

## Arm Based Remote Monitoring and Control System for Environmental Parameters in Greenhouse

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**Abstract --** The greenhouse vegetable production needs less labor, less capital, has faster returns than normal vegetable production. And this cannot be easily influenced by the climate. Therefore the greenhouse vegetables are sought after by vegetable growers. It is very difficult to control scattered greenhouse without a remote environment monitoring system. In recent years, there appeared a canopy remote monitoring system based on GSM.

### Introduction

In an industry during certain hazards it will be very difficult to monitor the parameter through wires and analog devices such as transducers. To overcome this problem we use wireless device to monitor the parameters so that we can take certain steps even in worst case. Few years back the use of wireless device was very less, but due to the rapid development in technology now-a-days we use maximum of our data transfer through wireless like Wi-Fi, Bluetooth, Wi-Max, etc. This project is designed as a greenhouse remote monitoring system based on GSM Technology.

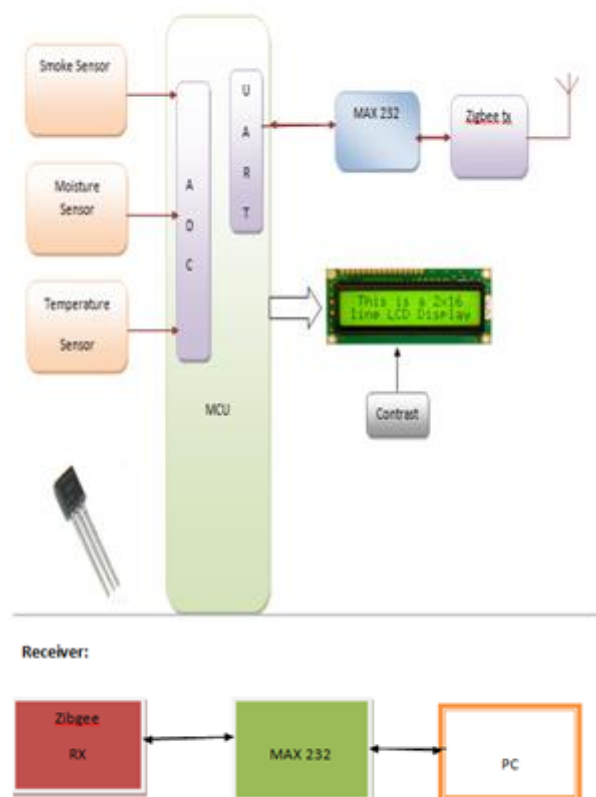
### Existing system

In this project we use different modules such as zigbee, 8051 as controller, smoke sensor, temperature sensor, moisture sensor, and display the presence of gas on 16X2 LCD on the transmitter side. If any gas exceeds the value automatically at the receiver side the particular functionality will be on condition.

This project uses sensors such as smoke sensor (MQ-6), temperature sensor (LM35). Whenever hazardous gas is detected, a buzzer is connected to produce

audible alert signal. And the sensor values are given to ADC to get processed by controller. The temperature sensor LM35 senses the temperature and converts it into an electrical (analog) signal, which is applied to the micro controller through ADC. The analog signal is converted into digital format by the analog-to-digital converter (ADC). This project uses microcontroller AT89S52.

Block Diagram:



