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GSM Based Data Acquisition and Industrial High End Equipment Protection Using Arm7



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The main objective of this paper to protect the industrial equipment when any unexpected incident happening while equipments are under operation. In this paper we are considering the temperature, smoke, fluid level measurement and Wireless camera can be used for monitoring purpose .When temperature crosses the minimum and maximum limits the system will alert the workers through buzzer sound and send an immediateSMS alert to the authorized persons. The system also has a facility to detect smoke when any fire accidents happen in the industries, If it detects any smoke immediately it will switch ON the buzzer and send an SMS alert to the authorized persons.

Other main feature of this systems is to monitor the fluid level, when the fluid level is below the minimum limit and exceeds the maximum limit in both the situations it will indicate through alarm sound and send an SMS alert to the authorized persons by using GSM module interface. The advantage of this system is to avoid the human presence, the system continuously monitor the temperature, smoke detection and fluid level measurement and send an SMS to the authorized persons at regular interval of time. The system is designed by using ARM7 (LPC2368) microcontrollers. The system also has a facility to monitor all these information by using PC interface.

Keywords:

ARM7 Microcontroller, Smoke sensor, Temperature sensor, fluid level sensor, wireless camera, GSM, PC.

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I.INTRODUCTION:

Data acquisition system (DAC) is defined as the process of taking a real-world signal as input, such as a voltage or current any electrical input to the hardware circuit, for processing, Physical phenomena represent the real-world signal we are trying to measure. A data acquisition system converts a signal derived from a sensor into a sequence of digital values. The sensor is connected to an amplifier, which converts the signal into a potential. The amplifier is in turn connected to a digitizer, which contains an A/D converter. The digitizer produces a sequence of values representing the signal.

Physical system: In physical system the parameters like temperature, gas, fluid levels very crucial role but this parameters are detected by sense only.

Transducer: Transducer is the electronics device which converts one form of energy into another form.

Sensors:

Sensors are the primary input element involved in reading physical quantities (such as temperature, force or position) into a DAQ system. They are generally used to measure analog signals although the term sensor does in fact encompass some digital devices such as proximity switches. In this section we will deal only with sensing analog signals. Analog signals can be measured with sensors that generate either analog or digital representation of the quantity to be measured. The field of data acquisition has a very wide range of activities.



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At its simplest level, it involves reading electrical signals into a digital from. These signals may represent the state of a physical process, such as the position and orientation of machine tools, the temperature of a furnace or the size and shape of a manufactured component. The acquired data may have to be stored, printed or displayed. Often the data have to be analyzed or processed in some way in order to generate further signals for controlling external equipment or for interfacing to other computers. This may involve manipulating only static readings, but it is also frequently necessary to deal with time-varying signals as well. Some systems may involve data to be gathered slowly, over time spans of many days or weeks.

Camera Module: Wireless A/V camera high receives sensitivity +18dB, Receive signal picture sound 0.9G/1.2G. with high quality output. RM0100 is a Wireless A/V camera range up to 300 feet, Receive signal picture sound 0.9G/1.2G.with high quality output. The RM0100 is a 2.4GHz wireless camera works at ISM band. The Camera Transmitter with Receiver Set suitable for monitoring the robot, , widely used for theft prevention, after-hours surveillance, home security, for household, companies, shops, factories, security CCTV system kit. You can view the cameras on your TV or record directly to VCR. The Wireless Camera and Receiver will provide a day and night monitoring solution with the convenience of wireless technology.

II.BLOCK DIAGRAM:



Figure.1 Block diagram

III.HARDWARE IMPLEMENTATION:

The basic block diagram of the ARM based data acquisition system is shown in Figure 1. This project implements a Data Acquisition System using ARM microcontroller. It implements an interface to a Gas sensor (MQ-2), Temperature sensor (LM35) and Liquid level sensor and wireless camera (RM0100). The Gas level in the area will be continuously monitored via the gas sensor. The gas levels will be logged at predefined intervals and will be transferred to the mobile via GSM module. As long as the gas level is within set limits no action signal would be raised. As soon as the level increases beyond the set limits, a signal would be raised, and buzzer sound will produced at the same time a SMS will be sent to supervisor mobile. Also the temperature from surrounding monitored via temperature sensor. The temperature level will be logged at predefined intervals and will be send a SMS to the mobile via GSM module. If the temperature level crosses the limit, relay controls the accessories device.

GAS sensor (MQ-2):

MQ- series are available for various gas sensing. But MQ-2 is a sensor designed for the sensing of LPG, propane, butane. If the smoke or any gas sensed by the MQ-2 immediately buzzer sound will produce, at same time a Fire Alert will be sent to the mobile.

Temperature Sensor (LM35):

The temperature sensor which could give a proper linear output of sensed temperature of the location for monitoring and controlling. If the temperature range will increased Certain level a message will send to plant supervisor. And every predefined interval of time a message will send to the supervisor with all parameters that are sensed by the sensors.

Camera module (RM0100):

A relay is attached to power supply of the camera and it is interfaced to microcontroller, when we send a message to GSM module like CEMARA ON, controller will read the message and immediately it will turn on the relay, so that the power supply will switch on video and audio capturing will start. we can control the operation of camera by turning ON/OFF by sending message.

