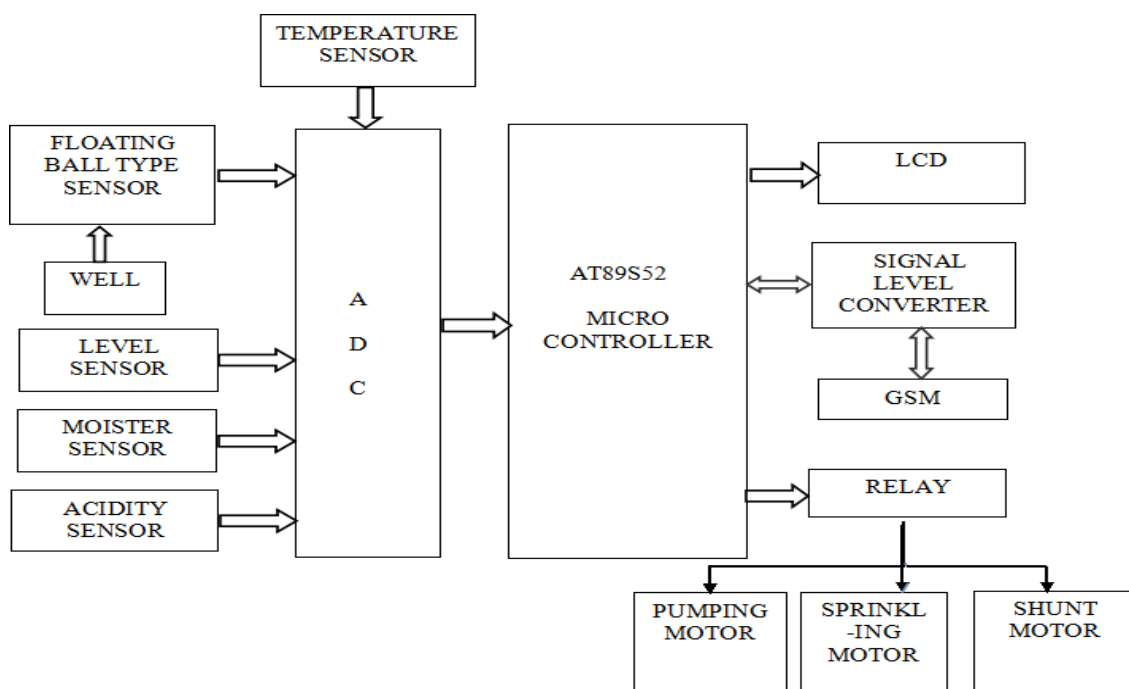
Keywords: sensors, GSM, UART, Motors, ADC, Microcontroller, LCD, Relay.

1. INTRODUCTION

India is ranked to be the second largest in agriculture. Agriculture is the backbone of India. ^[1]Today we Indians are second largest in the production of wheat, rice etc. cropping patters has been changed according to the lifestyle of people. Technology makes people lazy these days and so the farming these days are also developed with new technology. Plant protection is a mandatory thing in agriculture in order to intimate the farmers about their crops, a text message will be sent to the farmer from which they can monitor their lands in an easy way. Dry lands are a big threat to the farmers. To take care of these major and mandatory things few things are being implemented in our paper.

2. DESIGN

2.1 SYSTEM ARCHITECTURE: The system architecture is designed in such a way that it contains various sensors that are used for sensing the various parameters. It mainly deals with five modules and each module does a work which produces more efficient process to monitor the crop field .Our system is designed for the purpose of reducing man power and time consumption. Here the system consists of five sensors namely temperature sensor, level sensor, and acidity sensors. Each performs their respective actions which are being discussed later in the paper. Now, we shall see about the various levels that are involved in our paper.



REQUIREMENT LEVEL Requirement level is used to identify the requirements that are needed for the project .It includes

- A. Functional requirement involves the process of various details that includes sensing and technical activities^[5].
- B. Non-functional requirements involve the process of controlling and monitoring the field.