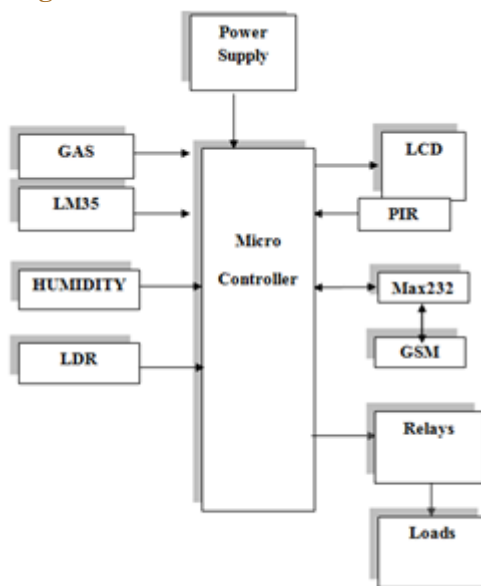
### Draw back

Limited distance

### Proposed method

The application will have embedded system which consists of ARM7 microcontroller, real time operating system, sensors, GSM modem and control devices to monitor the environmental parameters condition namely temperature, humidity, CO2 concentration and light intensity in greenhouse. The threshold levels of the sensors will be set with the help of push button keys or remotely via GSM communication mode.

### Block diagram

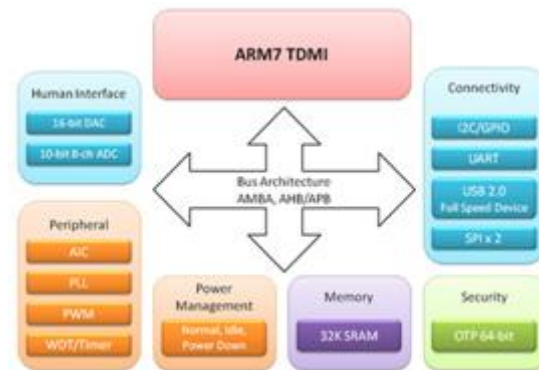


### Modules used in this project

The **LPC2148** are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes 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. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT, PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access

control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.



### VI. Global System for Mobile Communication (GSM)

#### Definition:

GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.

GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.

#### General Features:

- Tri-band  
GSM/GPRS900/1800/1900Mhz
- GPRS multi-slot class 10
- GPRS mobile station class –B
- Complaint to GSM phase 2/2+
  - i. -class 4(2W @900MHz)
  - ii. -class 1(1W @/18001900MHz)

- Dimensions: 40x33x2.85 mm
- Weight: 8gm
- 7. Control via AT commands
- (GSM 07.07, 07.05 and SIMCOM enhanced AT commands)
- SIM application tool kit
- supply voltage range 3.5.....4.5 v
- Low power consumption
- Normal operation temperature: -20 °C to +55 °C
- Restricted operation temperature : -20 °C to -25 °C and +55 °C to +70 °C
- storage temperature: -40 °C to +80 °C

The LM35 does not require any external calibration or trimming to provide typical accuracies of  $\pm 1/4^\circ\text{C}$  at room temperature and  $\pm 3/4^\circ\text{C}$  over a full  $-55$  to  $+150^\circ\text{C}$  temperature range. It can be used with single power supplies, or with plus and minus supplies. As it draws only  $60\mu\text{A}$  from its supply, it has very low self-heating, less than  $0.1^\circ\text{C}$  in still air. The LM35 is rated to operate over a  $-55^\circ$  to  $+150^\circ\text{C}$  temperature range, while the LM35C is rated for a  $-40^\circ$  to  $+110^\circ\text{C}$  range ( $-10^\circ$  with improved accuracy).

The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.



**Fig: temperature sensor**

1. Can be calibrated directly to the Celsius scale.
2. Linear scale factor  $+ 10\text{mV} / ^\circ\text{C}$
3. The accuracy of  $0.5^\circ\text{C}$ . at room temperature ( $25^\circ\text{C}$ ).
4. Range of temperature between  $-55^\circ\text{C}$  to  $150^\circ\text{C}$ .
5. Work on the voltage 4 volts to 30 volts.
6. Operating current less than  $60\mu\text{A}$ .

**Temperature sensor**

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

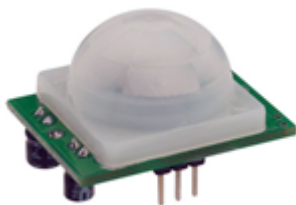
The LM35 thus has an advantage over linear temperature sensors calibrated in  $^\circ\text{Kelvin}$ , as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.



