Measurement of Vital Sign Parameters For Elderly Patients Using Patient Monitoring Module

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Abstract- *The evolution of technologies has reshaped healthcare in recent times. Recent study by WHO revealed that the incidence of cardiac disorders and respiration rate disorders were found to be 78.7% in India. Activity of elder patient's needs to be monitored to identify any change in their normal pattern. The major parameters of this patient monitoring module include ECG, Respiration rate, Temperature and Heart rate. The proposed project aims at integrating all these parameters together in a single monitoring module and assist in monitoring the individuals well being. Wireless technology has also evolved in most monitoring system. Patient's activity is monitored and if there is any abnormal change then the alert message will be sent to Physician number or patient's caretaker number in hospital through GSM module, providing prior preparation in emergency case before reaching fatality. Patient who is bed ridden can also use this module to monitor from their home.*

Keywords- ECG, Paralysed patient, Pulse rate, Alert message, Elder people

I. INTRODUCTION

Continuous measurement of patient parameters such as heart rate and rhythm, respiratory rate, blood pressure, blood- oxygen saturation, and many other parameters has become a common feature of the care of critically ill patients. When accurate and immediate decision-making is crucial for effective patient care, electronic monitors are used to collect and display physiological data. Such data are collected using non-invasive sensors from less seriously ill patients in a hospital's medical surgical units, labor and delivery suites, nursing homes, or patients' own homes to detect unexpected life-threatening conditions. Human heart activity is measured using Electrocardiograph. ECG is used to determine heart rate, heart rhythm and other information regarding the hearts condition. The signal is analyzed by studying the components of the waveform. The normal heart rate is 72 beats per minute. Breathing is one part of the process of respiration which provides continuous supply of oxygen. The two process involved are inspiration and expiration. The respiration rate is the number of breaths a person takes per minute. It is counted by measuring the number of times the chest rises for a minute and the normal breath rate is 12-16 breaths per minute. The pulse rate is a measurement of the heart rate, or the number of times the heart beats per minute. As the heart pushes blood through the arteries, the arteries expand and contract with the flow of the blood. The normal pulse for healthy adults ranges from 60 to 100 beats per minute. The pulse rate may fluctuate and increase with exercise, illness injury, and emotions. The normal body temperature of a person varies depending o n gender, recent activity, food and fluid consumption, time of day , and, in women, the stage of the menstrual cycle. Normal body temperature can range from 97.8 degrees F (or Fahrenheit, equivalent to 36.5 degrees C, or Celsius) to 99 degrees F (37.2 degrees C) for a healthy adult. Our model is the combination of all these parameter in a single device. It aims to monitor continuously, user friendly.

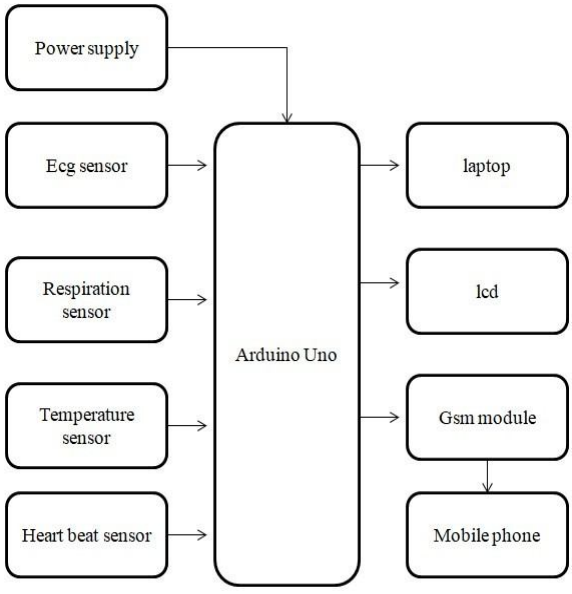

Fig.1: Block diagram of patient monitoring model

A. ECG Module

The AD8232 Single Lead Heart Rate Monitor acts as an op amp to obtain a clear signal of the QRS complex. The AD8232 is an integrate of signal conditioning block for ECG. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, created by motion

or electrode placement. It is cost effective, obtains signal in noisy condition and output is an analog signal.

B. PULSE RATE SENSOR

The pulse rate is measured using a heart beat sensor. Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. When the heart beat detector is working, the LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of Plethysmography. With each pulse the detector signal varies. It is connected to arduino and the output is measured and displayed.

C. RESPIRATORY SENSOR

The Respiration Sensor is used to monitor abdominal or thoracical breathing. Besides measuring breathing frequency, this sensor also gives you an indication of the relative depth of breathing. The first step in this process is breathing in air, or inhaling. The taking in of air rich in oxygen into the body is called inhalation and giving out of air rich in carbon dioxide from the body is called exhalation. The second step is gas exchange in the lungs where oxygen is diffused into the blood and the carbon dioxide diffuses out of the blood. The third process is cellular respiration, which produces the chemical energy that the cells in the body need, and carbon dioxide. Finally, the carbon dioxide from cellular respiration is breathed out of body from the lungs.

D. TEMPERATURE SENSOR

Temperature is commonly measured parameter in human to know the change in temperature in their body. The temperature sensor has 3 terminals and it requires maximum of 5.5V.It performs the operation according to the temperature to vary the resistance. The sensor senses the change in resistance value and from it temperature is calculated. LM35 is an analog temperature sensor. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius temperature We can make use of this in built ADC of arduino to convert the analog output of LM35 to digital output. Since Arduino has a 6 channel inbuilt ADC, there are 6 analog input pins numbered from A0 to A5. Connect analog out of LM35 to any of these analog input pins of arduino.