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Liquid Level sensor:



Figure.2 Liquid level sensor

Liquid Level Sensor show in circuit ,three transistors Q1,Q2,Q3 are connected to power supply +3.3v through resistance R1,R2,R3.and three level pins are placed in water or liquid as shown in Figure 2. When water level reached to Level 1 with respect to the GND, a message will be send to the mobile like "WATER LEVEL AT ONE", same will continued for reaming two levels.And this system will offer the feature like when supervisor want to know temperature state, fluid level at any point of time this will done by sending message "GET DATA" and system will replay the all data.

GSM Technology:

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone.GSM (Global system for mobile) uses a process called circuit switching. This method of communication allows a path to be established between two devices. Once the two devices are connected, a constant stream of digital data is relayed.GSM networks consist of thee major systems the Switching System (SS), The Base Station(BSS) and the Mobile station(MS).

GSM Modem parameter and specification:

Frequency band:Quad band 850/900/1800/1900Transmission power: 2 W @850/ 900 MHz 1 W
@800/1900MHz.Baud rate: 9600Power supply: 12V, 1AOperating Temperature: -40 °C to 85 °C

IV.SOFTWARE IMPLEMENTATION:

The software section is composed of namely, KEIL μ VI-SION, FLASH MAGIC, KEIL μ VISION: μ Vision₃ is an IDE (Integrated Development Environment) that helps you write, compile, and debug embedded programs. It encapsulates the following components:

- » A project manager.
- » A make facility.
- » Tool configuration.
- » Editor.
- » A powerful debugger.

 μ Vision3 adds many new features to the Editor like Text Templates, Quick Function Navigation, Syntax Coloring with brace highlighting, Configuration Wizard for dialog based startup and debugger setup.

FLASH MAGIC:

NXP Semiconductors produce a range of Microcontrollers that feature both on-chip Flash memory and the ability to be reprogrammed using In-System Programming technology. Flash Magic is Windows software from the Embedded Systems Academy that allows easy access to all the ISP features provided by the devices. These features include:

- Erasing the Flash memory (individual blocks or the whole device)
- Programming the Flash memory
- Reading Flash memory

• Performing a blank check on a section of Flash memory

- Reading the signature bytes
- Reading and writing the security bits

• Direct load of a new baud rate (high speed communications)

• Sending commands to place device in Boot loader mode.

Flash Magic provides a clear and simple user interface to these features and more as described in the following sections. Under Windows, only one application may have access the COM Port at any one time, preventing other applications from using the COM Port. Flash Magic only obtains access to the selected COM Port when ISP operations are being performed.

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This means that other applications that need to use the COM Port, such as debugging tools, may be used while Flash Magic is loaded.

Viewing Code and data: The μ Vision₃ Debugger provides a number of ways to display variable and program objects

Executing Code: The μ Vision₃ offer several ways you can control and manipulate program execution. Advanced Analysis tools: advanced analysis tools are available to help test and debug embedded applications.Simulation; Simulation capabilities make it possible to test target system without target hardware.

V.FLOWCHART:



Figure.3 Flowchart

VI.ADVANTAGES:

- 1. Can use hazardous/remote areas where life is at risk.
- 2. High data reliability.
- 3. Support for multiple network topology
- 4. Transmission range available up to 1.6 km

5. Lower power consumption with battery life ranging from months to year.

- 6. Highly reliable cost effective, and compact in size
- 7. Independent of line of sight communication.

8. Simple to install and easy to maintain. It helps to monitor and control the parameters in a place where Human inference is difficult.

9. No need of any technical person for control or monitoring.

10. Number of parameters can be added in the system as we have used ARM7.

VII.APPLICATION:

1. DAS generally used in Automation control system.

2. Temperature monitoring and pressure measurement.

- 3. Water level management in liquid tanks.
- 4. Weather forecasting.
- 5. Light controlling system.

6. The system helps the user to get the efficient and cost effective system for monitoring and controlling hazardous gas like LPG.

VIII.RESULT AND CONCLUSION:

Here in our project we have designed a wireless data acquisition system using LPC2368 microcontroller and GSM module. Data Acquisition is a portable acquisition system of fluid level measurement, smoke detection and temperature data. The system can be connected with host by GSM module interface and process fluid level, smoke/gas detection, temperature and other data. The DAS is an invaluable tool to collect and analyze experimental data, having the ability to clearly present real time results, with sensors and probes able to respond to parameters that are beyond the normal range available from most traditional equipment. The system helps the user to get the efficient and cost effective system for monitoring and controlling hazardous gas like LPG. It helps to monitor and control the parameters in a place where human inference is difficult. No need of any technical person for control or monitoring. Number of parameters can be added in the system as we have used ARM7.

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Figure.4 GSM Based Data Acquisition and Industrial High End Protection Using ARM7

There exists a scope for further improvement in its speed, number of channels, power consumption, and PC interface software for post data analysis. Also for any illegal action and in natural calamity the data or message can be send to each and every worker for their safety. GSM communication performed almost data transfer from sensor at remote area was executed without incidents. Since all communication between DAS and user are wireless based, this translates into lowest cost compared to all others system.



Figure.5 Wireless Camera Module

In this project all the database is stored in a central database in the DAS; user has global access to consolidate data from many system or locations. Wireless based solutions have universally accepted, familiar and user friendly system. Real-time logging would allow warnings to be flagged to the relevant personnel (e.g. an SMS warning message to the supervisors or operator) and allow corrective action to be taken before the quality and value of the catch is degraded.



Figure.6 SMS Output Shown in Mobile **ACKNOWLEDGMENT:**

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