

Smart Health Care Monitoring System

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Abstract: Health care sensor plays a vital role in hospitals to monitor the patient's health with the progress in technology. In the proposed technology temperature sensor, heartbeat sensor, blood pressure sensor and glucose sensor are integrated in single module to monitor the patient's health constantly. This also eliminates the manual procedure of thermometers and other devices for monitoring the health condition. This project deals with the microcontroller based monitoring system for heart rate, body temperature, sugar level, blood pressure and communication of monitored parameters through BLUETOOTH. The threshold value for the project is 20 to 120 pulses per minute for heartbeat, 18°C to 38°C for monitoring temperature, 120/80 for blood pressure and 70/120 for glucose. The Heart Rate, Body Temperature, sugar level and pressure level is transferred wirelessly to the doctor through GSM technique. The sensors monitor the parameters and transfer it through GSM Modem on the similar frequency at which cell phones work.

Key Words: IRD, GSM, Threshold value

I. INTRODUCTION

The main objective of evolving patient monitoring system is to reduce the costs involved in health care by reducing emergency room, Clinical visits, hospitalizations and diagnostic testing process. New wireless transmission protocols and expertise is adapted to develop modern applications. Protocols and techniques that are mostly applicable to real time patient monitoring system includes Zigbee Bluetooth, GSM (Global System for Mobiles), CDMA (Code Division Multiple Access) and EDGE (Enhanced Data rates for GSM Evolution), Radio frequency identification (RFID), Wi-Fi (Wireless Fidelity) and Wi-Max (Worldwide Interoperability for Microwave access). Bluetooth technology is a wireless standard utilized for short-range wireless range of communication. Bluetooth functions within the frequency of 2.4 GHz band and data packets are spitted down and exchanged amongst any one of the 79 nominated channels of Bluetooth. Many trending techniques are available for communication, however GSM is the supreme pervasive technology employed to transmit things at faster rates. GSM is presently the industry standard for cell technology and it has a harmonized spectrum. Though different countries works at diverse frequency bands, consumers could shift without any glitch amongst different networks.

In order to take care of critically ill patients, continuous monitoring of patient's heart rate, glucose level, blood pressure and temperature is necessary.

Performing accurate monitoring and making instant decision becomes critical for active patient care. Data's are collected employing non-invasive sensors from non-crucial ill patients in clinics or patients' residence to alert the sudden fatal circumstances or to record routine on the other hand it also require data proficiently. The patient monitoring is termed to be uninterrupted observation and measurement of the medical condition of each patient, physical function and the utility of life support equipment, to provide guidance for making appropriate decisions, that includes therapeutic interventions and assessment.. A patient monitor not only gives an alert care message, it also gives information about the potential life-threatening events; It also provides physiologic input data used to control directly connected life support devices. These techniques that just a few years ago were used only in the ICU are now routinely used on general hospital units and in some situations by patients at home.

Patient Monitoring System with GSM technology dealt with the fast pace of life, as it is perhaps challenging for a person to remain available always with a patient suffering from disorders. Thus continuous monitoring of the patient's physiological factors such as pulse rate, temperature, sugar level and blood pressure are discussed [1]. In [2] Time dependent analysis of an ion-implanted GaAs OPFET is based on the primary parameters like body temperature is monitored, a low cost portable method is implemented to measure temperature from human body using the microcontroller. Temperature is measured using temperature sensor and readings are noted down. With advancement of latest technology, patient health care monitoring system is the foremost trending equipment because of its intrinsic sensors that monitors the patient condition

The development of a low power and portable Electrocardiography (ECG) monitoring device by Resistant hypertension—its identification and epidemiology is based on microcontroller and Android phone is presented in this document. This work is done to provide a reliable solution for cardiovascular patients who themselves can analyze their ECG easily. There are many other implementations on ECG monitoring devices where most of the devices are built using custom integrated chips[4]. Developments in innovative materials and research in signal processing facilitates the smart medical sensors to appreciate the recording of data in real-time and handling multi-physiological signals. The design of heart rate monitor scheme by home blood pressure tele-monitoring and managing blood pressure control is based on microcontroller that presents display on the LCD and simultaneously transmits the information through Bluetooth to smart phone is presented in paper [5] that provides precise readings of patients.

