Eco Friendly Green House Monitoring and Control System

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Abstract— This paper discusses the sensor and ARM7 controller based automatic monitoring and control system .It detects the atmospheric humidity, temperature, light intensity and gases detected by sensors such as SY-HS 220,LM35,Light Detecting Resistor and MQ-6 GAS sensor respectively. These values are processed by ARM 7 controller i.e. LPC 2148 .They are converted into their corresponding digital values by inbuilt Analog to Digital converter of ARM 7 controller. These values can be displayed using monitor at remote monitoring center.However out of four parameters which are contributing to the growth of plants in green house, two of them are controlled .Light intensity and temperature can be varied using external setup to compensate for reduction of any of them. The LPC 2148 controller is 32 bit controller. Inbuilt Analog to digital converter is of 10 bits. Data transfer takes place via internet. General Packet Radio Service network is used to transfer data packets. Protocol used for data transfer is TCP. The system gives stable performance and it is fast and reliable. Solar panel is used to convert light energy of sun into electricity. Electricity stored in battery is supplied for functioning of system.

Keywords— General Packet Radio Service, TCP, ARM 7, LPC2148

I. INTRODUCTION

Using this system, remote monitoring and control of environmental parameters like humidity, temperature, light intensity and gases is possible. Use of solar panel which are of 12 V and 8 W,ensures quick electricity supply to all equipments of system. ARM7 controller processes data collected from sensors, converts that data into digital values for simplicity of reading it by end user or farmers of green house. Transmission of data takes place using General packet radio service network. Data packets are transferred using Transmission control protocol. This Protocol ensures reliable, error free delivery of data moreover possibility of duplication of data or loss of data is completely ruled out due to Thes protocol. Flash magic and visual basic softwares are used for writing program and for graphical user interface respectively.

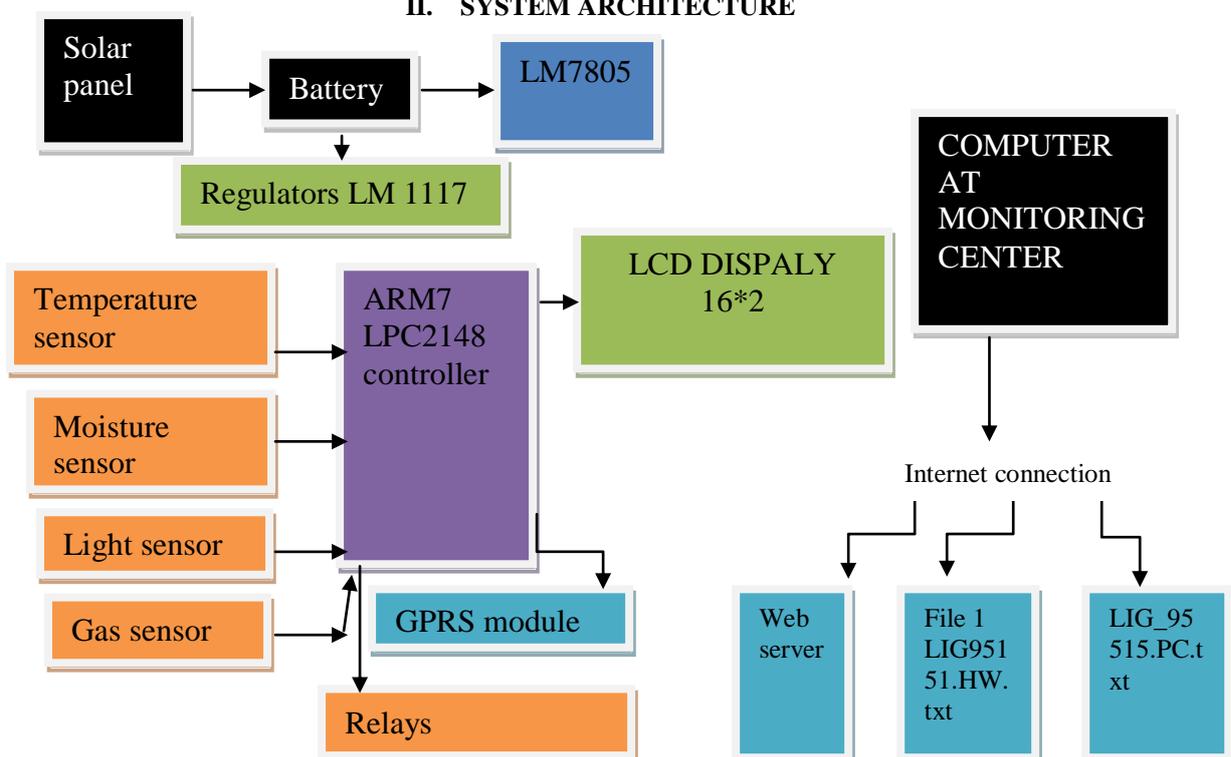## II. SYSTEM ARCHITECTURE

Fig (1) Block diagram of monitoring and control system

III. HARDWARE REQUIREMENTS

Sensors used are as follows. **Temperature sensor:** The LM 35 is rated to operate over at -55° to +150°C temperature   range. Another   important characteristic of the LM35 is that it draws only 60 micro amps from its supply and possesses low self heating capabilities.