E. LCD DISPLAY

A LCD is used to display the Pulse rate, Temperature, Respiration rate. The LCD 16*2 display is connected to the Aurdino board by connecting its data pins. The VCC pin of the LCD module is connected to 5V DC from aurdino. For adjusting the contrast in LC, potentiometer is used.

F. LAPTOP

The laptop is connected to aurdino board to view the ECG signal. The ECG waveform is analog, so laptop is being used. To view the signal respective software is used and the communication port is changed accordingly. By setting up the ECG signal is viewed for 0V and by placing the electrodes in the body the necessary signal is obtained.

G. WIRELESS TRANSMISSION

The data that are collected to be transmitted wirelessly using GSM module and it is connected to the board. All the digital values will be sent through a message to their smart phone if any abnormality occurs.

H. AURDINO BOARD

Janani Palanisamy, Roshini Gnanakumar, Saravana Perumal Guided by Mrs.Roshni Pal, Department of Biomedical Engineering, Agni college of Technology, Chennai, India.The aurdino UNO is microcontroller based board. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.While programming the board, it can be connected to the PC using USB port and it runs on USB power. The aurdino has 32kb Flash memory,1kb EEPROM and 2kb SRAM. connected to different aurdino It can be shields for connectivity with Bluetooth, Wi-Fi, Zig-bee, GSM etc.

III. RESULTS

All the parameters are interfaced with the arduino and the programme is uploaded in the board.The output for temperature, pulse rate and respiration rate is displayed in LCD and ECG waveform in Laptop. If any abnormality occur then the result is transferred to their mobile phone using wireless connection.

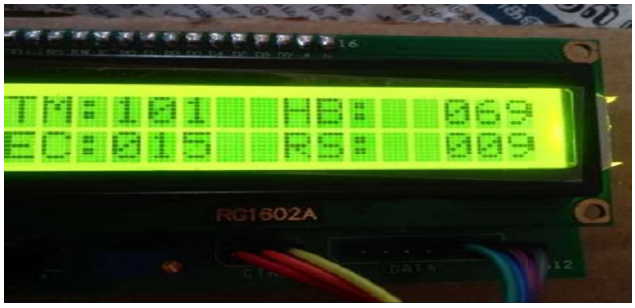

Fig: 4.1 Sample output for heart rate

Fig: 4.2 Sample output for temperature

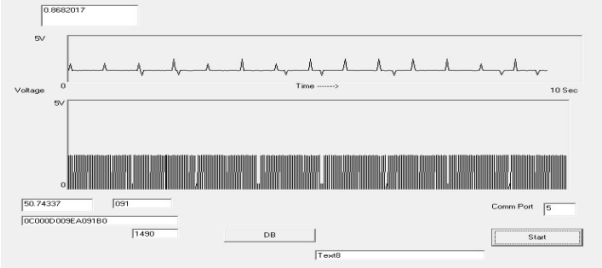

Fig. 4.3 Sample output for ECG

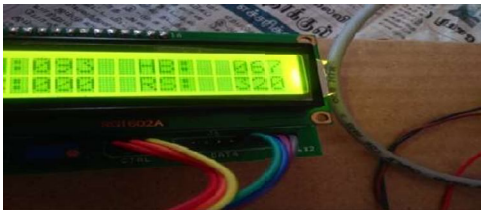
Fig:4.4 Sample output for respiratory rate

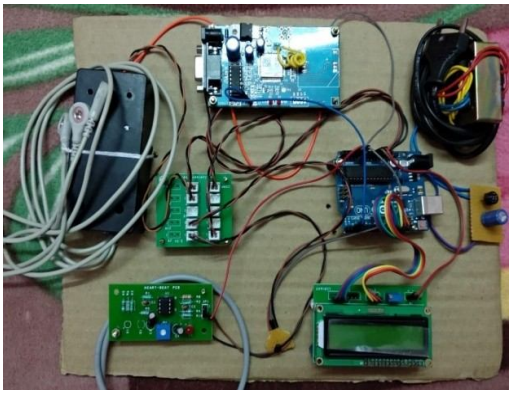
Fig 4.5 Module image

Table1: Measurement of Vital sign parameters using Patient Monitoring Module:

Subject	Heart rate (bpm)	Temperature (fahrenheit)	Resp rate (db)
Subejct A (55 yrs)	67	99	319
Subject B (59 yrs)	69	101	323
Subject C (63 yrs)	67	93	302

Table2: Measurement of Vital Sign Parameters using Patient Monitoring System:

Subject	Heart rate(bpm)	Temp(celsius)
Subject A (55 yrs)	71	33.4
Subject B (59 yrs)	70	32.7
Subject c (63 yrs)	69	33.1

Table 3: Efficiency of Module and System

Parameter	Efficiency of Module (%)	Efficiency of System (%)
Heart Rate	93	97
Temperature	92	98

IV. CONCLUSION

In this approach, we have targeted elderly patients who are in ICU and Paralysed patient's. ECG is one of the most important parameter to be monitored continuously for elderlypatients. For each parameter respective sensors such as AD8232 for ECG, Heart rate sensor for Pulse rate measurement, Temperature sensor for temperature measurement is used and they are connected to arduino board and the program is uploaded in it. Thus when the sensor gets contact with the body it measures the biological signal and

displays the output in LCD display. This module is cost-effective and it comprise of various vital sign parameter together. Hence, we can prevent the patient from major fatality risk.

V. FUTURE WORK

MEMS technology can be used to miniaturize the module. By miniaturizing it can be converted into the wearable device which measures all the vital sign parameters using a single device. The patient can wear this device continuously or at the time of need. It provides effective measurement and proper health care can be provided. Emergency situation can be handled with care and sometimes it can be avoided, by knowing the change in biological signal prior itself.

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