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Various types of medical sensors are offered on the market extending from conservative sensors based on piezo-electrical resources for measurements of pressure and temperature estimation using infrared sensors. The interpretation of blood pressure plays vital role to guide clinical decision making and complement patient consultation within the pharmacy setting [6]. The embedded microcontroller based system for the measurement of blood glucose agreements based on surveys made in population samples so as to decide the degree of the problem and it also evaluate the eminence of medical care provided to the hypertensives[7]. On-call system deliberates about diabetes mellitus, a group of metabolic diseases categorized by high blood sugar levels that results from imperfections in insulin secretion. In this study, a system embedded with microcontroller is designed and developed for the measurement of blood glucose using Amperometric method [8]. A PIC 18F4520 microcontroller based system is employed to display measured values of blood glucose.

The Microcontroller Based glucose level Monitor focused on blood glucose meter is a device used to determine the approximate concentration of glucose in the blood [9-10]. Security aspects in wireless data communication has been discussed [11].

II. WORKING OF THE SYSTEM

Sensors are instruments which measures the physical parameters such as velocity, temperature, pH, flow rate, rotational rate, pressure into its equivalent voltage levels. When the supply is given to the system, the Bluetooth and GSM gets initialized and the Bluetooth is paired with the Bluetooth terminal in the mobile. Then the heart rate of the patient is sensed by the IR sensor, as the patient placed his/her finger in between the IR transmitter (bright LED) and receiver (photo diode) as shown in figure 1. The readings will be displayed on the LCD after 60 seconds since heart rate is measured in terms of pulse per minute. And one more output medium other than LCD is Bluetooth terminal in the user's mobile where it displays the measured heart beat rate. The flowchart of the communication system is presented in figure 2.

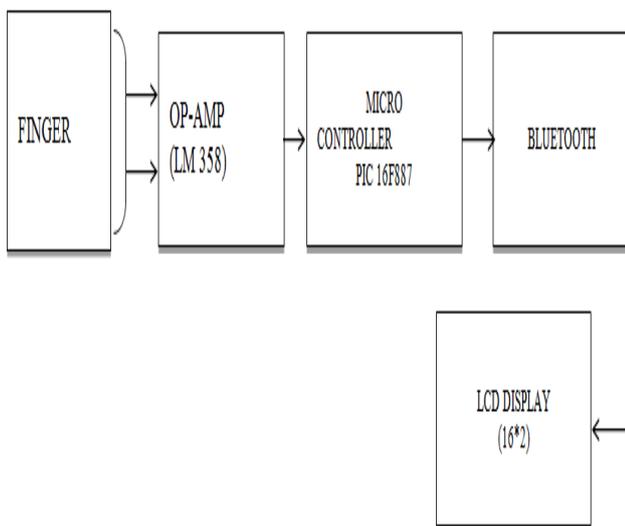


Figure 1 Block diagram of heartbeat sensor

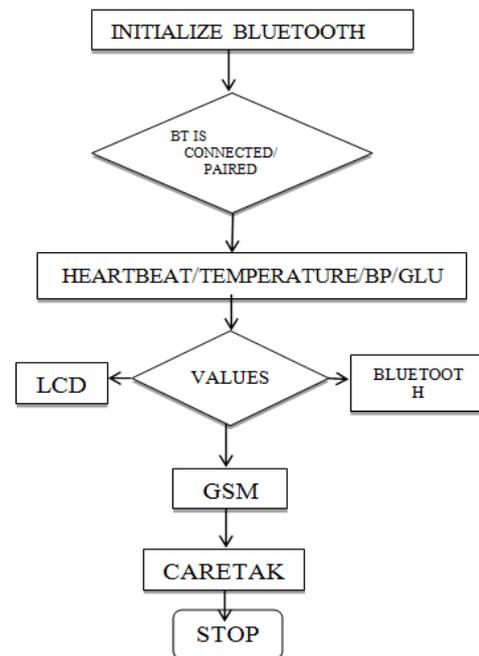


Figure 2 Flowchart of Sensor Section

The temperature of the patient is sensed by the sensor called LM35, and converted into digital output by ADC as shown in figure 3. Finally the readings will be displayed after some seconds of detecting. And one more output medium other than LCD is Bluetooth terminal in the user's mobile where it displays the measured temperature value in terms of Fahrenheit.