SPECIFICATION LEVEL Specification level includes the specification of all the required tools used in the project like

no	Devices	specification
1.	UART	Dual EIA-232 Drivers/receivers
2.	Microcontroller	AT89S52
3.	Temperature sensor	LM35DZ
4.	Level sensor	WL400
5.	Moisture sensor	HS1100 or HS1101
6.	Acidity sensor	WQ201

ARCHITECTURAL LEVEL In this level all the five sensors are connected to the analog and digital converter (ADC). From this analog signals are converted to digital signals which are being displayed in the LCD^[6]. The signals from ADC are given to microcontroller and that gives it to LCD, UART, and Relay. LCD displays the values that are sensed by the sensors. UART (universal asynchronous receiver transmitter) helps to send message using GSM .Relay is used for controlling the motors (ON\OFF).

COMPONENT LEVEL This level describes about the hardware and software parts of the project^[3]. This level is very important because without this the architecture will not work. The hardware components used in this are microcontroller, analog to digital converter, sensors, LCD, relay, motors, GSM. The software components used in this are as follows Keil compiler, embedded c.

INTEGRATION LEVEL This level mainly includes about the working of the system architecture. It connects all the parts together and provides a complete structure.^[4]The temperature sensor, level sensor, acidity sensor, floating ball sensor does their respective works and this will be given to the analog to digital converter which converts the analog values to digital which in turn sends it to the microcontroller and values are displayed in the LCD^[2]. Then these values are being sent to the GSM by using UART.

APPLICATION LEVEL This is used to provide easy way of accessing the crop irrespective of the place where the farmer is. It also provides accurate values because the values are being represented in digital. Crops health can be monitored now and then.

3. PROPOSED SYSTEM

In our proposed system it majorly contains various modules that perform various sensing operations according to the given conditions.

The following are different modules that are discussed in this paper.

3.1 MODULES This paper is divided into five different modules

MODULE 1 – Temperature sensor Temperature sensor used here is LM35DZ

This sensor will be placed in the field which senses the temperature. A maximum value called threshold value will be set above which the message will be sent automatically to the farmers. In our project the threshold value is set to 40 degree Celsius above which the message will be sent to the farmers by GSM protocol using UART^[10]. As soon as the farmer gets the message he can both directly go to the field and provide water to the field or he can just send a reply message which will automatically turn on the motor. The motor used in this module is pumping motor which is a DC motor^[9]. And it provides water to the field, when it receives the reply message. The motor will be automatically turned off when it comes to the level that has been set which is 40 degree Celsius.

Module2-level sensor Level sensor detects the level of flow of water in the field. The water level can be measured by using three factors namely low, medium, and high. When it indicates low and medium it means the water level is in a perfect state. When it reaches high it will send a message to the farmer^[8]. If the farmer sends a reply message it will turn on the shunt motor. This sensor is used to avoid overflow of water and helps to monitor the crops health in an easy way.

Module 3–ACIDITY SENSOR This sensor is mainly used for sensing the PH level in the field. If it crosses the threshold value it might damage the crops^[7]. This acidity sensor checks the PH level and it is helpful in sending message to the farmer. After receiving the reply message it turns on the sprinkling motor which will be helpful to reduce the pH level.

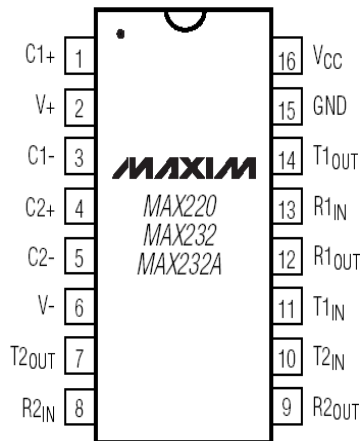
MODULE 4 – RELAY^{[5] [9]} A **relay** is operated as switch. Relays used to control the motors for the start and off of the motor. With the help of relay we can identify which motor is turned on. Even if the farmer is not available in the current place the relay will be helpful for operating the motor by itself because it can accessed by remote area as a switch. Example, if the farmer is not in the field area if he sends a reply message the relay will automatically Turn on the motor.