Humidity sensor: SY-HS220 is resistance type Humidity Sensor Module .It is operated on DC5V. This sensor has operating temperature range 0~60°C (32~140°F) and operating Humidity 95% (Relative Humidity) .Its output is 0~3.3V.

Light Detecting sensor: Light detecting resistor is a photoconductive light sensor does not produce any electricity but simply changes its resistance when subjected to light energy. The commonly used photo resistor is called Light Dependent Resistor or LDR. LDR will have a resistance that varies according to the amount of visible light. The light falling on the brown zigzag lines on the sensor causes the resistance of the device to fall. This is known as a negative co-efficient. There are some LDRs that work in the opposite way i.e. their resistance increases with light (called positive co-efficient) Now, in order to use this device in a simple circuit, all we need to do is put a voltage across it and measure the current flowing through it. However, measuring current can be a little tricky. So, we put another resistor in series, and measure the voltage across the LDR. This makes us a potential divider, and the voltage across the LDR is proportional to the current.

Relays: A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electro magnet to open or close one or many sets of contacts. It was invented by Joseph Henry in 1835. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier. Rating of Relay in prototype system is 5A, 125 VAC and 230 VDC.

Voltage regulator: The LM7805 series of three-terminal positive regulators is available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut-down, and safe operating area protection. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components for adjustable voltages and currents.

LM1117 Regulator: The LM1117 is a series of low dropout voltage regulators with a dropout of 1.2V at 800mA of load current. It has the same pin-out as National Semiconductor's industry standard LM317. The LM1117 is available in an adjustable version, which can set the output voltage from 1.25V to 13.8V with only two external resistors. In addition, it is also available in fixed voltage 3.3V. The LM1117 offers current limiting and thermal shutdown. Its circuit includes a Zener trimmed band gap reference .To assure output voltage accuracy to within ±1%. The LM1117 series is available in LLP, TO-263, SOT-223, TO-220, and TO-252 D-PAK packages. A minimum of 10µF tantalum capacitor is required at the output to improve the transient response and stability.

SIM 900(General Packet Radio Service network modem for wireless transmission of data packets): GSM/GPRS TTL -Modem is built with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3/5V TTL interfacing circuitry, which allows you to directly interface 3V3 Microcontrollers (ARM, ARM Cortex XX, etc) .The baud rate can be configurable from9600-115200 through AT command. Initially Modem is in Auto baud mode. This GSM/GPRS TTL Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS a well as DATA transfer application in M2M interface

Embedded system: LPC 2148 controller of ARM7 family: This is heart of the system .It is used for processing of data acquired from various sensors ,GPRS modem .I t has inbuilt Analog to Digital Converter of 10 bits.The analog signal from sensors os converted into its corresponding digital values by the same Analog to digital converter in ARM 7 controller and these values are displayed on LCD as well as monitoring centre

LCD Display: LCD display used to display data and messages related to working of whole system .I t is 16*2 bit display of two rows.

Computer system: This system with internet connection is required at remote location where monitoring of data is going on. The monitor or screen of computer system will be able to display graphical representation of various parameters of system.

Solar Panel: A Technology is developed which performs remote monitoring of environmental parameters on the Internet. To supply power to run this system a solar panel is used which coverts light energy into electricity. Thus existing system prototype derives power required to run the entire system. A solar panel is used for converting light energy into electricity. Photovoltaic cell converts sunlight into electric energy and this effect is known as photovoltaic effect. Photons strike the surface of solar panel where they collide with electrons and provide energy to them thus making them free to move through the crystal. Such free electrons constitute a direct current or D.C. current which is further converted into A.C. current using inverter. Panel used in this system gives output voltage of 12 V. Electricity is saved in battery of 12 V.

IV. SOFTWARE REQUIREMENTS

keil µvision4: The µvision4 IDE is a windows based software development platform that combines a robust and modern editor with a project manager and make facility tool. It integrates all tools needed to develop embedded applications including C/C++ compiler, macro assembler, linker/locator, and a HEX file generator. µvision 4 helps expedite the development process of embedded applications.

Visual basic studio 2008: Visual basic (VB) is the third generation event-driving programming language and integrated development environment (IDE) from Microsoft for its COM programming model. VB is also considered a relatively easy to learn and use programming language, because of its graphical development features and its BASIC heritage. Visual basic was derived from BASIV and enables rapid application development (RAD) of graphical user interface (GUI) applications, access to database using Data Access Objects, Remote Data Objects, or active X Data Objects, and creation of ActiveX control and Objects. Scripting languages such as VBA and VB script are similar to Visual Basic but perform differently. A programmer can put together an application using the components provided with visual basic itself. Programs written in Visual Basic can also use the Windows API, but doing so requires external functions declarations. Links to manuals ,on-line help, device datasheets, and user guides.