The Blood pressure of the patient is sensed by the pressure sensor, as the arm of the patient is covered by the cuff and the air is pumped to a certain level and slowly losing the air by using the valve as shown in figure 4. Hence the sensor senses the value and the readings will be displayed on the LCD. And one more output medium other than LCD is Bluetooth terminal in the user's mobile where it displays the measured Blood pressure value

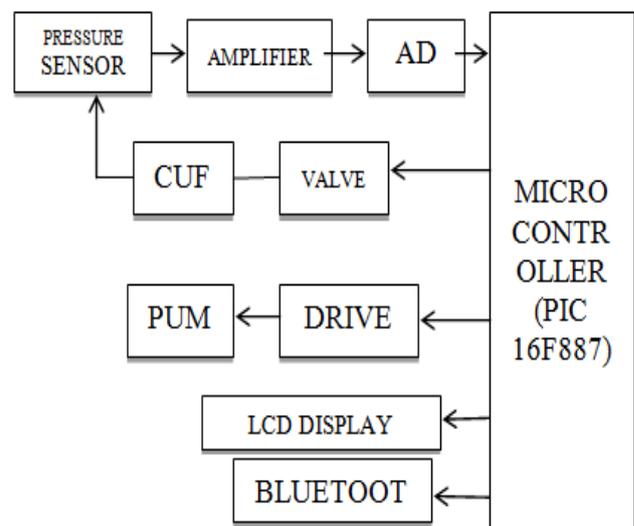


Figure 4 Block diagram of blood pressure sensor

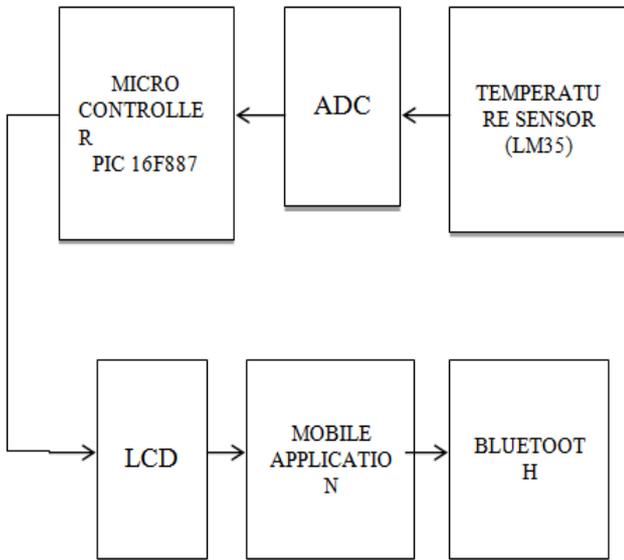


Figure 3 Block diagram of temperature sensor

The sugar level of the patient is sensed by the glucose sensor, as the patient's blood drop is placed on the test stripe. The signal conditioning unit is shown in figure 5. The readings will be displayed on the LCD. And one more output medium other than LCD is Bluetooth terminal in the user's mobile where it displays the measured sugar level.

