WIRELESS SYSTEM FOR MONITORING HUMAN HEALTH USING GSM

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Abstract - *The design and implementation of human health monitoring system for emergency medical services which can demonstrate collection, integration, and interoperation of wifi data flexibly which can provide support to emergency medical services like Intensive Care Units(ICU). This project describes the design of a simple, low-cost controller based patient health monitoring system. In these system, pulse rate is measured from the pulse monitoring system which detects the heart beat by using finger. This system has a simple Optoelectronic sensor, conveniently strapped on the finger, which gives continuous reading of the pulse digits. These sensors reading will be regularly transferred to receiver's monitoring system from which it is upload to hospital's web server continuously. The receiver or the doctor can monitor the patient condition from any place.*

***Key Words*: Wifi, GSM, Sensors, Microcontroller, Patienthealth.**

1. INTRODUCTION

Health monitoring system is essential to constantly monitor the patient's physiological conditions. Now a days the present systems allow continuous monitoring, these systems require the sensors to be placed in such a way that it limits the patient to its rest position. This project comprises sensors to measure elements like body temperature, heart beat rate and pulse rate sensors. A microcontroller board is used for analyzing the inputs from the patient and any fluctuations or abnormal condition felt by the patient allows the monitoring system to give an alarm and sends the SMS to the doctor and concerned advisor. Also all the process elements within an interval selectable by the user are recorded in the common computer. This is very useful for future technical analysis and revaluation of the patient's health condition. For more various medical applications, this project can be improvised, by comprising dental sensors and annunciation systems, thereby making it useful in hospitals as a very efficient, effective and dedicated patient care system. Using the available data, and assisted by decision support systems that also have access to a large accumulation of observation data for other individuals, the doctor can make a much better medical prospect for your health and recommend treatment, early interaction, medical step in, and life-style choices that are particularly effective in improving the quality of your health.

2. METHODOLOGY

2.1 BLOCK DIAGRAM

Information is gathered using the wireless sensors such as temperature, pulse and ECG sensors and transmitted to the microcontroller AT89S51.

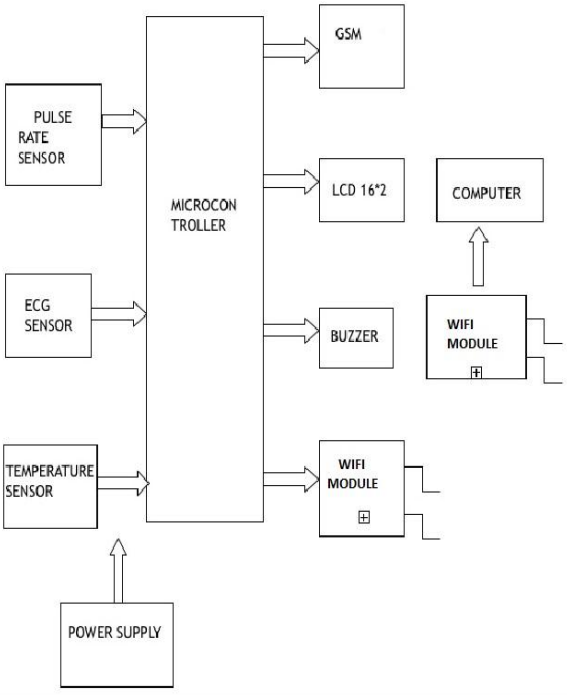

Fig-1: Block Diagram of the System

The microcontroller AT89S51 is used for the purpose of transmission and reception of data. The critical parameters measured by the Pulse rate sensor is connected to pin 2 of port 3 of the microcontroller which functions as a timer while the information from the temperature sensor is sent to the analog to digital

(ADC) convertor, MCP3208 which is 12 bit converter and has 8 input pins. This convertor is then connected to port 1 of microcontroller which is an Input-Output port. The data is continuously flow through wifi to a receiver's computer. This way the medical reports of the patient is maintained which can be used at anytime. GSM modem sim900 system has also been used in the above system so as to send an automated message to the physician or the concerned advisor in case the critical parameters decrease or increase from the predefined value .The modem receives information from RS232 which acts as a protocol converter. A buzzer is also connected to the system and it will functions as an alarm system in case of emergency conditions. This system works on a 5V power supply.
The system consists of three main working units: (1) Patient unit: This unit consists of three different types of sensors used to measure the parameters such as temperature, Pulse rate and ECG of the human body in its working environment. The sensors are connected on the by using of Wireless Body Sensor Network (WBAN). The microcontroller of the patient unit collects the sensor information with the help of the signal conditioning circuit and in that moment of time microcontroller passes that received information to the main controller unit with the help of the Wifi transmitter module. (2) Main Controller unit : The main controller unit consists of Wifi module and GSM modem. The information of the patient unit is received by the microcontroller and displayed on the LCD of the controller unit connected system. Buzzer is for providing warning in any vital condition. By the use of the GSM modem all the information of the patient's critical parameters will be send to the Physician's mobile as a SMS. (3) Observer unit: This unit consists of Physician's mobile phone and the personal computer which will be storing the physiological parameters and health condition of the patient.

