ABSTRACT

Now a days, heart diseases are exceeds up to dangerous levels which leads to death of human being. Monitoring the patient constantly is difficult or doctors are also unable to monitor particular patient for total working hours. In many critical conditions such as patient is located far away from hospital or also in case of old patient who suffering with heart disease or physical disorders, continuous monitoring of patient is not possible. This module deals with solving above problems. This module consists of a heart rate sensor and temperature sensor including a humidity sensor for moisture content which is present in the patient room. Buzzer which is provided near patient will be activated so that the surrounding persons will know the condition of the patient. A SMS is sent through GSM module to the medical advisor for preliminary precautions so that patient can be prevented from serious condition before reaching to the hospital. In this a Arduino controller device is used. The measured values are displayed through LCD which is interfaced with the controller.

Keywords : Arduino Device, GSM, Cloud computing ,Heart beat Monitoring system

I. OBJECTIVE OF THE PROPOSED WORK MODULE

The proposed work entitled as “Cloud Computing Based Heart beat Pulse Monitoring & health monitoring System” describes the design and development aspects. Since it is a prototype module and for study purpose the basic concept is proven here, it cannot be used for real applications. Because the sensors used here may not be so accurate. Heart rate must be sensed with high intensity type sensors, because the heart is playing a major role in the human body.

The heart beat rate sensor and temperature sensor are connected to the individual patients and the information is transmitted to the doctor’s mobile through GSM modem. The concept presented here is aimed to monitor the blood flow through finger tips. For this purpose, the finger must be placed between the IR LED and IR sensor. The op-amp which is used in this heart beat sensor is DHT11. These two devices arranged in a clipping type of device can detect the intensity of blood that is flowing through fingertip. The sensor used here conducts little bit when it detects some IR energy transferred through the tissue of fingertip.

The temperature sensor used in this project work can measure up to 1000 C, the limitation is being with the sensor which cannot withstand at higher degrees of temperature because it is a semi conducting device and the properties of a semi conductor may differ at high temperature. DHT11 (from National Semiconductor) is used for the purpose. This is used as a temperature sensor, which is a precision centigrade sensor, whose output voltage varies linearly proportional to the Celsius. There are several different scales used in the measurement of temperature, the familiar is Fahrenheit and Celsius (Centigrade). These two scales are arranged such that 0 degree centigrade is the same temperature as 32 degree Fahrenheit. Here the temperature is measured in degree centigrade. The digital display section interfaced with controller through LCD (Liquid crystal Display) will display the readings of the temperature.
It is clear that the above functions cannot be performed without microcontrollers, therefore these devices are said to be heart of the instruments, now a days there is no such instrument that works without microcontroller. Hence micro-controllers are increasingly being used to design instruments & control systems. It is therefore important to understand micro-controller based instruments well.

A play back cum record voice recorder is used here for general announcements to the patients and nurse near by the patient. It consists of a APR33A3 controller, a audio amplifier and a speaker. The controller i.e., APR33A3 board consists of 8 keys which are used for recording 8 messages and a toggle for record and play purpose. This voice recorder is not connected with microcontroller as it is a separate module.

The main purpose of this project is to measure and display the heart beat rate, humidity and temperature by the microcontroller. As the controller cannot read the analog values, an inbuilt ADC is designed for converting analog information into digital in the Arduino, thereby this controller is playing major role in this project work.

As the system utilizes GSM technology, there won’t be any range restriction, the doctor or care taker can monitor the patient condition anywhere from the earth. As the GSM technology playing major role in this project work, it sends and receives the patient’s heartbeat, temperature and humidity with patients ID.

2.1 EXISTING METHODS

The most preferable way of measuring heartbeat is manual way of testing in olden days. Now-a-days a more precise method of determining heart rate involves the use of an electrocardiograph, or ECG (also abbreviated EKG). An ECG generates a pattern based on electrical activity of the heart, which closely follows heart function. Continuous ECG monitoring is routinely done in many clinical settings, especially in critical care medicine. In the same way temperature is measured manually and with a thermometer. In the present scenario, it is a touch type sensor to make the patients easier to check their temperature. In this project we are using sensors to measure heartbeat rate and temperature such as heartbeat sensor and temperature sensor.

