Real-Time Monitoring System for Human Physiological Characteristics

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Abstract— The people who are physically handicapped or aged people who are suffering from some diseases are usually confined to their home. The project paper deals with the development of GSM for Blood Pressure and Body Temperature monitoring. GSM system is used in this project for communicating the abnormal condition in biomedical parameter. In this project if there are any abnormalities sensed by set point values, and denoting by set point values then this project will worked out . If there are any abnormalities then message will be displayed on caretakers/doctors mobile phone using GSM system. Doctor/Caretaker can Directly communicating with the patient by using GSM .When Patient measured their Blood Pressure and Body Temperature then after completion of this process all these three parameter will be displayed on LCD and doctor/caretakers mobile phone then your caretaker can communicating with patient and let them know the physical condition of patient.

Key words: Blood Pressure Circuit, GSM Modem, Microcontroller, Temperature Sensor

I. INTRODUCTION

Automated monitoring and controlling of various biomedical parameters like Blood Pressure and Body Temperature are monitored using GSM system through the use of short distance wireless communication methods are in use[1]. However such systems restrict the distance between transmitted and remote access. It is always preferable to use wireless systems for biomedical applications as these biological signals can be well observed in living conditions of the patient[2]. The application of GSM communication methods does not restrict to any specific parameter, they are even used in automobile tracking. The age old people/patient requires to constantly monitoring their health conditions specially physically handicapped or heart attack patient even when they go out of their home[3]. Aim of the work is to study the abnormalities in multiple biomedical parameters and to inform it to a caretaker using GSM communication network through SMS[5]. The design of hardware and software system with low cost to achieve remote monitoring has been studied[4]. In this system, monitoring of simulated biomedical parameters is implemented for simulated Blood Pressure & Body Temperature. In the event of any abnormal condition will alerts by messages on LCD display as well as sends SMS to Doctor's / Care taker's cell phone and if there are no such help is available then buzzer is used alert the people around and to seek help from them[6].

II. HARDWARE OF THE PROPOSED SYSTEM

In this paper we have proposed a GSM system for biomedical parameter monitoring. This System has two modules, one is the system module and other is the mobile module or a cell phone[1]. It makes use of GSM architecture & its facility for mobile communication for the status of biomedical parameters of the patient to his doctors cell phone[3]. In this system, both the system module and a cell phone can acts as transmitter & receiver, because it is a bidirectional communication system. The system module, which is actually a micro controller based, which collects the data from all sensors & compares for any abnormal situation from person's set point values[4]. In case of abnormalities; it automatically sends an SMS to the doctor's cell phone along with new values of biomedical parameters [7].

This system responds to SMS sent by the doctor or caretaker, verifies the authenticity (password) and then sends a reply SMS [2]. By the response of SMS sent by this system, caretaker can know the patients' health status [5].

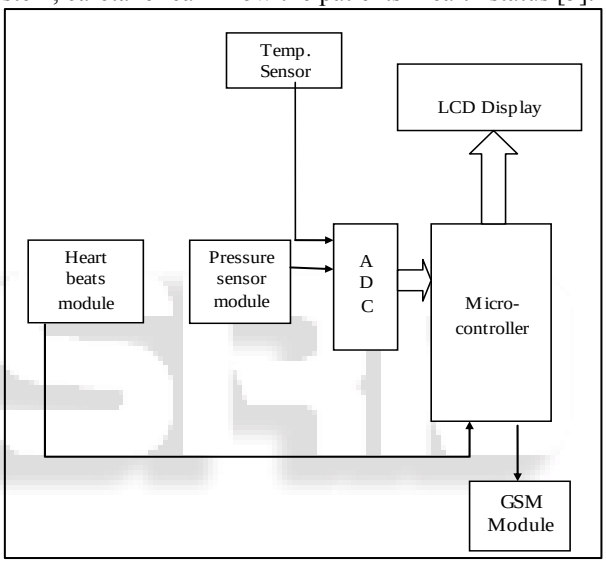

Fig. 1: Block Diagram

The details of few hardware components are;

1) Embedded Microcontroller.
2) Temperature sensor.
3) Blood Pressure Circuit.
4) Analog to Digital Converter (ADC).
5) Dual Band GSM Modem.
6) Subscriber Identity Module (SIM):
7) Short Message Service (SMS)
8) 8. LCD Display unit.
9) Buzzer (Emergency Switch)
10) Power Supply.

