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Real Time Process Controlling and Monitoring by using Microprocessor

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Abstract

Application of electronics devices in all the field of life is growing very fast. On the other hand applications of microprocessor in real time are also increasing rapidly. Microprocessors so far have been very much utilized in information technology. Microprocessor hasa vast potential for real time control in various application areas in industrial automation. Other main areas which can be influence by microprocessors are personal, professional, medical, and space research.In most of the cases, input analog signals are taken from sensors by the microprocessor unit via peripherals and after processing, it sends output digital signal to the real system for monitoring and control. This paper describes the use of microprocessor for real time monitoring and control in the process control application. The system developed will be able to sense and measure required parameters of the system and finally control the system to achieve its performance.

Keywords: Electrocardiogram(ECG), Electromyography (EMG), Industrial, Microcontroller, Microprocessor, Radio Frequency(RF), Real Time Protocol (RTP), Scientific and Medical Radio(ISM), Ultrasonography(USG)

1. Introduction

One of the prominent real time applications of microprocessor is in the field of medical science. The patient monitoring system which is of comprises a portable device, a microprocessor-based internet server and software running on a remote computer. The developed system samples and sends the patient's diagnostic information like USG, ECG, EMG, etc. to the specialized doctor seating far away over the Internet. At the remote computer, the diagnostic information is presented on the screen in real time to be analyzed by a health professional. The all the relateddiagnostic informationare sent to the microprocessor- based Internet server via Radio Frequency (Bluetooth). Bluetooth was used because it operates on ISM band, presenting low power and low cost.Theseinformation are packed into Real Time Protocol (RTP). The remote computer receives and unpacks the RTP packets to display the related diagnostic information on the screen.These signals are broadcasted over the Internet in real-time, allowing physicians to monitor the patient´s health. Bluetooth technology gives freedom to the patient to develop his home activities under monitoring, since the KC11 achieves a range of 200m in open areas. The developed system transmits the ECG signals from remote or isolated areas over the Internet, allowing the following up of cardiac patients without the need of his frequent displacement to a hospital, improving the life quality of the patient[1]. Possible real time application of microprocessor in the field

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of industrial engineering. The system monitors the bus voltages and reactive power flows to determine the shunt capacitor bank breaker switching actions. Once the capacitor bank is switched on, the apparent phase impedances and the zero- sequence current through the capacitor bank are mentioned to detect blown fuses in the individual capacitor cans. The results indicate that the system would maintain the voltages and the power flows within the specified limits and it can detect a lossof a single can in the capacitor bank[2].

Another possible real time application of microprocessor in the field of industrial engineering is to develop a system based on AVR micro controller that is used for monitoring the voltage, current and temperature of a distribution transformer in a substation and to protect the system from the rise in mentioned parameters. Providing the protection to the distribution transformer can be accomplished by shutting down the entire unit with the aid of the Radio frequency Communication. Moreover the system displays the same on a PC at the main station which is at a remote place. Furthermore it is capable of recognizing the break downs caused due to overload, high temperature and over voltage. The design generally consists of two units, one in the substation unit, called as transmitter and display unit, and another in the Main station called as controlling unit. The transmitter and the display units in the substation is where the voltage, current and temperature are monitored continuously by AVR microcontroller and is displayed through the display unit. An RF transmitter is used for transmitting the signals that are obtained. The controlling unit in the main station by means of a PC and a RF receiver receives the RF signals that are transmitted by the Transmitter unit and reacts in accordance to the received signal. In general, the proposed design is developed for the user to easily recognize the distribution transformer that is suffered by any open or short circuit and rise in temperatures. The ultimate objective is to monitor the electrical parameters continuously and hence to guard the burning of distribution transformer or power transformer due to the constraints such as overload, over temperature and input high voltage. If any of these values increases beyond the limit then the entire unit is shut down by the designed controlling unit[3].

Battery management system (BMS) forms a crucial systemcomponent in various applications like electric vehicles (EV), hybrid electric vehicles (HEV), and uninterrupted power supplies (UPS), telecommunications and so on. The accuracy of these systems has always been a point of discussion as they generally give an error of maximum 10% considering all the parameters together. In this, asystem is presented which is developed using low cost microcontrollers for measurement of electrolyte temperature, electrolyte level and no. of backup hour'sparameters of lead-acid batteries. Since the batteries, which would be used in the hybrid electric vehicle (HEV), are lead-acid batteries, they will be the focus of this project. While the present prototype system accounts only for measuring backup hours of a car in a stationary as well as in a running mode. With the help of this, we are able to know the battery life span and its efficiency. Data backup is also provided to save the all records of battery[4].

