

GSM Based Patient Health Monitoring System Using AVR

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Abstract: The target connected with this anticipate is to illuminate doctor about patient condition, who is in Intensive Care Unit, on his portable or tablet. For the therapeutic experts to screen patients condition is most extreme critical. In particular doctor's facility or clinical focus where a solitary specialist goes to numerous patients, it is hard to monitor basic conditions created in each of the patients. This anticipate gives a gadget which will persistently screen the indispensable parameters, for example, heart thumps, BP, temperature of patient and do information logging ceaselessly. In the event that any parameter crosses safe minimal level, this unit additionally raises an alert furthermore speaks with the concerned specialist by method for a SMS. Another objective of this anticipate is to construct a reduced and savvy gadget fit for checking a few medicinal parameters while patients lead their ordinary every day exercises, and store these parameter readings in an installed framework based versatile gadget. A correspondence convention and patient observing programming application are actualized to store information that can be later downloaded to a doctor's workstation for investigation and finding..

Keywords – Patient monitoring, blood pressure, AVR microcontroller, GSM

I. INTRODUCTION

In today's world it becomes very essential for medical practitioner to keep health track records of patients. Medical practitioner needs to monitor more than one body parameters of patients that are either hospitalized or at work but need continuous medical care. This need of patient and practitioner attracted many researchers and developer to develop new device which is easy to use, reliable and cost effective. Although present systems in hospitals allow continuous monitoring of patient vital signs, these systems require the sensors to be hardwired to nearby, bedside monitors or PCs, and essentially confine the patient to his hospital bed. Building such monitoring system has following challenges that we are going to address

- Selecting vital signs and location sensors that are low cost, low power, accurate and able to communicate with other components.
- Selecting a lightweight, low cost platform that incorporates wireless communications.
- Devising a packaging of the sensors and platform that is acceptable to patients and convenient to handle.
- Analyzing the data from the sensors and presenting alerts and data to practitioners.

In order to address above challenges we have designed Patient Monitoring System using GSM. This patient monitoring system incorporates body temperature sensors Heart beat sensors, blood pressure sensors and signal processing unit and local alerting system and GSM module to communicate with physician.

The proposed patient monitoring system would be beneficial for medical practitioners to do proper and better treatment; also it would be useful for health care providers to improve disease management.

II. LITERATURE SURVEY

Tolerant observing is not another framework in human services as it was initially begun in the year 1625 for checking the body temperature and pulse of patients. Along these lines, this framework has started to discover its use and acknowledgment for checking diverse sorts of physiological parameters and wellbeing related perspectives that are being performed as of not long ago. These days understanding observing frameworks are accessible in two structures:

- Single-parameter observing framework
- Multi parameter observing framework

Single parameter observing framework: This framework is utilized for measuring the circulatory strain of a human body, checking ECG, checking SPO2 (oxygen immersion in blood), et cetera.

Multi parameter observing framework: This framework is utilized for checking different basic physiological indications of patients by transmitting the crucial data like ECG, breath rate and circulatory strain, and so on. Because of these reasons, multi parameter understanding observing frameworks assume a noteworthy part in the field of restorative gadgets.

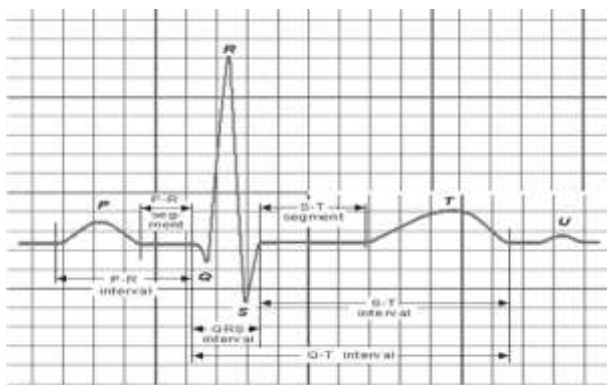
For observing the patient it is constantly required to screen essential indications of the patient like temperature, circulatory strain and heart rate and so forth these parameters influences the opening body so it was important to contemplate the chronicled foundation of every one of these parameters

Estimation of Heart Rate: The ordinary scope of heart pulsates is 60-90 BPM (Beats every moment). Ordinarily heart thumps are measured by utilizing stethoscope and wrist watch. This technique was embraced by the vast majority of the specialists and paramedical staff. In this technique heartbeat are detected by touch and in some cases they were heard by stethoscope at wrist of left arm. In the event that the beat is powerless then it was heard at left half of heart. These heartbeats are measured regarding wrist watch. Amid this procedure manual blunder may get presented.