A. Embedded Micro Controller:

The micro controller is the most important part of this system. It controls all subsystems like ADC, blood pressure circuit[2]. GSM modem as well as LCD display unit etc. The controller chosen for this work is Atmel's 89C51 and it does all controlling activities of the system by executing a program has been then stored into a flash program memory[4]. An 8-bit micro controller with 8-k bytes of internal flash program memory and 256-byte of data memory, 4-I/O ports. It also consists of a full duplex serial

UART and internal timer/counter. It is an ideal choice for compact E.S design for such applications.

B. Temperature Sensor:

The temperature sensor is chosen for the project is LM35. It is a standard semiconductor transducer (temperature sensor) suitable for the temperature range of -50 C to +150 C. It is fastened to the person's body and it produces: 10mV/0C of the body temperature. This signal is suitably amplified which is then fed to the adc[5].

C. Blood Pressure Circuit:

Blood pressure (BP), the pressure which is exerted by the circulating blood on the walls of the blood vessels, and it's the one of the principal signs. When used without any of specification, "blood pressure "is usually refers to an arterial pressure of a systemic circulation [2]. During each of heartbeat, blood pressure is varies between a maximum (systolic) and a minimum (diastolic) blood pressure. A person's blood pressure is expressed in terms of the systolic pressure over diastolic pressure and is measured in millimeters of mercury (mmHg), for example 120/80. Blood pressure values. Two potentiometers analog signals supply, one representing Systolic value and another representing Diastolic value. These analog signals then fed to two separate channels of the ADC. Then an ADC converts these analog signals into 8-bit digital values and then provides them to the micro controller. The micro-controller then internally compares the value with their set point values to find out whether there are any abnormalities [3].

D. Analog to Digital Converter (ADC):

The ADC is responsible to convert the analog signal into a binary number. When any of analog signal is then applied at its inputs, then it start conversion process, an ADC converts the input signal into the proportional to binary value, by taking some short time[1]. When it finishes conversion and it is ready with the digital data, it indicates with an end of conversion signal. The controller can now read the digital data from the ADC an 8-bit, successive approximation type of an ADC 0809 is used[2].

E. Dual Band GSM Modem:

It is a wireless MODEM and can send and receive data through the GSM modem and network. It actually requires a SIM card and connectivity to the GSM network. Now the GSM MODEM starts communication with the help of an AT commands. It works on to the two frequencies i.e. 900 MHz and 1800 MHz i.e. up-linking and down-linking. Hence it's called Dual band GSM MODEM. GSM for Global System for Mobile Communication. The GSM modem consists of a slot for inserting subscriber identity module (SIM). GSM network generally contains three major stations. Mobile Station and the Base station subsystem and Network subsystem [3] The mobile station contains an International Mobile Station Equipment Identity (IMEI) number and SIM has also IMSI number. Network subsystem contains visitor location register (VLR), home location register (HLR), Authentication Centre (Au) and equipment identity register (EIR). Mobile switching centre (MSC) is the major part which is the gate way for communication between mobile station and public switched telephone network (PSTN)[6]. HLR stores the information about the subscriber and the current location of subscriber. In order to communicate with the GSM modem we have a special set of commands called SMS AT commands [3].

AT+CMGR	Read SMS Message
AT+CMGS	Send SMS Message
AT+CNMI	New SMS Message Indication
AT+CSAS	Save SMS Settings
AT+CSMS	Select Message Service

Table 1: AT Commands

Fig. 2: GSM module

F. Subscriber Identity Module:

One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phonebook[4].

G. Short Message Service (SMS):

Short Message Service (SMS) is popular among mobile phone users as a cheap and convenient method of communicating. Since the use of SMS technology is a cheap, convenient and flexible way of conveying data, researchers are trying to apply this technology in many different areas. One of such areas that the SMS technology could be used as a cost effective and more flexible way will be remote monitoring and controlling[3].

H. LCD Display Unit:

This system has a LCD module for display. A 2-line, 16 character type LCD modules with backlit facility is used. The controller sends the signals to LCD module through its ports[8].

