Advanced health monitoring system development and implementation for real-time applications

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Abstract

In the modern world, health monitoring systems are crucial. This system's purpose is to use sensors to measure the patient's body's biological parameters, such as temperature, heart rate, and oxygen saturation. The LM-35 temperature sensor is used to measure temperature. A pulse sensor is used to calculate heart rate. The associated registered number will automatically get an SMS using GSM when the oxygen level thresholds change. Arduino compares the patient's parameters to the values inside the usual range, and if the parameters are out of range, an SMS is automatically sent over GSM to the relevant registered number. The parameters are shown on an LCD screen.

Keywords: Health monitoring, LM-35 temperature sensor, Pulse sensor, Arduino, GSM, LCD display.

I. INTRODUCTION

People are suffering from chronic ailments at an alarmingly high rate due to the world's constantly growing population. The primary causes of this are regular cigarette use, alcohol use, excessive stress, lack of physical activity, etc. The WHO estimates that millions of people die each year as a result of high cholesterol, obesity, hypertension, and other factors. A person with a chronic illness must manage his life with the utmost care and should receive ongoing medical care and supervision.

The heartbeat, body temperature, amount of oxygen in the blood, and other factors are crucial indicators of chronic diseases. Doctors can keep an eye on a large number of patients at once thanks to the patient monitoring system.

As the principal healthcare practitioner, a physician, often known as a medical doctor, directs the medical staff in providing patient care. A doctor can prescribe medication, perform operations, perform surgery, or administer therapy in addition to diagnosing and treating illnesses and disorders. doctor-centered behaviours such as generosity

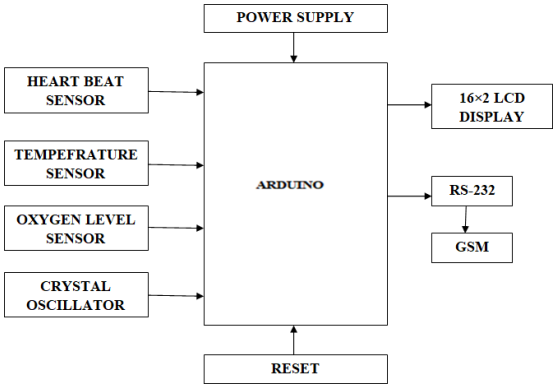
The majority of patients accepted doctors' directives rather than explanations, asking specific questions rather than general ones, not expressing their emotions, and not asking for the patient's opinion. Doctors appear to recognise this patient attitude. However, the majority of patients anticipate patient-centered behaviours from physicians, such as showing empathy and allowing patients to voice their opinions. Over 80% of respondents favoured doctors making decisions (item 6), while a comparable number asked that patients be involved in decision-making. Only 50% of physicians are aware of this need. Only 50% of doctors acknowledge that a sizeable portion of patients (29%) believe that their doctors do not consider their viewpoints. 2 The doctor will do a few easy tests to learn more about the health of your ticker. He will take your heart rate, check your blood pressure, and listen to your heart.

II. PROPOSED SYSTEM

We are installing an Arduino-based health monitoring system in the suggested system. With the help of this device, we may assess the patient's biological parameters.

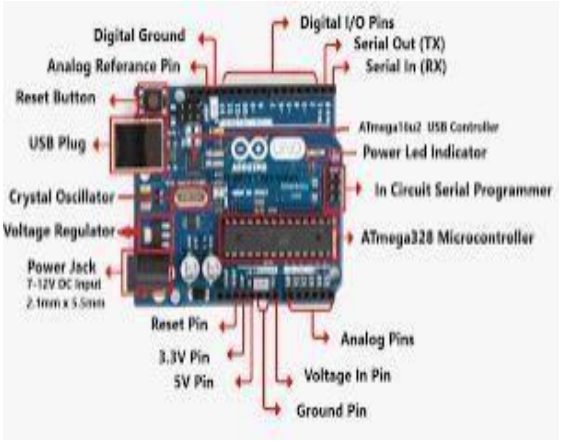
A healthy person's heartbeat typically ranges from 70 to 75 beats per minute. With the aid of an Arduino, the system will use a pulse sensor to monitor the patient's heartbeat and compare it to a reference value for the normal range. A message will be delivered through GSM to the associated mobile number if it is outside of the typical range. Normal body temperature is 37 degrees Celsius; if it is outside of that range, an automatic message is delivered to the associated mobile number. The LM-35 temperature sensor is used to measure temperature. The oxygen level was compared in the same manner, and a message was sent over GSM. On the LCD panel, every parameter is shown.