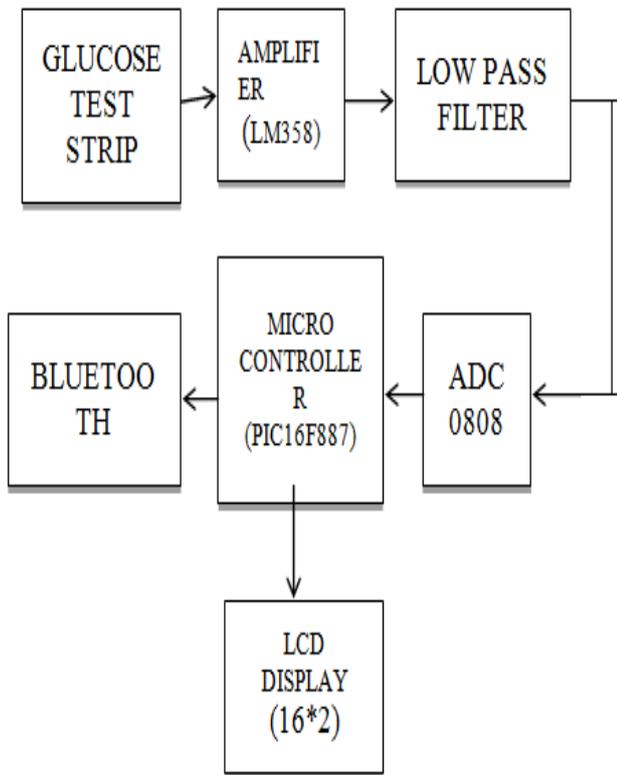


Figure 5 Block diagram of glucose sensor

III. RESULTS

The comparisons of the proposed system with the standard testing instruments are presented in this section. Blood glucose, Heartbeat, temperature and blood pressure measured by the proposed system are compared with standard instruments and are presented in Table 1-Table 4 respectively. The sample test results obtained from patient are presented in Table 5 and Table 6. The LCD display of the monitored parameters are indicated in Figure 6 -8.

COMPARISON OF PROPOSED AND EXISTING SYSTEM

STATE	ACCUCHEK Blood Glucose Meter mg/dl	Proposed Blood Glucose Meter mg/dl
Fasting	93	92
Before Meal	99	93
After Meal	145	150

Table 1 Blood Glucose Meter

STATE	SEN-11574 Pulse SensorBpm	Proposed Heartbeat moduleBpm
Running	100	95
Walking	80	78
Rest	78	78

Table 2 Heartbeat Module

STATE	Dr. Morepen Thermometer (°F)	Proposed Temperature Module (°F)
Normal	90	86
Fever	110	119

Table 3 Temperature Module

STATE	Meditech Mercurial Bp Sphygmomanometer	Proposed Bp Measurement Module
Normal	120/80	127/90
Low	90/60	95/63
High	141/90	140/86

Table 4 BP Measurement Module

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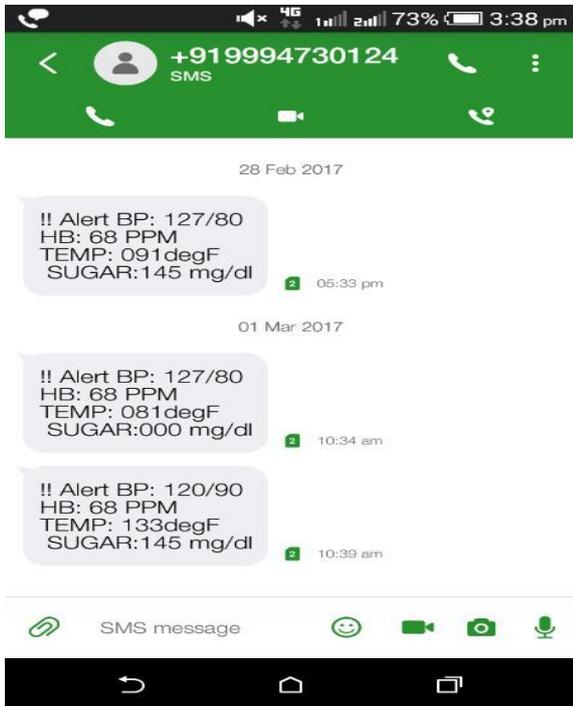


Figure 6 Message through h GSM module

PATIENT 1	BP	HB (BPM)	TEMP (F)	SUGAR (mg/dl)
<pre>Bluetooth Terminal H... ASCII AT AT+CMGF=1 AT+CNMI=2,2,0,0 AT+CMGS="+919940844668" !! Alert BP: 127/80 HB: 68 PPM TEMP: 139degF SUGAR:081 mg/dl AT AT AT+CMGF=1 AT+CNMI=2,2,0,0 AT+CMGS="+918012664082" !! Alert BP: 127/80 HB: 68 PPM TEMP: 139degF SUGAR:081 mg/dl AT AT AT+CMGF=1 AT+CNMI=2,2,0,0 AT+CMGS="+919660979800" !! Alert BP: 127/80 HB: 68 PPM TEMP: 139degF SUGAR:081 mg/dl</pre>	127/80	68	139	81

Table 5 Sample of patient 1

OUTPUT	DESCRIPTION
	<p>This LCD display shows the output of Temperature and sugar of the patient and the value of Temperature is 86degF sugar value is 102mg/d</p>

Figure 8 Temperature and glucose indication

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