I. Emergency Switches:

In the event of any abnormalities, if the patient or person presses any emergency switch, buzzer is used alert the people around and to seek help from them[2].

J. Power Supply Unit:

Since this instrument has to be carried by the patient while moving. Hence it is essential that the entire patient's unit has to be designed to work on batteries. It consists of rechargeable batteries, filter capacitors and voltage regulators. The batteries can be charged by a regular charger [1].

Fig. 3: Blood Pressure Module

Displays initial title message on LCD. Monitoring of biomedical parameters starts.ADC and scans each Channel of ADC. Body temperature value from temperature sensor through ADC and displays on LCD display. Compares present values with their internal SET values .If any of the parameters are abnormal, it displays a message on LCD and turns on the buzzer and waits for DISABLE button to be pressed within a stipulated time If DISABLE button is pressed within stipulated time, it disables alarm and goes back to monitor patient's parameters again. Prepares SMS containing the values of biomedical parameters .Sends SMS by communicating with GSM modem through AT commands .Disables alarm and goes back to monitor patient's parameters again[6].

III. SOFTWARE IMPLEMENTATION

In software implementation system program is written in Assembly language as it produces the most compact hex code. The system comes to ON condition from RESET position when power is applied. The controller execute program and performs the following tasks in the sequential order. Initializes microcontroller Port configurations. On LCD it displays initial title message on LCD[8]. Monitoring of biomedical parameters starts.ADC and scans each Channel of ADC. Body temperature value from temperature sensor through ADC and displays on LCD display Compares present values with their internal SET values .If any of the parameters are abnormal, it displays a message on LCD and turns on the buzzer and button to be pressed within a stipulated time. If DISABLE button is pressed within stipulated time, it disables alarm and goes back to monitor patient's parameters again[5]. Prepares SMS containing the values of biomedical parameters .Sends SMS by communicating with GSM modem through AT commands [4].

IV. EXPERIMENTAL RESULTS & DISCUSSION

This system has its feasibility with GSM connectivity for biomedical parameter monitoring and of medical emergencies[2]. The person himself can ask for the help by pressing a button or a micro-switch attached to the instrument whenever he is uncomfortable. If there is nobody to help the person, the microcontroller obtains afresh data & prepares a concise SMS and sends the information through the GSM modem to the mobile phone of the doctor/care taker of the affected person[7]. It helps such people to get the critical help in time and also serves as a life say in instrument for critically ill patients. From the above discussions it is clear that the system is automatic, wireless, portable and does the communication of all [1]

Fig. 4: Experimental Setup

V. MESSAGE SENDING FROM ONE MOBILE TO ANOTHER MOBILE

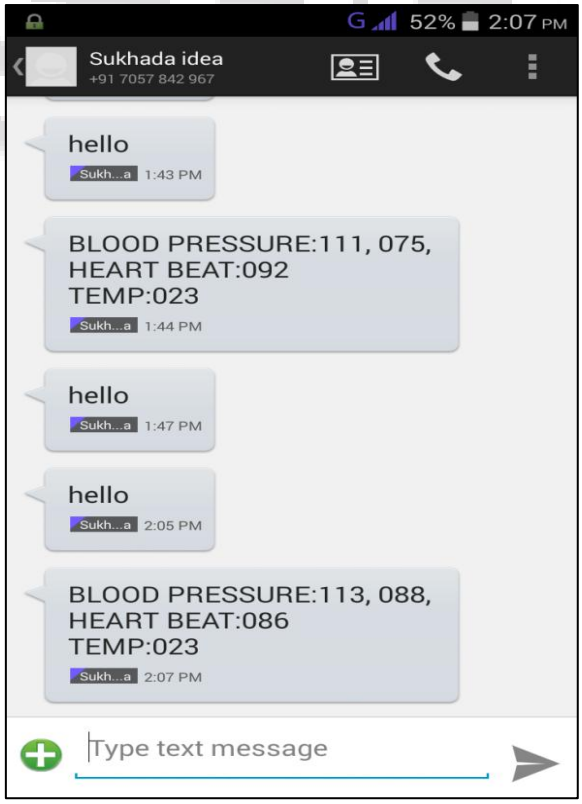

Fig. 5: Massage Sending From the One to another Mobile

1) The details of this SMS are as follows: SYS=111 (Systole Pressure), DYS=075 (Diastole Pressure) & BT=023(Body Temperature).