2. GSM Module

SIM Com has made an ultra compact wireless module-SIM900. It is a complete Quad-band GSM module and designed with a very powerful single chip processor integrating ARM926EJ-S core. Featuring an industry-standard interface, the SIM900 delivers GSM 850/900/1800/1900MHz functioning for voice, SMS, Data, and Fax in a small package and having the low power consumption. With a tiny configuration of 24mm x 24mm x3 mm, SIM900 can supports almost all the requirements of your M2M and medical applications, especially for small and compact demands of design.

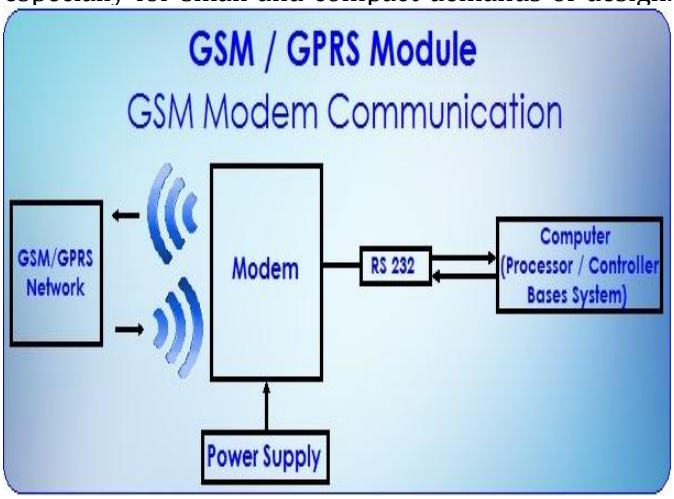

Fig-2: GSM Modem Communication

3. Microcontroller

Microcontrollers are mostly used in embedded systems and devices. Microcontroller is an IC in which the programme can be dump. A microcontroller has a CPU in addition to the RAM, ROM, Input-Output ports and a timer embedded all on a single chip IC. The on-chip components ROM, RAM and number of I/O ports in microcontrollers makes them used for many applications in which cost, size and space are critical.

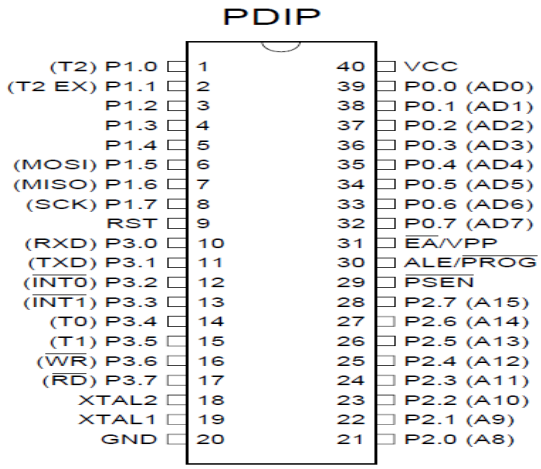

Fig -3: Pin Configuration of Microcontroller

All the three sensors are connected to this microcontroller. The microcontroller will control the performance of these sensors and other components.

4. SENSORS

Sensor is an electronic device which converts any physical parameter to its equivalent electrical signal. There are different types of sensor are available there are: Temperature sensor, Light sensor, Voltage sensor, Smoke Sensor, Gas sensor, Fire sensor, Magnetic Sensors, etc. Here in this system we are using three sensors such as temperature, pulse rate and ECG sensors.

