

Wireless Body Area Network for Telemetry

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Abstract

The aim of the project in designing a system which is capable of tracking the location of patients and also monitoring of heart rate and health parameters also alerts in case of emergency through SMS to predefined number. This aims in design and present the novel wearable system with the bio recognition sensors based on the GPS and GSM communication Network .In this project sensors (3-axis accelerometer, temperature sensor, heartbeat sensor, humidity sensor, ECG sensor) added and located at patient body for getting the postures information and activity by them always monitored. The system sends alert messages in emergency times, project using ARM-7 LPC2148 microcontroller is an exclusive project that can monitor the health status of the patient.

Keywords: GSM, GPS, Heart beat sensor, Temperature sensor, Microcontroller

I. INTRODUCTION

Now a day's technology is running with time, it completely occupied the life style of human beings. It is used everywhere in our daily life to fulfill our requirements. In this project using advanced technology to sense serious health problems so that efficient medical services are provided to the patient in appropriate time.

In this project, a framework for the real-time monitoring of wireless sensors. This is platform that requires minimum human interaction during set-up and monitoring. Its main components includes sensors, to automatically set up the body area network, a mechanism for delivering data to the server, and automatic data collection, profiling and feature extraction .The aim of the project is in designing a system which is

capable of tracking the location of patients and also monitoring of heart rate and health parameters also alerts in case of emergency through SMS to predefined numbers. alerts in case of emergency through SMS to predefined numbers. The system sends alert messages in emergency times, i.e. when a person is alone in home or travelling and his heartbeat or body temperature or humidity or ECG levels rises or lowers then alerting messages will be send to the mobile phone, the message consist of location of that user also. Also, we can get the heart rate of the person by simply sending a SMS. We get the alerting message from the GSM modem (SMS Message). GPS gives Position, velocity, time of anything located on the Selecting a Template earth. This GPS receiver is capable of identifying the location .In this system consists the temperature sensor LM 35, heart beat sensor, humidity sensor, ECG sensor, GPS receiver module as input and GSM modem, LCD output modules. These sensors are arranged on patient's body to getting health information. The system has both visual and audible alerts using buzzer and LCD modules.

II. EMBEDDED SYSTEMS

An embedded system is a computer system designed to perform one or a few dedicated functions computing . Embedded is a part of a complete device including hardware and software. A personal computer (PC), is designed to be flexible and to meet a wide range of user needs. Many devices are controlled by Embedded systems which are used today. Embedded systems are controlled by main processing cores which are Microcontrollers or Digital Signal Processors (DSP). For example, air traffic control systems is considered as embedded, even though they involve mainframe computers and dedicated national networks between airports and radar sites. A modern example of embedded system is shown in fig: 1

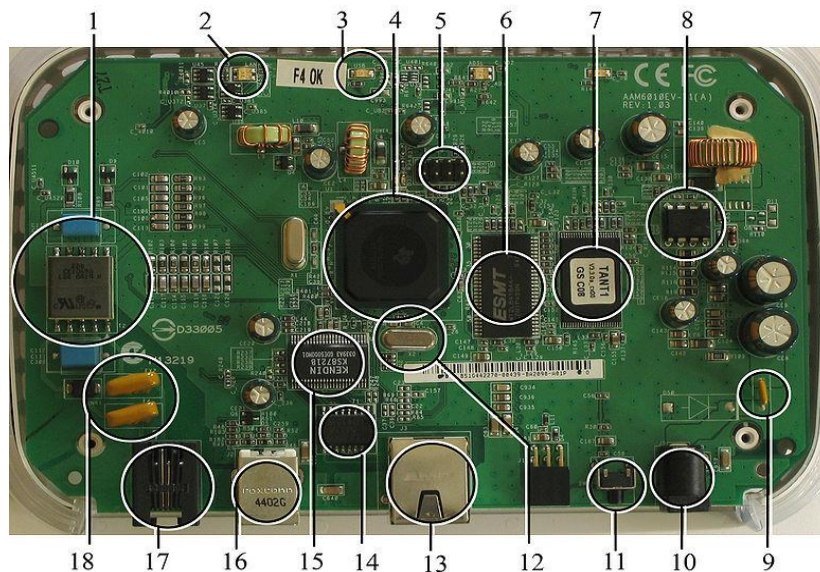


Fig 1. A modern example of embedded system

Labeled parts include microprocessor (4), RAM (6), flash memory (7). Embedded systems programming is not like normal PC programming

III. NETWORK COMMUNICATION EMBEDDED SYSTEMS

A wide range of network interfacing communication is provided by using embedded systems .e.g. Consider a Web Camera is connected to the computer with internet can be used to spread communication like sending images, pictures, videos etc. to another computer with internet connection throughout anywhere in the world. Consider a Web Camera is connected to the door lock. Whenever a person comes near the door, it takes the image of a person and send it to the desktop of your computer which is connected to internet. This gives an alerting message with image on to the desktop of your computer, and then you can open the door lock just by clicking the mouse.



