Multiple Sensing using ARM

Rachana L. Bhanushali[1] Akshada A. Mahadik[2] Priyanka P. Sherkhane[3] Rohan S. Mali[4]
[1,2,3,4]Department of Information Technology
[1,2,3,4]P.V.P.P.C.O.E Mumbai, India

Abstract— A prototype system is being developed based on a mobile Smart-phone linked via Web Server to an ARM kit which has a temperature sensor and a gas sensor to enable analysts to self-manage their own industry. It deals with the robust and reliable evaluation of Temperature with a Smart-phone. The objectives of the work are to design the system around a chemical industry. The key principle in design is to make the system accessible to the analyst in the simplest manner. The device available to measure the temperature is LM35 and that to detect the presence of LPG is MQ-6. The system will show the output in a digital manner on an LCD of the kit. These values are sent over the web domain to the Android-based device. The main purpose of the project is to help analyst obtain their industry environment at home and to keep a record of their measurements. Temperature can vary throughout the day depending on activity. One or two measurements taken at different times are not enough to properly define the environment temperature. It is preferable to take numerous measurements. It is in your interest to carry out a large number of measurements. In our project we are successfully integrating temperature sensor IC LM35 and gas sensor MQ-6 with the ARM kit LPC2148 from where the readings are successfully transferred to the mobile device.

Key words: ARM7, embedded, sensors, LPC2148, LM35, MQ6

I. INTRODUCTION

Temperature sensors are vital to a variety of everyday products. For example, household ovens, refrigerators, and thermostats all rely on temperature maintenance and control in order to function properly. Temperature control also has applications in chemical engineering. While temperature is generally sensed by humans as "hot", "neutral", or "cold", chemical engineering requires precise, quantitative measurements of temperature in order to accurately control a process. This is achieved through the use of temperature sensors, and temperature regulators which process the signals they receive from sensors.

Temperature sensors are devices used to measure the temperature of a medium. Gas sensing is also an important parameter in a chemical laboratory as well as at home. The presence or absence of a particular gas can cause issues in various laboratories which can be handled only if it is detected properly with the help of sensor. These both parameters must be thus recorded for easily monitoring the current place under observation.

II. EXISTING SYSTEM

A. Industrial Temperature Monitoring and controlling using ARM 7 processor based on LP2148 controller.

Accurate measurement and monitoring of temperature is an important task in research field and vital task in industrial and chemical processes. An inexpensive instrumentation for the measurement, monitoring and processing of temperature of a thermally insulated chamber is the existing system. The same principle can be extended to any other system whose temperature has to be measured. The system is built around an advance 32-bit ARM RISC processor: LPC2148. The LM35 temperature sensor is interfaced to the LPC2148 by directly connecting its output to the analog input channel of the on-chip 10-bit ADC. The sensed temperature is not only displayed on the LCD but also sent to the laptop/desktop by communicating over fiber optic cable. [1]

1) *Problems in Existing System:*
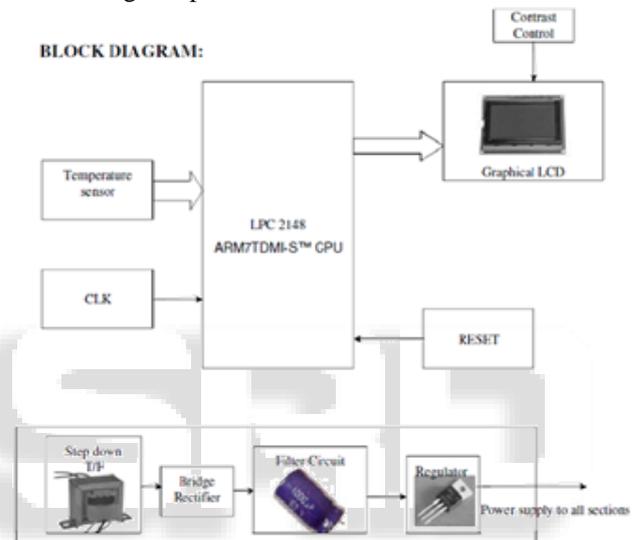   –   Wired system.
    –   Degrade performance.