Estimation of Heart rate utilizing electronic gadgets:

Heart rate is gotten by from the ECG signal. It is measured by either the normal or prompt time interims between two progressive R crests. A normal rate (beats/moment) is computed by including the quantity of heartbeats given time. The normal technique for estimation does not demonstrate the genuine photo of heart's reaction. Beat to beat computation is finished by measuring the time (T), in seconds, between two back to back heartbeats, and changing over this time into pulsates/minute, utilizing the formal thumps/min = 60/T. This procedure precisely speaks to the genuine photo of the heart rate. Taking into account above standards heart rate meters are separated into two gatherings

- Average heart rate meters
- Instantaneous heart rate meters



ECG Waveform in its Original Form

Calculation of heart rate from patient's ECG based upon the reliable detection of the QRS complex. Most of the instruments are, however, quite sensitive to the muscle noise (artifacts) generated by patient moment. This noise often causes a false high rate that may exceed the high rate alarm. by using a QRS matched filter we can reduce a false alarm generated by muscle noise

Measurement of blood pressure:

Blood pressure is the most often intensively studied parameters in medical and physiological practice. The determination of only its maximum and minimum levels during each cardiac cycle supplemented by information about other physiological parameters is a valuable diagnostic aid to access the vascular condition and certain other aspects to cardiac performance.

Blood is pumped by the left side of the heart into the aorta, which supplies it to the arterial circuit. Due to the load resistance of the arterioles and the precapillaries, it losses most of its pressure and returns to the heart at low pressure via highly distensible veins. The right side of the heart pumps it to the pulmonary circuit, which operates at lower pressure. The heart supplies blood to both circuits as simultaneous intermittent flow pulses of variable rate and volume. The maximum pressure reached during cardiac ejection is called systolic pressure and the minimum pressure occurring at the end of ventricular relaxation is termed as diastolic pressure. The mean arterial pressure over one cardiac cycle is approximated by adding one third of the pulse pressure (difference between systolic and diastolic values) to the diastolic pressure. All blood pressure measurements are made with reference to the atmospheric pressure

The most frequently monitored pressure, which has clinical usefulness in medium and long term patient monitoring, are the arterial pressure and venous pressure. Blood pressure can be measured directly or indirectly. The indirect method consists of simple equipment and cause very little discomfort to the subject but they are intermittent and less informative. They are based on the adjustment of a known external pressure equal to the vascular pressure so that the vessel just collapses. On the other hand, the direct methods provide continuous and much more reliable information about the absolute vascular pressure from probe or transducer inserted directly in to the blood system. This is achieved at the cost of patient's disturbance and increased complexity of instrument.

A number of automated blood pressure measuring instruments have been designed which make use of the Riva-rocci method [6]. They operate in a manner analogous to that employed by a human operator, but differ in the method of detecting the pulsation of blood flow at the systolic and diastolic levels.

Measurement of temperature:

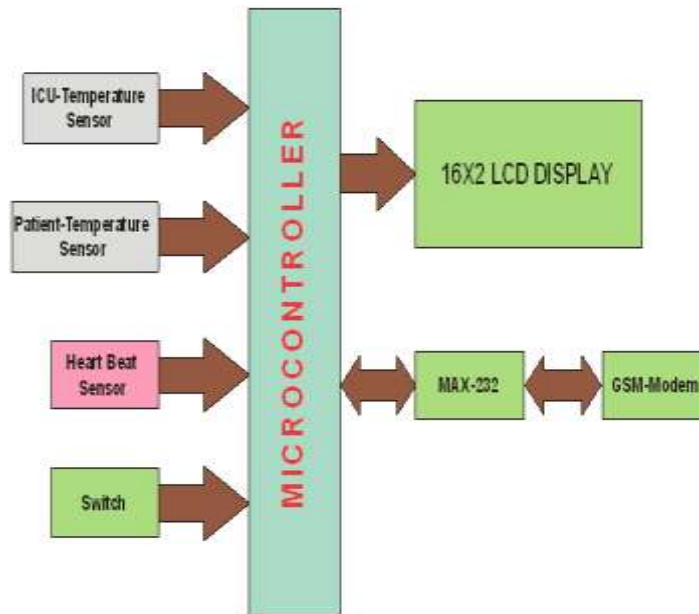
The average temperature of an adult measured orally is between 36.7°C and 37°C. A temperature higher than the usual average is called a fever or hyperthermia and when it is below normal value it is called as hypothermia.

The body temperature can be measured at oral, rectal and axillaries (under the arms) sites. It can also be measured in the ear at the tympanic membrane (ear drum). The thermometer may have a long slender tip is best for oral or axillaries temperature; the rounded tip is used to take rectal temperature. To read a mercury thermometer it is hold at eye level and turn until the mercury line is seen. The upper end of the line the highest point the mercury has reached gives the temperature.