7. Low output impedance  $0.1\ \Omega$  for 1 mA load

### Pir sensor:

A PIR sensor, or Passive Infrared sensor, is a type of detector that is capable of detecting infrared light emitting from objects within its field of view. PIR sensors differ from other infrared sensors because they are only able to receive infrared waves rather than being able to emit and receive them. Because all objects emit infrared (electromagnetic waves that travel with heat), PIR sensors are able to detect objects that are in front of them. In fact, PIR sensors can see many things that humans cannot. PIR sensors are used for a number of applications, such as night vision, motion detection, and laser range finding.



### Light dependent resistor

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. The animation opposite shows that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it.

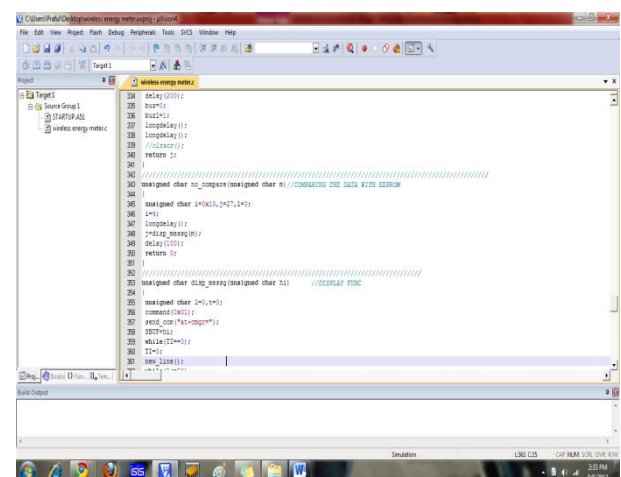


LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically.

Thus in this project, LDR plays an important role in controlling the electrical appliances based on the intensity of light i.e., if the intensity of light is more (during daytime) the loads will be in off condition. And if the intensity of light is less (during nights), the loads will be switched on.

### Software tools

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.



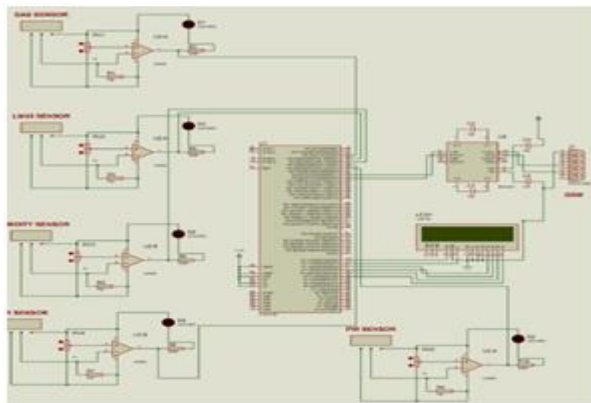


**Flash Magic**

Flash Magic is a tool which is used to program hex code in EEPROM of micro-controller. It is a freeware tool. It only supports the micro-controller of Philips and NXP. It can burn a hex code into that controller which supports ISP (in system programming) feature. Flash magic supports several chips like **ARM Cortex M0, M3, M4, ARM7 and 8051.**



**Schematic Diagram:**



**Results:**



**Advantages**

- Reliability
- Ease of Operation
- Useful to detect harmful gases
- Can be used as electrolytic applications

**Applications:**

- In public places like shopping malls, etc, this project can be applied where public safety is a major task.
- In hospitals and sensitive areas also this project can be implemented.
- In Marine Applications

**Conclusion**

By this, environmental parameters in greenhouse can be monitored and controlled manually as well as remotely. The hardware and software modules of the application system are discussed in detail. This embedded application is implemented and tested for its correct functionality. The experimental results show that the developed monitoring system has the following features, such as simple structure, high reliability, good extensibility and flexible on configuration. It will control automatically the environmental parameters in every greenhouse and has project practicality and vendibility.

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