Fig. 1: Block Diagram Industrial Temperature Monitoring and controlling using ARM7 processor based on LP2148 controller.

B. LPG and Smoke Detector with Auto Dialer using ARM7 (LPC2148):

This project is designed to monitor the LPG leakage or smoke and active the siren and auto dialer using ARM based microcontroller. LPG sensor is used to sense the leakage. A buzzer is provided to alert the user in abnormal condition. The LPC2148 are based on a 16/32 bit ARM7TDMl-S CPU with real-time 596emulation 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 POBT, 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.

This project uses two power supplies, one is regulated 5V for modules and other one is 3.3V for microcontroller. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full Wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer. [2]
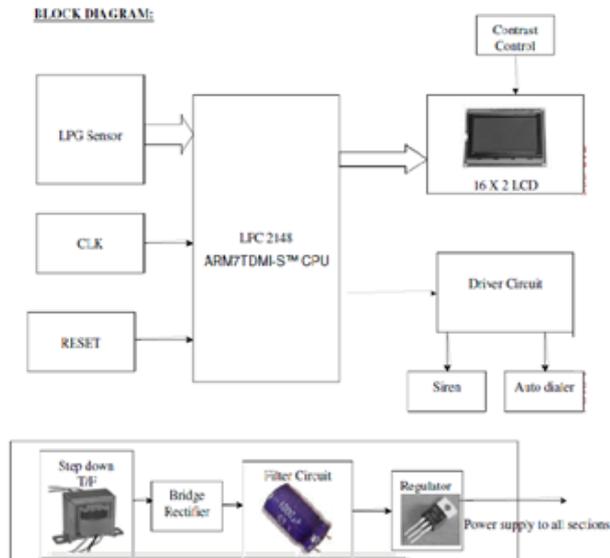

Fig. 2: Block diagram of LPG and Smoke detector with Auto dialer using ARM7 (LPC2148)

III. PROPOSED SYSTEM

A. Problem Statement:

Our system measures temperature and detects gas of the surrounding using a temperature sensor LM35 and gas sensor MQ-6 which is interfaced with the 32-bit ARM RISC processor: LPC2148. The temperature is measured as well as the gas is detected for any abnormality on regular intervals and this is sent to an Android based Smart phones using Web Server i.e. wireless connection. This system is very effective considering the cost and the speed. The temperature and gas sensor give result in digital manner.

LPC2148 is a hardware kit that provides the easy input and output modes. It has UART inputs for programming and VGA output to any external devices [3]. The sensor LM35 is rated to operate from -55^0 C to $+150$ ^{0} C while the LM35C is rated to operate for -40^0 C to $+110$ ^{0} C. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm.

The Proposed system will interface the temperature and gas sensors to LPC2148 linked to Android phone via Web Server. Due to availability of various open-source functionalities it would be possible to store and monitor the variations in the readings taken over a period of time. Also generate reports that can be sent to the analyst for monitoring the environment. With the help of this mobile application people can easily measure surrounding temperature and detect presence of LPG at any time. This may help in preventing undesirable loss and reduce expenses. So the application will give basic preliminary health-analysis and indicate any possible risk due to changes in the vital signs. A user can maintain track of the measurements.

B. Architecture of the Proposed System:

The proposed system consists of the sensors which are used for detection purpose and are interfaced to the LPC2148 with the help of an UART port. A potentiometer is also attached for the purpose of transmission over the protocol RS-232. RS-232 is a standard communication protocol for linking computer and its peripheral devices to allow serial data exchange. In simple terms RS232 defines the voltage for the path used for data exchange between the devices. It specifies common voltage and signal level, common pin wire configuration and minimum, amount of control signals [6]. The result is sent to the web server using this protocol which will send the values to the Android device connected to the respective web server.
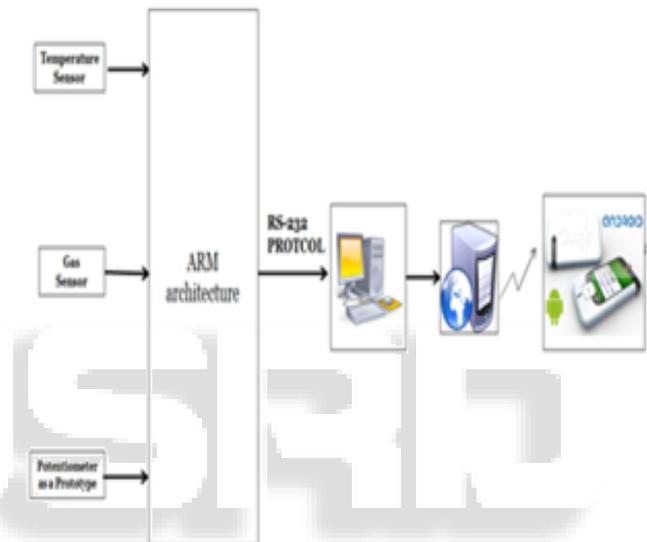