2) The details of this SMS are as follows: SYS=113(Systole Pressure), DYS=088 (Diastole Pressure) & BT=023(Body Temperature).

A. MESSAGE DISPLAYED ON LCD:

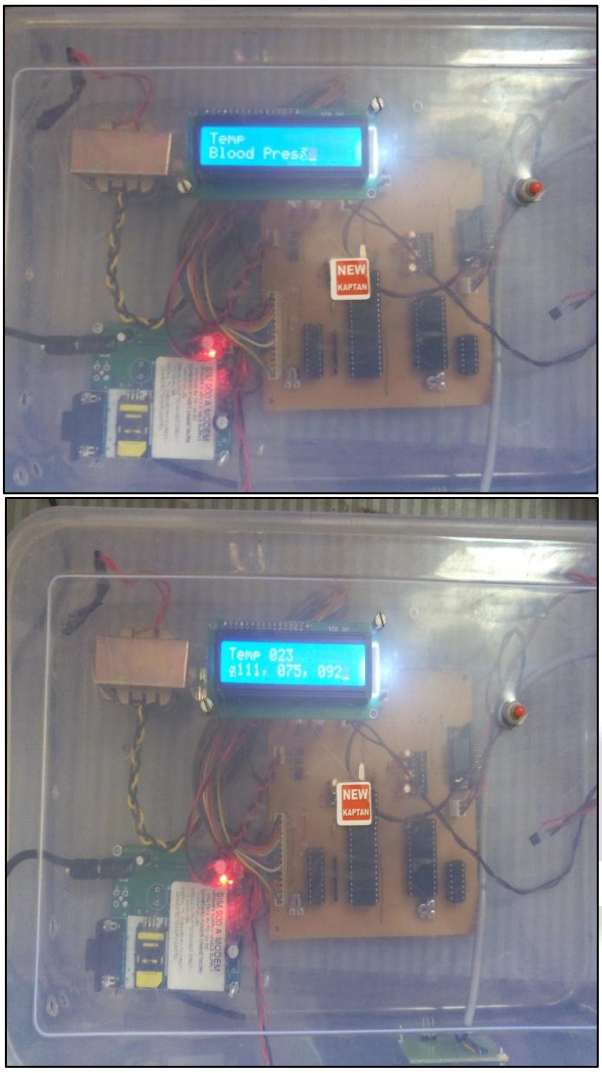

Fig. 6: Message Displayed on LCD

B. Blood Pressure Rate of Some People:

Sr.No	Name
1.	GhargeSuman R. Systolic Blood Pressure : 160mmhg Diastolic Blood Pressure :90mmhg Body Temperature :29
2.	JagadaleBhagyashree S. Systolic Blood Pressure : 105mmhg Diastolic Blood Pressure :76mmhg Body Temperature :28
3.	Gavali Sukhada R. Systolic Blood Pressure : 110mmhg Diastolic Blood Pressure :75mmhg Body Temperature :27
4.	Pise Rasika R. Systolic Blood Pressure : 98mmhg Diastolic Blood Pressure :64mmhg Body Temperature :26
6.	Page Vishakha Systolic Blood Pressure :109mmhg Diastolic Blood Pressure :79mmhg Body Temperature :28

Table 1: Blood Pressure Rate of Some People

VI. CONCLUSION

The objective of this project is to design & implement a low cost GSM enabled simulated biomedical parameters monitoring system using Atmel's 89C51 microcontroller. The system is designed and developed successfully in the laboratory. The system has been designed using so many technologies such as sensors, data acquisition, biomedical instrumentation & GSM and we had to choose the suitable technology for the design. The developed system is simple, can be used by people suffering from variety of Network .However, rarely the GSM connectivity may not be available. In such situation, the system cannot send information but the store-forward architectural feature of GSM enables the delivery of the SMS little late. low cost and potable. The final goal of the work was to reduce the hospitalization and assistance cost and to increase patients and families quality of life. This system has functioned reliably and medical ailments. It is believed that, the other populations of patients such as elderly people may greatly be benefited by the creation of similar devices. The only disadvantage could be non-availability of GSM.

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