

Advanced Integrated Wireless Healthcare Monitoring

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Abstract: In rural areas and old age homes, the unhealthy persons need a constant monitoring of their body. In the present work the physiological parameters such as Heart beat, Body temperature, ECG, Smoke detection and brain tumor detection are obtained, processed and displayed in an android application. Monitoring and control of all the specified parameters are done using particular sensor for each parameter. These sensors are not harmful to human body as they are sensitive to infrared rays. If anyone of the vital parameter goes out of normal range then an alert message is generated and sent by the system via GSM/GPRS module to the authorized mobile numbers. Thus, it reduces the doctor's work and also gives reliable results. Whenever there is an abnormality felt by the patient, the system will give an alarm signal, by which the patient can rush to the nearest hospital. Thus an expert-based health care can be provided at crucial circumstances. The accessibility of this android application is simple and easy. By using this application, we can say that, it is cost effective and user friendly. This system can detect the abnormal conditions, issue an alarm to the patient and send a SMS to the physician and or to the family members.

Index Terms: Smart phone, Android application, GSM module, Wi-Fi module, ECG monitoring, Body Temperature, Heart rate, Brain tumor, Smoke detector.

I. INTRODUCTION

The main objective of the system is to reduce the size and cost of the system. Electrocardiography known as an ECG is a recording to examine the functions of the heart. ECG is a recording device used to study disorders that manifest changes in the electrical activity of the heart [5]. ECG provides valuable information about a wide range of cardiac disorders such as the presence of an inactive part (or) an enlargement of the heart muscle. Heart rate is the number of heart beats per unit time and is usually expressed in beats per minute (bpm). In adults normal heart beat is about 60 to 100 beats a minute during resting condition. Body temperature is a measure of the body's ability to generate and get rid of heat. Normal human body temperature depends upon the place in the body at which the measurement is made,

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And the time of day and level of activity of the person. Different parts of the body have different temperature. Smoke detector is used to detect the smoke in lungs while inhaling and exhaling of air. This can also be used in various applications like domestic gas leakage detector and portable gas detector. Brain tumor is sensed by using a high intensity type LED and LDR. If brain tumor is detected, system will give an alarm signal. Output data of these parameters is displayed on the android app by using Wi-Fi module. Application is based on TCP/IP protocol. Messages will be sent to the authorized mobile numbers by using GSM/GPRS module.

A. Structure of assessment

This paper is organized into five sections where, section 1 gives a brief introduction, section 2 deals with system representation, section 3 gives about hardware implementation, while the results and conclusion are made in section 4 and 5 respectively

B. Literature survey

Although, the studies and systems based on the concept of Health care monitoring have been published since many years, most of the systems are using only three parameters i.e., ECG, Body temperature and Heart rate and even they are not getting reliable results. Yogita L. Kumbhare, Pankaj H. Rangaree [1]. Displayed the data on pc. S. Deepika, V. Saravanan[2] offered the system with a special feature like online videography. A. Sagahyoon, raddy. H, Ghazy. A, Suleman. U [5] have monitored the data and transferred it via Bluetooth. Whereas this work discusses how the output data like brain tumor detection, body temperature, ECG, heart rate and smoke detection is transferred via WI-FI module to the android application.

II. SYSTEM REPRESENTATION

The Heart rate, Temperature, ECG, smoke detection and Brain tumor are fed directly to the ARM7 Micro controller.

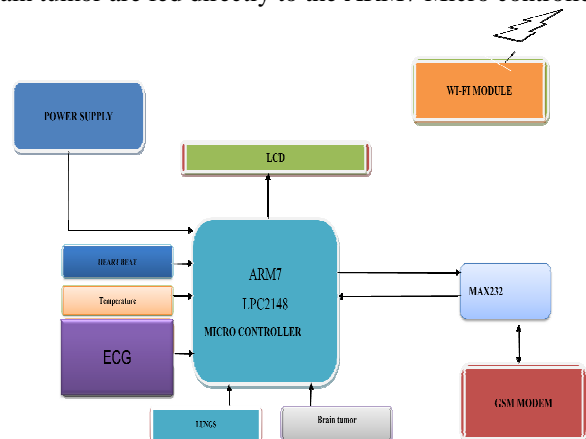


Fig: 1 Block diagram of Health care monitoring system

These parameters are then amplified, filtered and displayed on the smart phone. The software compares the real time data with the preset threshold values and if the threshold values are crossed, an alert SMS is sent via the GSM module.

III. HARDWARE IMPLEMENTATION

Heart beat sensor:

LM358 sensor is used here to measure the Resting pulse rate (RPR). It is one of the key vital sign routinely measured in clinical practice. According to the national health statistics reports, U.S., the mean RPR is of 129 beats/min at less than age 1 year, which decreases to a mean RPR of 96 beats/min by age 5, and further decreases to 78 beats/min in early adolescence. The mean RPR in adulthood plateaus is at 72 beats/min. In addition there is a significant gender difference, with the male pulse rate plateauing in early adulthood, while the female resting pulse plateaus later when middle aged [4]. The RPR will be as follows

Child aged 7 to 12 years - 75 to 110 beats/min.

Adult aged 18+ years - 60 to 100 beats/min.

Adult athlete - 40 to 60 beats/min.

Temperature sensor:

The temperature sensing is performed by using a LM35 which is an analog temperature sensor. The normal body temperature of a person varies by depending on gender, recent activity, food and fluid consumption. 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 [2]. Formula for converting temperature from Celsius to Fahrenheit is $^{\circ}\text{C} \times 9/5 + 32 = ^{\circ}\text{F}$.