MODULE 5 – UART an UART, universal asynchronous receiver / transmitter which is used for transmitting and receiving message from the field to the farmer. UART is used for communication of the message. [3] In the microcontroller two pins are allocated for UART that are TX,RX which is the transmitter and receiver pins .With the help of these two pins the message is transmitted and received. Basically UART contributes of two components viz.

- Max232 ic.
- Rs232 serial cable.

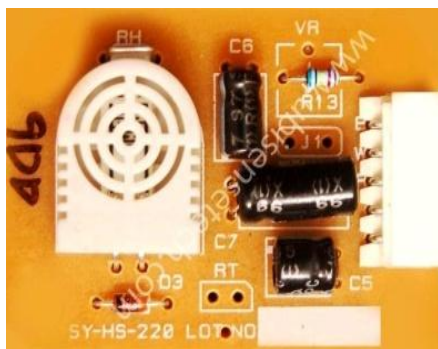
This TX and RX pins will be present In the GSM. This receives the message from the UART and sends it to the farmer.



3.2 HUMIDITY SENSOR

Humidity sensor is used to detect the moisture content present in the soil and also in the air [6]. According to the condition, it sends message to the farmer.

In our project, the sensor contains two rods, one is zinc rod and other is copper rod. Using this the moisture content can be measured.



3.3 GSM The GSM system is the most commonly used protocol in world today. The operation of GSM in our paper will be operated as follows, a SIM will be inserted in the GSM modem and it will be placed near IC [6] [3]. According to the given conditions the message will be sent to the farmer.

FEATURES

Input voltage: 5V-30V

Current: 8mA in idle mode, 150mA in communication

GSM 900 @ 12V, 110mA in GSM 1800 @ 12V

Temperature range: Operating -30 to +85 degree Celsius;

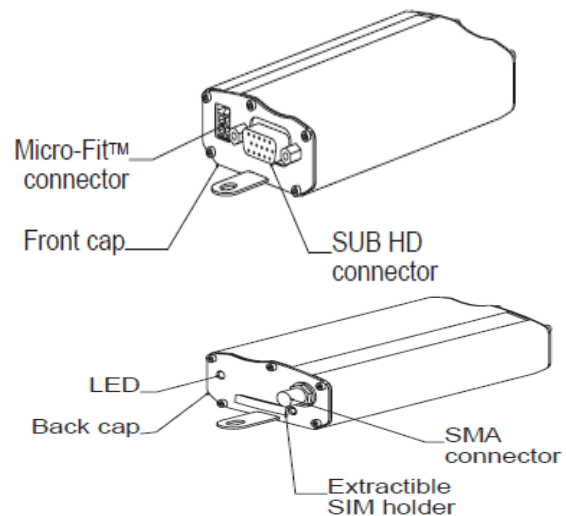
Storage -30 to +85 degree Celsius

Overall dimensions: 80mm x 62mm x 31mm /

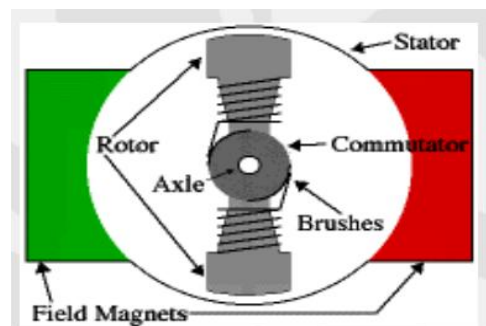
Weight: 200g

SIM Interface 3V / 5 V

Remote Control by AT Commands



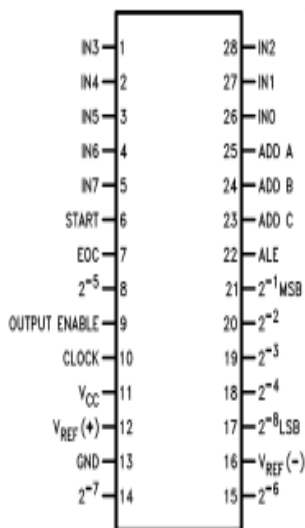
3.4 MOTORS DC motor converts electrical power to mechanical power. There are three motors used in our paper namely pumping motor, shunt motor, sprinkling motor [3]. These are the motors that will be turned on when the relay is turned on. Each motor performs different tasks, according to the condition given.