III. SYSTEM ARCHITECTURE

The architecture of the proposed work PATIENT MONITORING SYSTEM is developed as shown in figure. The main aim of the system is to monitor more than one parameter of patient. Microcontroller is used to control the circuit action and programmed to provide desired operation of the system. **Atmega16A** microcontroller is used in this

application. The system consists of two temperature sensor, interfaced with the microcontroller. One of which is used to monitor the temperature of the ICU, Calibrated in degree Celsius and other one is used to monitor the temperature of the patient's body, which is calibrated in degree Fahrenheit unit.



Block diagram of Patient Monitoring System

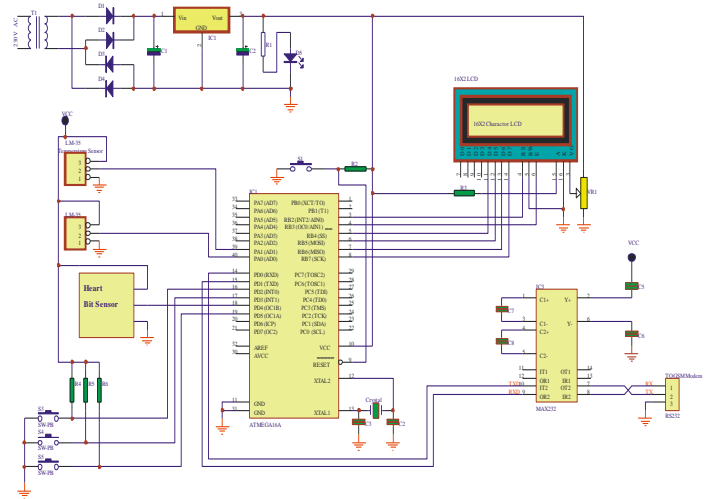
The system also consists of a heart beat sensor, used to count the heart beat of the patient. This heart beat sensor gives the beat rate in beats per minute. This sensor is interfaced with the microcontroller, and provides counted bits to the microcontroller.

This system also has a function of measuring blood pressure of patient. To measure blood pressure three switches are provided in the system. In this system the blood pressure is measured manually.

To display all the above mentioned parameters of patients a 16x2 LCD display is also interfaced with the microcontroller. This LCD will display the body temperature, ICU unit temperature, heart beats and blood pressure of the patients in the ICU.

A GSM modem interfaced with the microcontroller using a MAX232 circuit is used to inform the doctor about abnormalities in case of any patient in the ICU. The GSM modem used in this application is SIM300, which requires a SIM card to send SMS to the doctor.

The power was supplied to the circuit by 5V DC power supply. This power was derived from 230V AC mains supply. This supply is down converted by 12-0-12 transformer, and it is converted to DC by rectifier Filter and 7805 regulator.



Circuit diagram of Patient monitoring System.

Testing Setup:

For testing system following steps will perform:

- 1) By using keypad enter Systolic and Diastolic Blood pressure Reading;
- 2) Heart Beat Final count Is automatically is set after Finger is placed at sensor;
- 3) Setup is completed.

Test Results:

S R n o.	Tim e	Temp		Hea rt Bea t (BM P)	Blood Pressure		MSG sent (yes/ no)
		IC U (D C)	Patie nt (DF)		Systo lic (mm Hg)	Diasto lic (mmH g)	
1	08: 00 AM	30	84.0 2	76	100	71	NO
2	09: 00 AM	30	95	80	105	69	YES
3	10: 00 AM	30	107. 06	68	103	96	YES
4	11: 00 AM	30	90	72	110	85	NO
5	12: 00 PM	32	88.0 7	104	110	65	YES
6	01: 00 PM	33	89.0 6	108	98	80	YES

7	02:00 PM	34	89.06	64	94	78	YES
8	03:00 PM	33	89.06	66	120	92	YES
9	05:00 PM	32	89.6	84	115	99	YES
10	07:00 PM	30	85	80	120	80	NO

[6] TammyNoergaArdewnes, 'Embedded Systems Architecture', first edition 1999.

IV. CONCLUSION

It can conclude that the microcontroller based system can be effectively used as communication medium in conjunction with GSM. Sensors designed in the developed system gives accurate readings so it can be said that the developed system is very cost effective and accurate. In the developed system only three parameters temperature, Heart rate and Blood pressure are monitored. The developed system can be used in the hospitals; in ICU ward, general wards as well as in accident wards. The developed system can be used at home as well as in traveling.

The "Patient monitoring and alerting system" using micro controller will be extremely useful for hospital application, soldier monitoring in military, new born baby monitoring. This system useful when the patient in critical condition. This project is useful for measuring the parameter of patient with the different sensor also obtaining the message about patient health.

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