2.2 Proposed Method

An Arduino interfaced modules is a new technology in recent days. So as to, make easier and reduce the complexity of the hardware. Here in this project a arduino which is a microcontroller is used. Coming to the approach of the project is that heartbeat is the major problem that most of the human beings are suffering. So as to, reduce the heart beat related cases and make them to self check their heartbeat rate and body temperature at some intervals of time. Their by knowing their health condition at their homes who are far away from the hospitals.

Cloud Computing Based Heart beat Pulse Monitoring & health monitoring System

1.1 BLOCK DIAGRAM
1.1 BLOCK DIAGRAM EXPLANATION

The above figure 1.1, represents the block diagram of the project. Where each module is interfaced with the Arduino Uno. It consists of a heartbeat sensor which directly gives the up-low pulses to the arduino and it displays in digital format. Similarly, temperature sensor and humidity sensor gives the analog values to the arduino, it converts into digital using ADC and displays the output on LCD.

A GSM module is interfaced with the arduino to transmit and receive the message at regular intervals of time. A voice cum play back chip is used for the general announcements. It consists of microphone, an audio amplifier and a speaker.

1.2 SCHEMATIC OF THE PROJECT

Figure 1.2: Circuit Diagram

1.2 SCHEMATIC EXPLANATION

The above figure 1.2 represents the schematic of the project. in the above figure, the controller which is ATmega328 is interfaced with each module with circuitry. The temperature sensor LM35 is interfaced with the controller to the analog pins. In the similar way humidity sensor is also connected. Heartbeat sensor which gives digital pulses. A voice module is connected with audio amplifier and speaker for voice message.

1.3 ALGORITHM

STEP 1: initializing the device and GSM Modem for serial communication with band rate 9600bps.

STEP 2: if switch is ON, it checks for the condition whether the switch is high or low. If it is low, it displays the patient 1 and if it is high, it displays the patient 2.

STEP 3: it reads the values of heartbeat, temperature and humidity and it checks for the condition.
STEP 4: it checks for the temperature and humidity condition for patient-1 and it also checks for the heartbeat rate condition for patient-2. Whether it is in the prescribed limits or not.

STEP 5: if it satisfies the condition then it will go back to the initialization stage.

STEP 6: if it doesn’t satisfy the given condition then the buzzer is activated i.e, logic 1 and through GSM a message is send to the concerned person with patient ID, date and time.

STEP 7: Stop.

1.4 FLOW CHART

1.5 MEASURING OF PULSE RATE

The technique described here for measuring the heart rate is known as average calculation. This is the oldest and most popular technique. An average rate (i.e. beats per minute) is calculated by counting the number of pulses in a given time. The average method of calculation does not show changes in the time between beats and thus does not represent the true picture of the heart’s response to exercise, stress and environment. Hence beat to beat calculation is essential; in this method importance is given for the time by which the time is monitored between beat to beat. Here in this project work number of beats per minute is calculated and represented as heart rate.

The pulse gives a measure of pulse wave velocity and can be recorded and compared with the ECG signal. The pulse wave travels at 5 to 15 meters per second, depending on the size and rigidity of the arterial walls. The most popular method used for detecting the pulse rate is electrical impedance changing method. Here also somewhat similar principle is adopted using IR sensors and is known as photoelectric method. In this method the changes of blood volume at finger tips is monitored through IR sensor. This is called transmittance method; in this method infrared light emitting diode and infrared sensor are mounted in an enclosure that fits over the tip of the finger. The infrared light transmitted through the blood flow of fingertip is aimed to detect the concentration of blood. Depending up on the blood flow, some of IR energy will be delivered from the finger. This energy is estimated depending up on the conductivity of IR sensor and accordingly digital pulse is generated through operational amplifier. With each contraction of the heart, blood is forced to the extremities and the amount of blood in the finger increases. It alters the optical density with the result that the light transmission through the
finger reduces and the resistance of the sensor varies accordingly. The IR sensor or photo diode connected in series with the potential dividing network configured as voltage divider circuit and produces a voltage that varies with the amount of blood in the finger. This voltage level is monitored and compared with reference voltage fed to the op-amp and a digital pulse will be generated for the microcontroller. The measured pulses information is transmitted to the doctor through the GSM transmitter whose explanation will be provided in the further sections.

