



Patient Health Monitoring System Using GSM Module

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ABSTRACT: Now a days technology is running with time, it completely occupied the life style of human beings. It is being used everywhere in our daily life to fulfil our requirements. We are employing different sensors for different applications. Some times we may even use the same sensor differently for different applications. We can not only increase the speed of life but also increase security with good ideas by making use of advanced technology. In this project we are making use of technology to sense serious health problems so that efficient medical services can be provided to the patient in appropriate time.

This project calculates the heart rate and temperature by placing a finger on the heart beat sensor. Alcohol can be detected using a sensor and a button pressed to calculate the result. Results of temperature, alcohol and heart beat show on the LCD screen.

KEYWORDS: ATMEGA328 Microcontroller, GSM module, temperature sensor, heartbeat sensor.

I. INTRODUCTION

GSM based Patient Health Monitoring Project mainly works for allowing doctors or relatives of patient to check the status of patient health remotely. The system calculates the heartbeats and body temperature of patient and if it goes above certain limit then immediate informative alert message will be sent to the registered number. For this system we used Microcontroller which is interfaced with LCD display, heartbeat sensor, temperature sensor. The GSM based Patient health monitoring system works with GSM modem to send the data remotely to the registered number, system powered by 12V transformer. The system also featured with manual health button using that the patient with some other issues will also be able to contact with doctor so, the system is very helpful for saving life of patient. The system also introduced a function through which a doctor will be able to check the status of patient after a certain interval of time by sending message. The system efficiently updates doctor about health of patient as well as accurately calculates the health parameter of patient.

The functioning of heart rate measuring device is based on the truth that the blood circulates for every one heart beat which can be sensed by using a circuit formed by the IR LED (IR DIODE). Depending upon the rate of circulation of blood per second the heart beat rate per minute is calculated by microcontroller. This device consists of a microcontroller which takes the input from the heart beat sensor and calculates the heart rate of the patient. Temperature measurement is also done by temperature sensor calculated by Arduino with internal ADC. The temperature sensor is required to be placed in two finger tips or in arms or in ear. After calculating the heart rate and temperature the Arduino displays these rates on LCD display.

The main objective of this project is:

1. Real-time calculation of heart-beat rate of a person.
2. Real-time calculation of temperature rate of a human body.
3. Display the calculated heart-beat and temperature rate on LCD module and send via SMS.

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II. TEMPERATURE SENSOR

The temperature monitoring unit consists of the components that are required to measure the temperature of the body. This unit comprises of a temperature sensor which measures the temperature of the body and is connected directly to a microcontroller. The temperature sensor that is used in this circuit is LM35 for the measurement of the body temperature. This temperature sensor is an analog sensor which produces an analog voltage by sensing the temperature. This sensor is held by the finger for a while (about 15 sec) in order to measure the body temperature. The body temperature on the body surface is about 1 degree centigrade less than the temperature of other parts. The analog voltage produced by the LM35 temperature sensor is directly proportional to the body temperature. The analog voltage needs to be converted to a digital value. The digital equivalence of analog voltage produced by LM35 sensor can now be used by the microcontroller for further processing. The microcontroller receives the data in analog form and converts it into digital form then sends it to the GSM module so that the data can be sent to the remote end. At the receiving end, a mobile device which utilizes the GSM system receives the message. The message received at the mobile device is displayed at the screen along with the data of heartbeat. The LM35 is a precision integrated circuit temperature sensor that is used here to measure temperature. The electrical output voltage of LM35 is linearly proportional to the celsius or centigrade temperature.

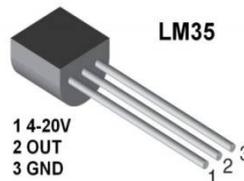


Fig1. Temperature sensor

III. HEARTBEAT SENSOR

Heartbeat is measured with the help of fingertip sensor which consists of an infra-red (IR) light emitting diode transmitter and an IR photo detecting receiver.



Fig2. Arrangement Of Sensor

Figure2 shows the arrangement of sensors for measuring the heartbeat of a patient. The device utilizes optical technology to measure heartbeat of patient. As shown in the figure, both the IR transmitter and receiver could be placed on the same plane and the finger would function as a reflector of the incident light. The IR receiver monitors the reflected signal in this case. The IR filter of the photo transistor reduces interference from the mains 50Hz noise. The IR LED is forward biased through a resistor to create a current flow. The values of resistors are chosen so that they can produce the maximum amount of light output. The photo-resistor is placed in series with the resistor to reduce the current drawn by the detection system and to prevent short-circuiting of the power supply when no light is detected by the photo resistor. This device makes the use of optical sensor to detect the heartbeat of the patient.