Flash Magic: Flash magic works with the ISP boot loader built into almost every LPC device from NXP and allows you to update the flash contents on your MCU via a simple UART connection. You simply need to set the ISP jumper, reset the device, and you should automatically enter ISP mode. The only HW required for this is an inexpensive UART convertor with 3.3V logic, available in our online store.
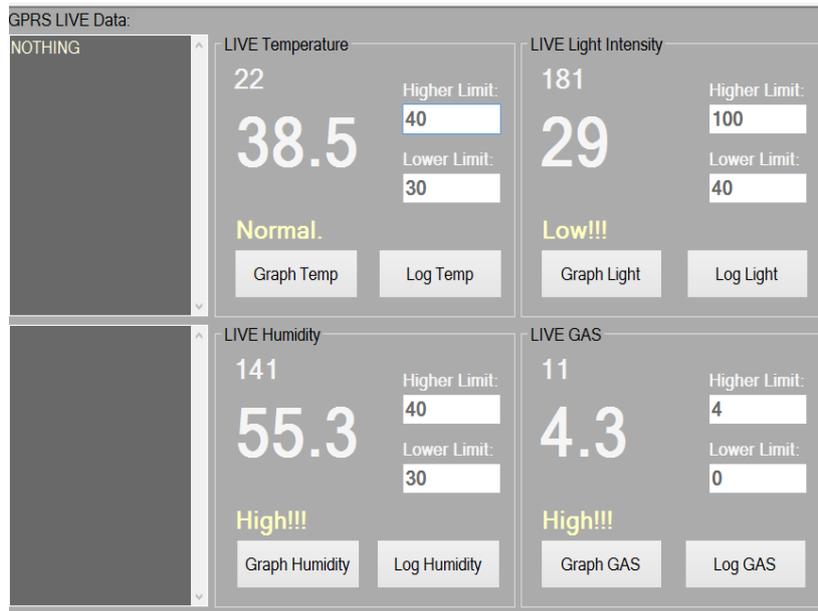
V. OBSERVATIONS

Fig (2) Digital values of environmental parameters.

Fig (1) From above table ,it is visibl that live temperature is within the range ,but light intensity is below minimum.Humidity is high which is not within specified range and range of gas present in the atmosphere is High.As soon as the light intensity goes below specified limits Relay 2 becomes ON and it switches ON the Bulb.
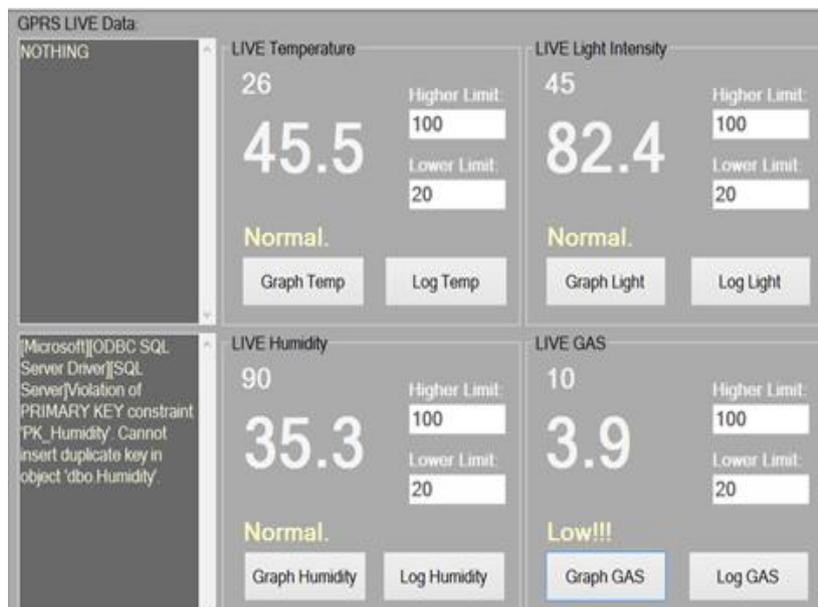
VI. RESULT

Fig (3) Observed environmtal parameters at monitoring center

Fig (5) Observed environmetal parameters at monitoring center.

Table 1: Observation of data displayed in tabulated format

Parameters	Upper limit	Lower limit	Observed value	Remark
Humidity	100	20	36.5	Within the range
temperature	100	20	47.3	Within the range
Light intensity	100	20	83.5	Within the range
Gas	100	20	3.9	Below the range

Table 2: Observation of parameters controlled by external equipments using relays

Parameters to be controlled	Live digital value	Lower limit	status of signal	Status of Relays	Device connected to relay	Status of device
Temperature	38.5	40	Low	Relay1 is ON	Heater	ON
Light intensity	42.7	50	Low	Relay2 is ON	Light bulb	ON

VII. CONCLUSION

The prototype system which monitors and controls green house parameters is implemented successfully using General Packet Radio Service wireless network. This technology can perform remote monitoring and controlling of environmental parameters on the Internet is designed. ARM7 Controller and four different sensors are implemented and parameters like temperature, moisture, light and gas are monitored successfully. The system is reliable and economic. Using this system, farmers or end users can keep log of environmental parameters into the database. Also parameters like light intensity and temperature can be controlled using external artificial lightening system such as light bulb for decreased light intensity and to compensate for decreased temperature heater is used .The system switches to external compensatory circuit through relays.

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