Fig 2: Network communication embedded systems

IV. HARDWARE DESCRIPTION

The block diagram of the project and design aspect of independent modules are considered. Block diagram is shown in fig: 3

A Scalable Wireless Body Area Network for Bio-Telemetry

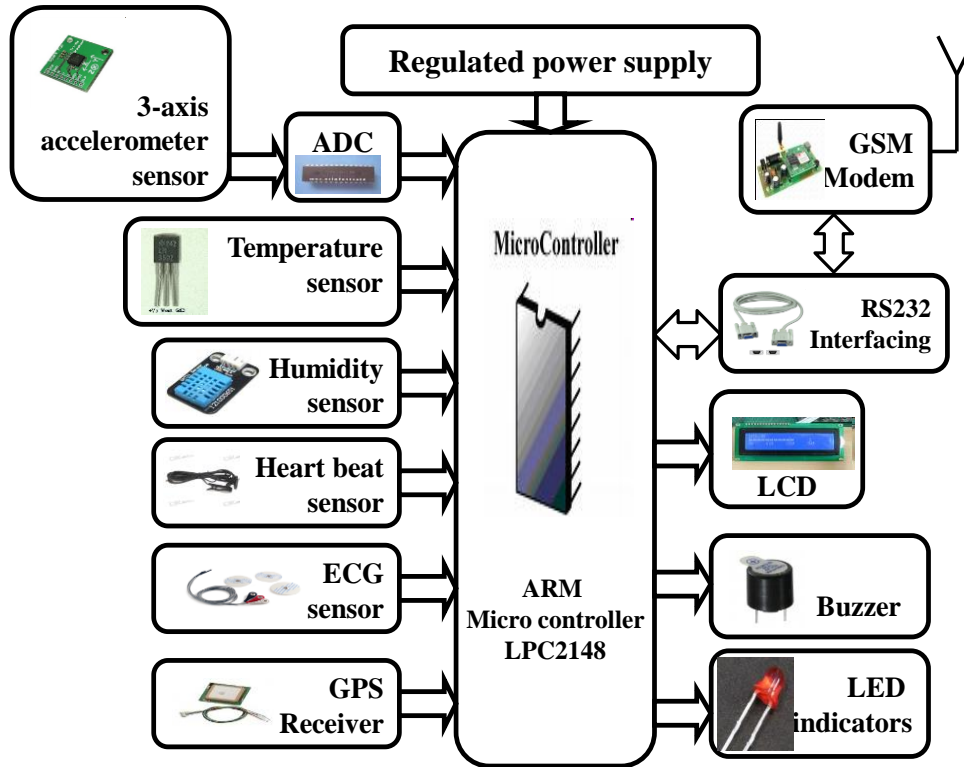


Fig 3. Block diagram of WBAN for Telemetry

A. The main blocks of this project are:

1. Micro controller (ARM-7 LPC2148)
2. Reset button
3. Crystal oscillator
4. Regulated power supply (RPS)
5. LED indicator
6. MEMS Accelerometer sensor
7. Temperature sensor
8. Humidity sensor
9. Heart beat sensor
10. ECG plates
11. GPS receiver
12. LCD
13. GSM modem
14. Buzzer

1. Microcontroller

Microprocessor:

1. The CPU, memories, timers, Input/output ports, serial communication, interrupts etc.
2. More power consumption is required and more cost.
3. Microprocessors are used in products like equipments and personal computers
4. There are various kinds of software applications can be loaded and used simultaneously.
5. Microprocessor are as like Multitasking.

Microcontroller:

1. The central processing unit(CPU), timers, serial communication, interrupts, memories, input/output ports etc. are equipped on the single chip.
2. It requires less space, so it consumes less power, and the cost is low when compared to microprocessor.
3. Used for products such that performs only a specified task.
Example: Air conditioner, remote controls, microwave etc..,