The optical sensor along with the combination of the infrared light emitting diode, also known as IR LED and IR photodiode senses the heartbeat of the patient and finally produces a weak output signal. The output signal received from these diodes is amplified and filtered and finally fed to the microcontroller. The microcontroller processes the data received from the sensors. The fingertip sensor consists of a photodiode and a bright LED. The LED and the



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photodiode are attached in an adjacent position so that the finger acts as a reflector for infra-red light. The light from bright LED collides with the tissues of the finger that is put above the bright LED and the photo diode. The blood is continuously changing inside the tissues of the finger which results in the variation of blood due to which there is variation of reflected light that the photo diode is going to detect. The bright LED and the photodiode are attached tightly so that they could have tight grasp while detecting the heartbeat. The resistor values are adjusted so that the optimum light passes through the finger which will enable the device to detect the heartbeat.

IV. GSM MODEM

GSM (Global System for Mobile communications) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets. It was first deployed in Finland in December 1991

GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 megahertz (MHz) or 1,800 MHz frequency band.

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. GSM Modem comes in interfaces like USB, and Serial. GSM Modem is However the main difference is that GSM Modem is wireless, while dial-up modem is wired (telephone previously). GSM is used here to interface with microcontroller and microcontroller command to the GSM modem with AT (abbreviation of Attention) command set implemented in our program.

1) Features of GSM Module:

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)
- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management
- High-quality speech
- Uses encryption to make phone calls more secure
- Short message service (SMS)

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V. ARDUINO

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control both physically and digitally.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or breadboards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++.

VI. WORKING

12V-0-12V transformer is connected with rectifier diodes 1N4007 and filter of 1000uf/16V, DC output is directly connected to Arduino board and GSM modem, LM35, CO2, H.B sensor is required DC5V converted with LM7805 regulator IC (separate for each sensor). 1000uf capacitor filter is connected to cancel loading effect for each regulator. Arduino board analog inputs pin are connected with all sensors as A0, A1, A2. Automatic and manual mode of selection is connected via SPDT switch to pin A5 and A6.

We can use any GSM modem like SIM300, SIM800A, SIM900A, A6, SIM95. Here we have used GSM modem is connected to the TXd (PIN1) and RXd (PIN0) pins of arduino board (PIN0 and PIN1). LCD data pins (AD4 to AD7) is connected to the pin 10, pin 11, pin 12, pin 13 to send the data for the LCD display. The control pins of LCD display is connected to pin 8, pin 9, respectively take action as RS, E. Variable resistor of 10K (or fixed 2.2K) is connected to the adjust contrast of 16X2 LCD display. 10uf capacitor is used to cancel loading effect and 0.1uf is used to bypass the unwanted spikes produced in the circuit. According to programming conditions, in arduino program we can change mobile number and time duration also to control SMS time duration.

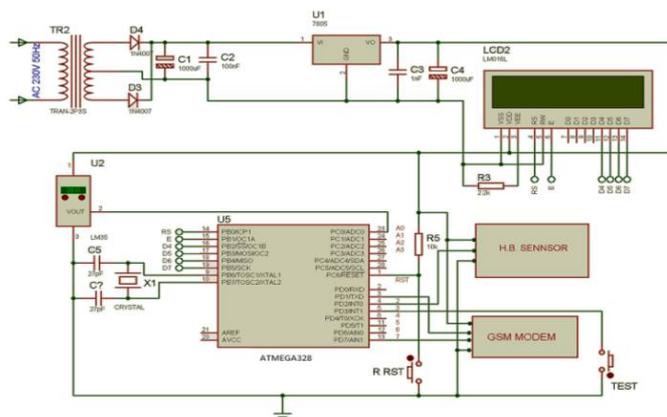


Fig3. Circuit Diagram Of Patient Health Monitoring System Using GSM Module



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VII. ADVANTAGES AND APPLICATION

ADVANTAGE:

- The circuit required power supply is very less. (12V, 750mAh)
- The component required for this hard ware is easily available in market, and well in rate.
- The circuit works with wide range of sensing ability can be set by preset.
- The circuit works with real-time application also for forming the regular use/ medical instruments.
- Due to serial communication data/ communication is very faster.

APPLICTIONS:

- Main application of this circuit is to measure heart beat and temperature of human body.
- It can be used in industries to monitor the physical conditions/ climate monitoring by implementing few hardware.
- This circuit can also used physical parameter measuring instruments.

VIII. CONCLUSION

Thus our group actively coupled with project, and we develop this project named as “PATIENT HEALTH MONITORING SYSTEM”. our group actively coupled with project, and we develop this project named as “PATIENT HEALTH MONITORING SYSTEM”. System can measure human body temperature by placing in fingers and heartbeat with placing finger tip on H.B sensor module the system can calculate temperature and heart beat and send SMS to the stored mobile numbers in the system.

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