Fig. 3: Block Diagram of Proposed System

IV. REQUIREMENT ANALYSIS:

A. Hardware Requirements:

1) LM35 Temperature Sensor:

This sensor has the properties like: Only 3 pin; smaller in size, directly gets the output in degree Celsius, 0.01V per degree rise is scaling factor.

2) MQ-6 Gas Sensor:

This sensor works as: Sensing element is enclosed in steel exoskeleton; sensing element is heated with incoming current, gases comes in contact changes the resistance of an element.

3) 32-bit ARM RISC Processor: LPC2148:

LPC2148 has following features: 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory, 128 bit wide interface/accelerator enables high speed 60 MHz operation, single 10-bit D/A converter provides variable analog output, multiple serial interfaces including two UARTs.

4) Web Server:

It means a machine intended specially designed to be used to run server software. It's still a PC, and you could run the same software it does on your desktop and vice versa.

5) Android OS:

Android is popular with technology companies which require a ready-made, low-cost and customizable operating system for high-tech devices. To run the application, the Android OS is required.

6) Windows XP/Vista/7:

Microsoft Windows is a meta-family of graphical operating systems developed, marketed, and sold by Microsoft. It consists of several families of operating systems and offers connection of the hardware and platform for its programming.

B. Software Requirements:

1) Android SDK:

The Android software development kit (SDK) includes a comprehensive set of development tools. The officially supported integrated development environment (IDE) is Eclipse using the Android Development Tools (ADT) Plug-in Android applications are packaged in .apk format and stored under */data/app* folder on the Android OS.

2) Eclipse IDE:

Eclipse is an integrated development environment (IDE) which contains a base workspace and an extensible plug-in system for customizing the environment. By means of various plugins, Eclipse may also be used to develop applications in other programming languages: Ada, ABAP, C, C++, COBOL, FORTRAN, Haskell, JavaScript, Lasso, Natural, Perl, PHP, Prolog, Python, R, Ruby, Scala, Clojure, Groovy, Scheme, and Erlang.

3) Java JDK:

The Java Development Kit (JDK) is an implementation of either one of the Java SE, Java EE or Java ME platforms. Developers use any text editor to edit Java and files, then use command line tools using Java Development Kit to create, build and debug Android applications as well as control attached Android devices.

4) Keil μVision:

The μVision IDE from Keil combines project management, make facilities, source code editing, program debugging, and complete simulation in one powerful environment. The μVision editor and debugger are integrated in a single application that provides a seamless embedded project development environment.

5) Flash Magic:

Flash Magic is a PC tool for programming flash based microcontrollers using a serial or Ethernet protocol while in the target hardware.

6) Embedded C:

Embedded C is a set of language extensions for the C Programming language. Embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

V. CONCLUSION

The existing system shows us how the ARM architecture works for various applications. This is used in our proposed system and we have develop an Android Application to display the values to the analyst of the laboratory which can be detected by the temperature sensor LM35 and the gas sensor MQ-6 with the help of embedded system. The embedded system used for the proposed system is the ARM architecture. The programming language used is Android which is an open-source technology that can help in better availability of the environment for the analyst.

VI. FUTURE SCOPE

This system can be improved to show temperatures in various units of measurements like, Fahrenheit. A temperature converter can also be embedded in the Android application.

The number of sensors can be increased to enhance its scope to various areas. Those sensors may include smoke sensor, proximity sensor, humidity sensor, etc. This will be helpful in cars and home applications.

VII. ACKNOWLEDGMENT

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