2. MEMS sensor MMA 7260 Q

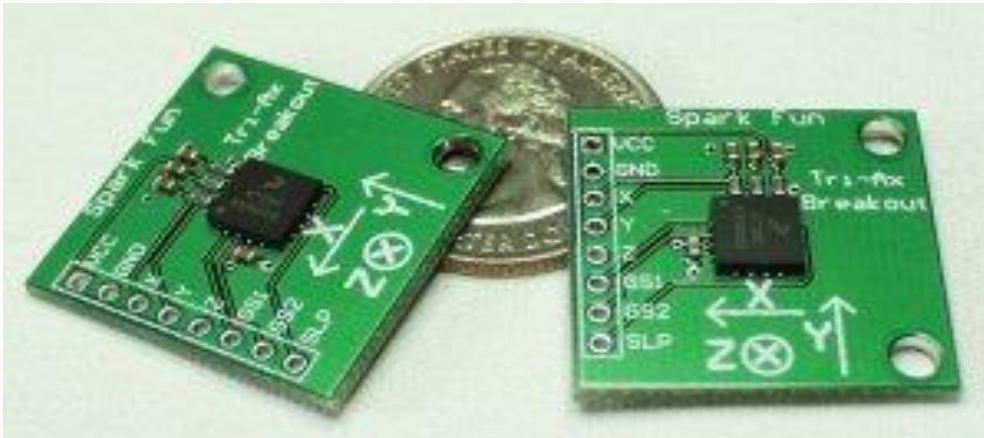


Fig 4: MEMS sensor MMA7260Q

The MMA7260Q is Three-axis accelerometer. An Accelerometer measures acceleration which is mounted on. Single axis Accelerometers measures acceleration in only one direction. Dual-axis accelerometers are the common measure acceleration in two directions, these are perpendicular to each other. With a three-axis accelerometer, you can measure an acceleration of an object in every direction. The MMA7260QT is a small, it's difficult for the typical student to use. The device also operates at 2.2 V to 3.6 V, this makes interfacing difficult for microcontrollers operating at 5 V. Working of MMA7260Q sensor:

The schematic of Three-axis accelerometer is shown below. The device can be powered directly through the Vcc/3.3 V pin using a supply is within the MMA7260QT's acceptable power supply range of 2.2 V to 3.6 V. The board is powered by higher voltages, up to 16 V., which connects to a low-dropout 3.3 V regulator. In this configuration, the Vcc/3.3 V pin can provide the output to be used as a reference voltage or power source for other low-power devices depending on the input. The sensitivity selection pins GS1 and GS2 are pulled up to the Vcc line, which are making the sensitivity 6g; these pins can pulled low by a microcontroller or through jumpers. for considering 5 V applications. The 3.3 V output can used as a reference for analog-to-digital converters to gain full resolution sample. Your conversions will be limited to 66% of the full range. Specifications:

1. Operating voltage: 3.3-16 V
2. Supply current: 1.35 mA
3. Output format: 3 analog voltages
4. Output voltage range: 0-Vcc (0-3.3 V for VIN > 3.3 V)

3. Heart Beat Sensor

1 Heart beat sensor is to be designed to give digital output of heart beat when a finger is placed inside it. When the heart detector is working, the top-most LED flashes in union with each heart beat. This digital output can be connected to microcontroller directly measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse A. Features Heart beat indication by LED

- Output digital signal for directly connecting to microcontroller
- Working Voltage is +5V DC

Applications:

- Bio-Feedback control of robotics and applications
- Exercise machines

B .Working

The sensor includes a super bright red LED and light detector. The LED needs to be super bright as the light passes through the finger and detected at other end. Now, when the heart pumps a pulse of blood through the blood vessels, and so less light reached the detector.. The output signal is also indicated on top by a LED which blinks on each heart beat.

4. Humidity Sensor

A. Introduction:

Humidity sensors are gaining more significance in diverse areas of measurement. Manufacturers are not improving the accuracy and long-term drift of their sensors, they are improving durability for use in various environments, and simultaneously reducing the component size and the price. A humidity sensor is a device that which measures the relative humidity of in a given area. A humidity sensor can be used in

both indoors and outdoors. This changes the level of charge in the capacitor of the on board electrical circuit.

B. Description:

Humidity sensors detect the humidity of the immediate environments in which they are placed. They measure both the moisture and temperature in the air and express humidity as a percentage of the ratio of the moisture in the air to the maximum amount that can held in the air at the current temperature. As air becomes hotter, it holds more moisture, so that humidity changes with the temperature. The measurement is to determine the amount of moisture in the air. Moisture from the air collects on the film and so it affects to the changes in the voltage levels between the two plates.

5. Temperature Sensor

A. Introduction:

LM 35: (TEMPERATURE /FIRE SENSOR):

The LM35 sensor series are to be a precision integrated-circuit temperature sensors, that is a output voltage is linearly proportional to the Celcius temperature. To detect the heat produced during fire occurrence we can use temperature sensor.