4.1 PULSE SENSOR

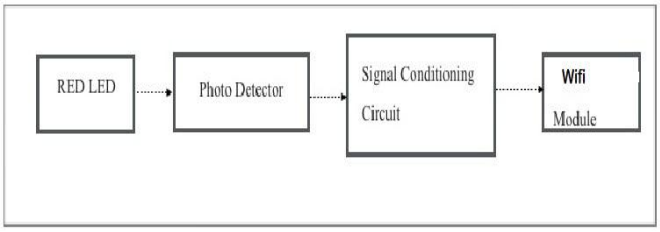

Fig-4: Block Diagram of Pulse Rate

Heart beat sensor gives the digital output of heart beat when a finger is placed on it. When the heart beat detector is working, the LED with 660nm wave-length connected to it is flashes in synchronization with each pulse. Because the flow of blood is pulsatile, the transmitted light signal changes with time. The light is absorbed from bloodless tissue , venous blood, and arterial blood for a normal finger. The amount of arterial blood changes with pulse rate of heart, so the absorption of light also changes with it. The light detector shows a large DC signal representing the residual arterial blood, venous blood, and bloodless tissue of body. When the photodiode senses or detects light signal, a current is made proportional to the intensity of the light which is detected. This current is now converted into voltage using a high performance differential current-to-voltage amplifier, followed by signal conditioning system consisting of low pass filter and high pass filters. This filtered output is then passed on to a Wifi module through which Pulse Rate will be stored in the Microcontroller.

4.2 ECG Sensor

The sensor consists of three connection connected to the right arm (RA), left arm (LA) and right leg (RL) of the patient of which the health is to be determine. We can use the Instrumentation Amplifiers for conditioning small signals in the presence of large common mode voltages and DC potentials. So we make the use of Analog instrumentation amplifier to amplify the ECG voltage signal from electrode connected to the patient's body, which is in the range of 1mV to 5mV. We have make the instrumentation amplifier using op-amp LM358, with a gain of 1000 and power supply is +12V to -12V.

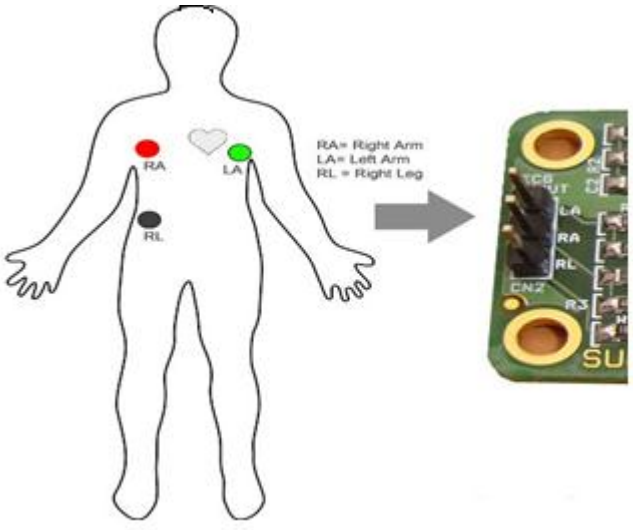

Fig-5: Connection for the ECG Sensor

4.3 TEMPERATURE SENSOR

Temperature Sensors measures the amount of heat energy or even coldness that is generated by an object, system or human body, allowing us to sense or detect any physical change to that temperature producing an analogous output. This analogous output is then converted to the digital by using ADC which is shown onto the LCD display. There are many different types of temperature Sensors available in the market and all have different characteristics depending upon their actual application.

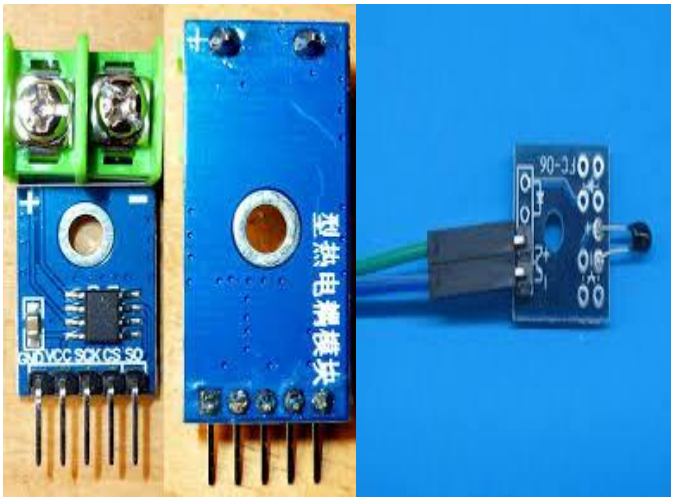

Fig-6:Temperature Sensor

5. CONCLUSION

The project provides low cost and high performance system to enhance the more use of remote monitoring capability of existing health care system by using Wifi wireless standard system and GSM modem. It uses three sensors such as Pulse rate, Body temperature and ECG data for monitoring human health. The sensors are operated and normal or critical information is transmitted to the microcontroller. By using this designed circuit containing AT89S52 MCU, GSM Modem, and other hardware circuits, the messages can be transmitted in case the value of any parameter decreases below a predetermined threshold value to the corresponding medical expert or medical advisor, so that the necessary medication can be given to the patient in emergency. This wireless system can be installed for testing and checking the health of patient's in their home for health care monitoring.

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