ECG recording:

Usually more than 2 electrodes are used and they can be combined into a number of pairs. For example: Left arm (LA), right arm (RA) and left leg (LL) electrodes form the pairs: LA+RA, LA+LL, RA+LL. The output from each pair is known as a lead. Each lead is said to look at the heart from a different angle. Different types of ECGs can be referred to by the number of leads that are recorded, for example 3-lead, 5-lead or 12-lead ECGs (sometimes simply "a 12-lead"). A 12-lead ECG is one in which 12 different electrical signals are recorded at approximately the same time and will often be used as a one of recording of an ECG, typically printed out as a paper copy. 3- and 5-lead ECGs tend to be monitored continuously and viewed only on the screen of an appropriate monitoring device, for example during an operation or while being transported in an ambulance. There may, or may not be any permanent record of a 3- or 5-lead ECG depending on the equipment used [6].

Smoke detection:

The sensor used here is MQ2 smoke sensor / gas sensor. It can detect any type of smoke in surrounding areas. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

Brain tumor identification: By using LED and LDR brain tumor is identified. The finger is placed between the LED

and LDR. As Sensor a photo diode or a photo transistor can be used. The skin may be illuminated with visible (red) using transmitted or reflected light for detection.

LCD display:

Liquid crystal display a type of display used in digital watches and many portable computers. Here the LCD is used as both the Transmitter as well as the receiver side.

The input which we give to the microcontroller is displayed on the LCD of the transmitter side and the message sent is received at the receiver side which displays at the receiver end of the LCD and the corresponding operation is performed. They make complicated equipment easier to operate. LCD's come in many shapes and sizes but the most common is the 16 character x 4 line display with no backlight. It requires only 11 connections – eight bits for data (which can be reduced to four if necessary) and three control lines only used two here). It runs off a 5V DC supply and only needs about 1mA of current. The display contrast can be varied by changing the voltage into pin 3 of the display.

ARM7 micro controller:

LPC2148 is widely used IC from ARM7 family. It is inbuilt with many peripherals making it more efficient and reliable option for high end application developers. 8 to 40 KB of on-chip static RAM and 32 to 512 KB of on-chip flash memory. 128 bit interface/accelerator enables high speed 60MHZ operation. In system/in-application programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400ms and programming of 256 bytes in 1ms. Embedded ICE-RT and embedded trace interfaces offer real-time space debugging with the on-chip real monitor software and high speed tracking of instructions execution. Low power real-time clock with independent power and dedicated 32 KHZ clock input. CPU operating voltage range of 3.0 to 3.6V with 5V tolerant I/O pads.

WI-FI module:

ESP8266 is an impressive, low cost Wi-Fi module suitable for adding Wi-Fi functionality to an existing microcontroller project via a UART serial connection. The module can even be reprogrammed to act as a standalone Wi-Fi connected device—just add power. It is a 32-bit RISC (Reduced Instruction Set Computer) CPU. 802.11 b/g/n protocol, Wi-Fi Direct (P2P), soft-AP Integrated TCP/IP protocol stack.

GSM module:

The modem used is SIMCOM900. This is a GSM/GPRS enabled module. It works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It is very compact in size and easy to use as plug in GSM Modem. The baud rate can be configurable from 9600-115200 bps through AT command.

IV. RESULTS

Currently, the healthcare system for heart rate, body temperature, ECG, smoke in lungs, brain tumor is successfully designed for applications using GSM. If the ranges of the given data changes, immediately messages are sent via GSM module to the given mobile numbers as given below

- when body temperature is below 95 and above 100

degrees Fahrenheit.

- When smoke is detected.
- Heart beat is not in the range of 40-100 beats/min.
- When Brain tumor is detected.
- When ECG is in the range of 120-300mm/sec.

The Term TCP v1.0 is an android application that works on TCP/IP protocol. When WI-FI connection is established between the mobile and system, by clicking on the listen button the output data is shown on the screen.

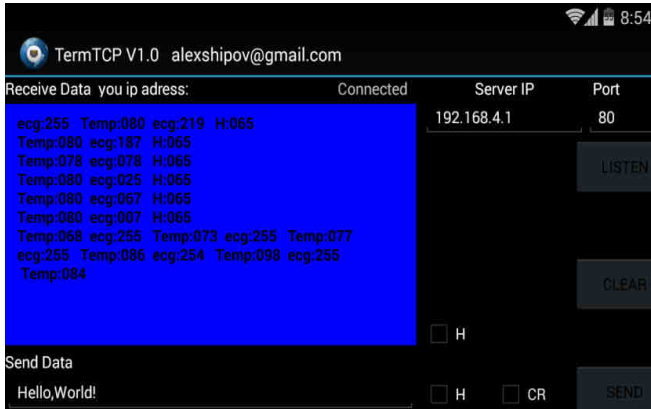


Fig: 2-display of data in android application.

A person can monitor himself whenever he wants, he can see the data in the android app by connecting through WI-FI, he can save the data by taking a snapshot and also he can send the data to some other person by clicking on send option.

V. CONCLUSION

The main objective of this project is to develop an efficient and reliable healthcare monitoring system that can play a vital role in providing basic health services to the remote area population and elderly patients without going to the physician for regular checkup. This work enables transmission of system body parameters which is sensed from remote patient to the smart phone by using wireless transmission technology i.e., WI-FI and GSM modules. The authorized mobile numbers will get the SMS in case any parameter goes beyond the specified range. The main aim of this project is to save the life of a person.

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