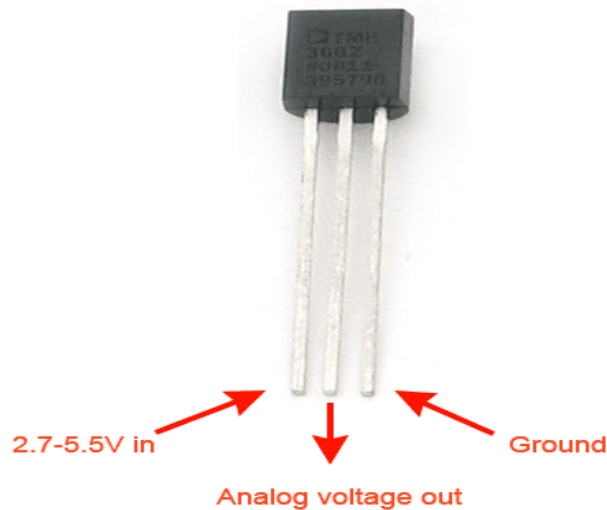


Fig 5. Temperature sensor

B. Description:

Temperature is the most-measured process in industrial automation. The LM34 thus has an advantage over linear temperature sensors which are calibrated in degrees Kelvin, the user is not required to subtract a large constant voltage from its output to obtain to convenient Fahrenheit scaling. The LM34 does not require any external

calibration or trimming to provide the typical accuracies of $\pm 1.2^{\circ}\text{F}$ at room temperature and $\pm 11.2^{\circ}\text{F}$ over a full -50 to $+300^{\circ}\text{F}$ temperature range.

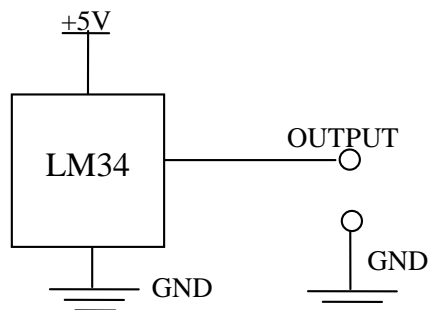


Fig.6: Circuit diagram for the LM35 temperature sensor functional module

6: ECG Sensor Plates

Electrocardiography is the process of measuring the electrical activity of the heart over a period of time with the help of electrodes placed on a patient's body. These electrodes detect the small electrical changes on the skin that arise from the heart muscle which is depolarizing during each heartbeat. In a conventional 12 lead ECG.

7. Global Positioning System

A. Introduction:

The GPS NAVSTAR stands for (Navigation Satellite Timing and Ranging Global Positioning System) is a satellite-based navigation, positioning system. This technology seems to be beneficiary to the GPS community which in terms of obtaining accurate data up to about 100 meters for navigation, meter level for it's mapping, and down to millimeter level. GPS which provides accurate location and time information for a many number of people in all weather, day and night, the role of GPS satellites to broadcast signals from space that are picked up and recognized by GPS receivers.

8. GSM modem technology

GSM: Global System for Mobile Communication (GSM)

A. Definition:

GSM means Global System for Mobile communications, important as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's that is user. GSM network search that cell phone towers which are in the nearby area. GSM is a accepted s a global having standard for digital cellular communication.



Fig. 6 GSM modem

B .Applications:

1. GSM Modem is useful for paralyzed persons.
2. Also useful for handicapped persons.
3. GSM modem can be implemented practically to patients in the hospitals ,old age homes, etc.

V. RESULT

The project Wireless Body Area Network for Telemetry was designed system with the bio recognition sensors based on the Non-vision over the GPS and GSM communication Network. By using this project Non vision based different wearable type sensors (3-axis accelerometer, temperature sensor, heartbeat sensor, humidity sensor, ECG sensor) added and located at patient body for getting the monitoring information. The system sends alert messages in emergency times, i.e. whenever a person is alone at home or travelling and his heartbeat or body temperature or humidity or when ECG levels rises or lowers then alert messages will be send to the mobile phone, the message consist of location of that person also..

Table - 1

| Name | Age | Heart rate | Temperature |
|--------|-----|------------|-------------|
| Raju | 72 | 90 | 37 |
| Seema | 80 | 83 | 37 |
| Pankaj | 88 | 74 | 37 |
| Rina | 83 | 86 | 36 |

CONCLUSION

This project presents a low cost, non-invasive, reliable system for health monitoring of patients. It is also user friendly and accurate. It also enables communication between the doctor and the patient through GSM modem. Whenever any vital signs exceeds or falls below the normal value the message is transmitted to the doctor and immediate action can be taken.

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