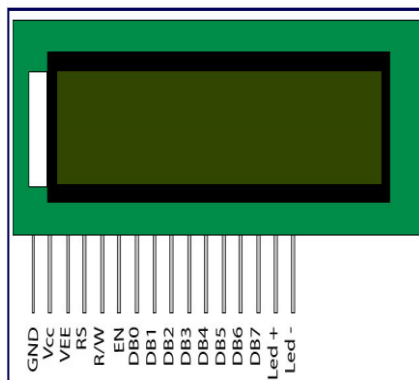
DESCRIPTION. A 12V DC motor contains two magnets that is surrounded with two coils of wire; it resides in the middle of the 12V DC motor that rounds a rotor [4]. Coils are placed like facing the magnets; it causes electricity to flow on them. This produces a magnetic field, that obviously pushes the coils from the magnets they are facing, and makes the rotor to turn. The brushes present within the 12V DC motor transfer the electricity from the rotor, it controls the motors timing; turning it on and off whenever required.

3.5 ADC The ADC0808, ADC0809 data acquisition component that converts analog to digital signal. The input given to ADC will be analog signal which will in turn provide an output in digital signal [6]. The reason behind using ADC is that, the motors used are DC motors for which an AC signal cannot be provided and so we are using ADC to convert it from analog to digital. It provides high speed, high accuracy and it consumes minimal power.

Dual-In-Line Package



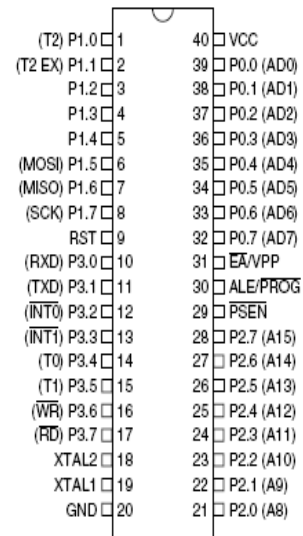
3.6 LCD Liquid Crystal Display (LCD) consists of rod-shaped tiny molecules squeezed between a flat piece of glass and a hazy substrate [9]. They are very slim and consume very small amount of power. Light passing through makes the required images appear. This is the basic concept behind LCD displays [11]. The reason why LCD is used in our paper is , the values given by the sensors are displayed in the LCD .



3.7MICROCONTROLLER:

The microcontroller we use here is AT89S52 which is a low power 8K bytes in-system programmable flash memory. It has a outrageous performance of CMOS.

40-lead PDIP



4. PROCEDURE

In our paper, the temperature sensor senses the temperature, if the temperature goes beyond 45 degree Celsius, it sends an alert message to the farmers and automatically pumping motor turn on and water will be poured in the field. And it is used to sense the environment temperature.

The shunt motor will be turned ON if the level of the water in the field goes above the threshold value.

The pH value limit kept is 7, if the pH value goes above or below 7, then sprinkling motor will be turned ON.

In our paper, the frmers can also control the motor using their mobile phones.



5. CONCLUSION

In day to day life agriculture is one of the most important parts in every human’s life. Many farmers are carried out on road and on field operations this will increase the time and man power. This paper is effectively used for the

farmers for reducing the man power and accesses their crops in an efficient way. This might reduce the time and work of the farmers. This is a less cost process that contains various sensors that are used to sense various parameters and this can be used effectively by the farmers using their mobile phone. And this can be carried out using GSM protocol where it uses a normal hardware and software components. The downside of this paper is the signal problem, if there is no signal in the farmer's phone. The message will not be sent to the farmer in the correct time ^[3]. So the future work may include some other protocol that can send messages even in offline mode or aero plane mode.

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