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 beat LED flashes in unison with each heartbeat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse. The interfacing of arduino with heartbeat sensor is shown in figure 4.4. However, this sensor is of high cost, hence in this project we are using a transducer to demonstrate the measure of heart beat rate. we are just showing a prototype and demonstrating how we can measure heart beat rate and send to remote doctors. Features are,

- Microcontroller based SMD design
- Heart beat indication by LED
- Instant output digital signal for directly connecting to microcontroller
- Compact Size
- Working Voltage +5V DC

1.6 VOICE RECORD CUM PLAY BACK CHIP

Figure 1.4: Functional Block diagram of IC APR33A3

Figure 1.5: Voice Module
1.6 SPEAKER
A loud speaker is the voice of any electronic entertainment equipment and, as such, it should be able to reproduce, as faithfully as possible, the original sound from the broad casting studios. A good loud speaker should be able to reproduce all sounds equally well irrespective of their amplitude, frequency and waveform. Sound waves are produced in air by a vibrating body. In the case of a loud speaker, the vibrating body is a cone or a diaphragm, which is attached to a driving unit, which converts electrical currents into Mechanical motion for the diaphragm to vibrate and produce sound waves containing the acoustical energy.

2.1 TOOLS
The details or data sheets of the important components like IC’s other devices used in the project work are gathered from websites. The following are the chips and other important components are given below,

2.2 HARDWARE TOOLS

1) Arduino Controller Board
2) LM 35 Temperature Sensor
3) DHT11 Sensor
4) Voltage regulator
5) ESP8266 Module
6) GSM modem
7) 547 Transistor
8) APR33A3 Voice Record cum Playback Chip

2.3 SOFTWARE TOOLS

1) Arduino IDE
2) Arduino editor

When power supply is ON, the board gets activated. LCD displays the title of the project as patient monitoring system. A Reset button is used to control the operation and switch which is used to select patient 1 and patient 2. If the switch is low, then it displays patient 1. In patient, we are measuring the patient’s body temperature and humidity using DHT11 Sensor. When the switch is high, LCD displays patient 2 heartbeats, it consists of a plug in which consists of IR transmitter and IR receiver. When the IR rays falls on the finger, it checks the blood flow and gives directly as high-low pulses to the op-amp i.e, LM358. Then arduino reads the digital information which is given to the digital pins of the arduino and displays the number of heart beats per minute. A voice module section which consists of microphone, audio amplifier and a speaker. Microphone consists of an IC APR33A3 and a toggle to record and playback. it also consists of 3 keys through which 3 instructions can be given. Each key has a duration of 1.35min. when we give an instruction through microphone it records the voice and sends to the audio amplifier for amplification for increasing the signal strength then it sends to the speaker and speaker gives the output.

II. RESULTS

Proposed system output
Figure 3.1: Cloud Computing Based COVID-19 Patient Health monitoring System

Figure 3.2: Temperature and Humidity monitoring output

Figure 3.3: Heartbeat
III. CONCLUSION AND FUTURESCOPE

This project work of Cloud Computing Based Covid-19 Patient Health Monitoring System is completed successfully and the results are found satisfactory. Since it is a prototype module, it has been thoroughly revised taking in to consideration the developments in technology and introduction of new and improved methods of medical instruments for proper diagnosis. The hardware used in this project work were bulky, when this prototype module converted into engineering model, all bulky components can be accommodated into a single chip and a sleek, portable, good looking module can be made.

As the technology advances, particularly in the field of world-wide telecommunication networks, people are expecting improved quality service for various other applications in addition to the personal communications through mobile phones. In this regard GSM modules are developed which can be used for many applications. The use of GSM technology in medical instrumentation has resulted in the integration of automation and built in
intelligence in medical instruments to a great extent. The advantages of using GSM processor is that there won’t be any range restriction, because the telecommunications network is enhanced to all corners of the globe.

In order to understand linkages between the life sciences and engineering techniques, it is necessary for engineers to have a fair understanding about the anatomy and physiology of the human body. The project can further improved by including EEG,ECG and other parameters can also be monitored. Continuous monitoring and future diagnosis can be performed. An infrastructure for the monitoring devices to push their data into, for example a server with a database. It can also be done in such a way that the monitoring system stores the data and applications needing data is connected directly to the monitoring device.

REFERENCE