BLOCK DIAGRAM:



III. MODULE DISCRIPTION

A. ARDUINO UNO:



The company's ATmega328P microcontroller is the basis for the open-source Arduino Uno microcontroller card. The card has advanced and basic info/yield (I/O) pin groups that can be connected to a variety of development cards (safeguard) and circuits. It contains 6 basic I/O sticks, 14 advanced I/O pins (six of which support PWM yield work), and a USB Type B connector that enables Arduino IDE (Integrated Development Environment) modification. Despite the fact that it can accept voltages between 7 and 20 volts, it can be powered by a USB link or an external 9-volt battery. It is comparable to Leonardo and Arduino Nano. The same Creative Commons Attribution 2.5 licence has been applied to the equipment reference configuration. It's excellent may be found on the Arduino site. Plan and assembling documents are additionally accessible for some equipment adaptations.

Fig 1: Hardware component Arduino uno

B.GSM MODULE:

Numerous cell phones and PDAs use the SIM900A, a GSM/GPRS module that is easily accessible. The module can also be used to develop embedded applications and IOT (Internet of Things) applications. The SIM900A is a dual-band GSM/GPRS device that operates at EGSM 900MHz and DCS 1800MHz. SIM900A supports the GPRS coding plans CS-1, CS-2, CS-3, and CS-4 and highlights GPRS multi-opening class 10/class 8 (discretionary).

Fig 2: GSM module

C. HEARTBEAT SENSOR:

The light plethysmography theory serves as the foundation for the heartbeat sensor. It monitors the variation in blood volume through any organ of the body that results in a variation in the amount of light passing through that organ. The timing of the pulses is more crucial in applications where heart rate is to be tracked. The rate of heartbeats determines the volume of blood that flows, and because blood absorbs light, signal pulses are equivalent to heartbeat pulses..

Fig 3: Heartbeat sensor

D. LM-35 TEMPERATURE SENSOR:

The output voltage of the LM-35 analogue linear temperature sensor changes linearly as the temperature changes. National Semiconductor's LM35 is a three terminal linear temperature sensor. It is capable of measuring temperatures between -55 and +150 degrees Celsius. For every degree Celsius that the temperature rises, the LM35's voltage output increases by 10mV. The standby current of the LM35 is less than 60uA and it can be run off of a 5V supply. The figure below depicts the LM35's pin layout.

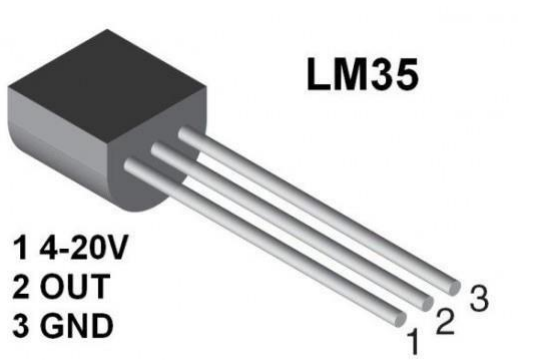


Fig 4: LM-35 Temperature sensor

IV. RESULTS:

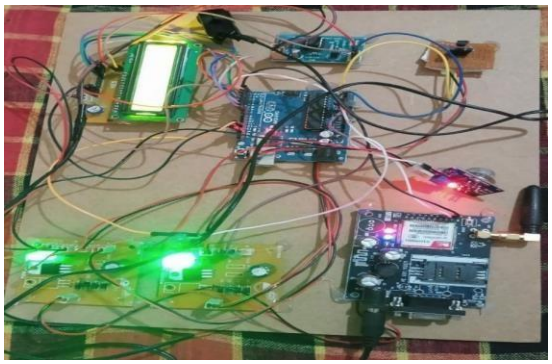


Fig 5: Hardware Implementation

When the system receives power, the biological parameters are assessed and compared to values within the normal range; if there is any deviation, an SMS will be sent via GSM to the corresponding mobile number, which may belong to a patient's relative or a doctor. The matching values are simultaneously shown on the LCD screen.

V. CONCLUSION ANDFURTHER RESEARCH

The condition of the patient is continuously tracked, and the data collected is sent to a centralised Arduino controller. Recent research has focused on electronic patient records, information security, and sensor networks for in-home patient monitoring. Making the system more reliable and real-time will increase the effectiveness of the examination ward. People who live in rural and hilly areas benefit from this approach because it is difficult for them to routinely visit the doctor.

This can also be expanded to measure ECG, body movement, and lung capacity.

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