2. General Working Description

With the increasing awareness of global warming aroundthe world, the demand for clean fuel/energy is on the riseand as a result there is a continuous

shift towards theelectric vehicles (EVs) and hybrid electric vehicles (HEVs). Battery forms one of the most critical systems in anyelectric vehicle. Battery performance is influenced byfactors such as depth of discharge (DOD), temperature andcharging process. EVs and HEVs use batterymanagement system (BMS) to address the implementationof monitoring system parameters such as current, voltageand temperature. This paper attempts to provide ameasurement of electrolyte temperature, electrolyte leveland no. of backup hours parameters of lead-acid batteries.The designed system as shown in figure and it consists of total 5 slave modules connected to each12V battery unit. These units collect all data regarding battery and send it serially to master microcontroller.

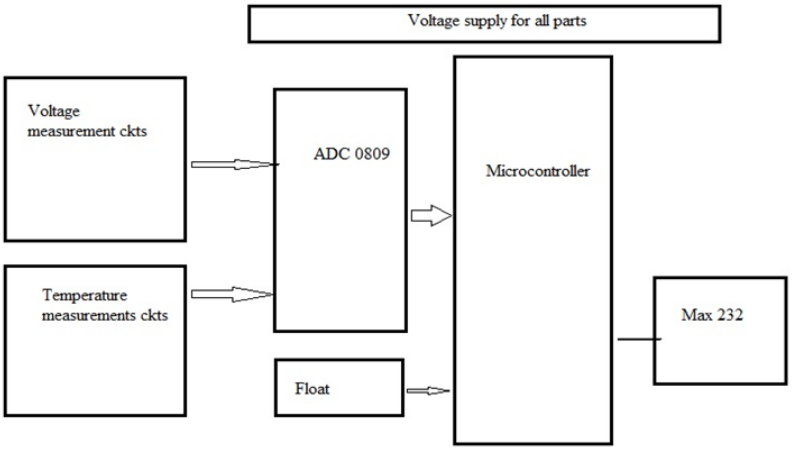

Figure 1. Block Diagram of a Primary Unit.

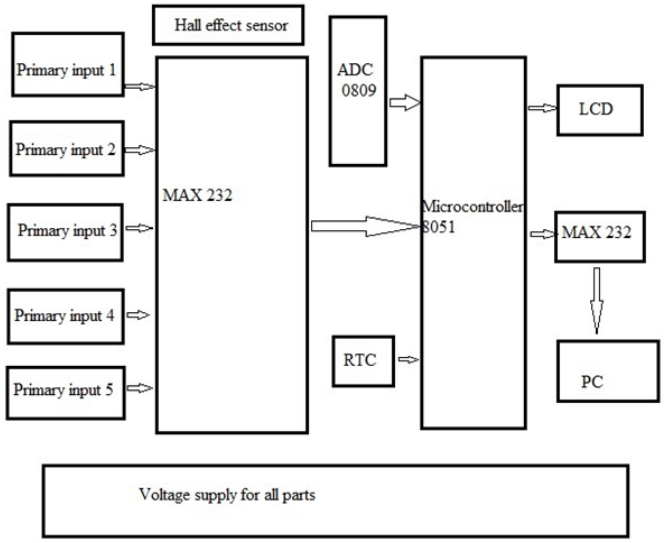

Figure 2. Block diagram of a secondary unit.

2.1 Primary Unit

To each 12V battery, there is a Primary unit is attached, which is used to measure surrounding temperature, actual voltage level of a battery. This unit is also indicates the low water level in a battery. This data is then sending serially to a Secondary unit. A Block diagram of primary unit is shown in Figure 1.

2.2 Secondary Unit

This is a main part of this system. It is used to collect all data coming from Primary via RS232 cable. It also records this data with respect to time with the help of RTC and sends it to a LCD and PC. Hall Effect IC is used to measure current. The block diagram is shown in Figure 2.

3. Conclusion

Various important application of microprocessors in different areas are described. In this paper a "Battery Monitoring System" has been reviewed which has capable to measure electrolyte temperature, electrolyte level and no. of backup hours given by battery of hybrid vehicle and can record all these parameters with respect to time and display it on LCD as well as on computer. The system will help to ensure the efficient working of battery.

4. References

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