

Accident Monitoring and Determining Wellness of Persons Using Wireless Network

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Abstract

Wireless network is used to detect the accident by using vibration sensor and determining wellness of persons, who is subjected to an accident. We are going to sense the wellness of patient through measuring the temperature, respiration and pulse rate. If these terms are found to be abnormal then the intimation is sent to the Doctors via Short Message Service (SMS). This helps to serve the patient at the right time. The condition of the patient is sensed continuously and the necessary step will be taken.

Keywords: *Temperature, respiration and pulse rate sensors, wellness, Vibration sensor.*

1. Introduction

Driving is an essential part in the life of many people. With the immense use of vehicles in day today life accidental death has shown a tremendous growth rate. Due to these accidents, in most of the cases, people lose their life. The main reason for this lies behind the delay in medical facilities to reach to the accidental place.

This project ensures the losses of life will be reduced rapidly. The health of the person is very important and when a person lacks it his lifestyle becomes difficult. Once his health become poor he will suffer in his daily activities. The person in the critical stage needs more care. That particular person wants to be cared by the society in both physically and mentally.

An individual person who is in need of checking their health continuously can be done only through the advanced system. For this purpose many researches were going on the medical application field.

When an vehicle is subjected to an accident, the vibration sensor is used to sense the accident, then the information is sent to the nearest surveying ambulance. Now-a-days accidents are happening frequently and immediately

treated in the ICU. In ICU the patient's pulse rate, respiration and temperature should be sensed continuously. The person can be monitored continuously in ambulance, hospital and wherever they are in need. The condition of particular person is intimated to their medical staffs and their caring persons through wireless network whether they are in normal are abnormal stage in ambulance. The wellness of the person is evaluated for forecasting unsafe situation.

The developed system is intelligent and does not use camera or vision sensors. This system is more helpful to all kind of persons as it is easy to monitor. The health condition of the patient is monitored in an ambulance and the intimation is sent to their medical staffs for further treatments.

As the patient is in the ill condition we need to fix the sensors in the necessary body area of the patient. The system has been developed to be used in ambulance, hospitals and in any place where power supply is available. In hardware level, we use PIC microcontroller and the GSM wireless network are used for the text messages. The developed system continuously reads the data from the patient and it is sent to the mobile as SMS.

Primarily we are going to absorb the normal status for the particular patient. Here we are going to monitor the required conditions of the particular patient and then the monitored values compare in the hardware device and the status will be informed to the concern person.

In the hardware side we are using 16F877A PIC microcontroller. The electronic system with intelligent mechanism, economically low cost, flexible, very easy to install, robust and accurate in monitoring is essential so that help can be provided to the patient at right time.

The ultimate goal of personal wellness system is to provide the necessary care for patient in the right time. It

does not depend on the environment they live, but the technology could access them.

Patient monitoring and information sending are the two important functions that is to be done in a timely regular manner rather than offline. Hence real-time processing of data is must for monitoring and predicting abnormal situation of the patient.

To deal with issues such as monitoring the condition of the patient and tracking system which is low cost, flexible, noninvasive and safe to use is designed.

2. System Description

The system consists of four modules. The first module includes vibration sensor for tracking an accident. In the second module sensors such as temperature sensor, pulse rate sensor, respiration sensor and the sensing methodology. In the third module programming in PIC microcontroller is done. In the fourth module data transmission through GSM is included.

2.1 Vibration sensor

A Vibration sensor is used to sense the vibration at an high frequency level. These sensors detect high frequency vibration signals related to bearing supports, casing and foundation resonances, vibration in turbine/compressor vanes, defective roller or ball bearings, noise in gears, etc.

If the vibration sensor sense as abnormal then the intimation is sent to the nearest ambulance driver from the accident vehicle driver through SMS automatically. Then the driver in ambulance rushed to the spat.

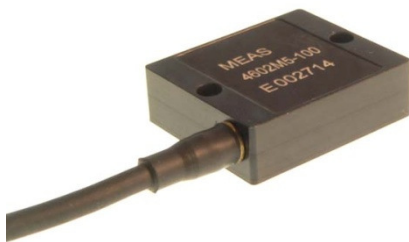


Fig.1 Vibration sensor

2.2 Temperature sensor

The temperature sensor is nothing but the thermistor. A thermistor is a type of resistor used to measure temperature changes, relying on the change in its resistance with changing temperature. Thermistor is a

combination of the words thermal and resistor. If we assume that the relationship between resistance and temperature is linear (i.e. we make a first-order approximation), then we can say that:

$$\Delta R = k\Delta T$$

Where ΔR = change in resistance

ΔT = change in temperature

k =first-order temperature coefficient of resistance.

Thermistors can be classified into two types depending on the sign of k . If k is positive, the resistance increases with increasing temperature, and the device is called a positive temperature coefficient (PTC) thermistor, **Posistor**. If k is negative, the resistance decreases with increasing temperature, and the device is called a negative temperature coefficient (NTC) thermistor. Resistors that are not thermistors are designed to have the smallest possible k , so that their resistance remains almost constant over a wide temperature range. It is commonly used one.

Symbol:

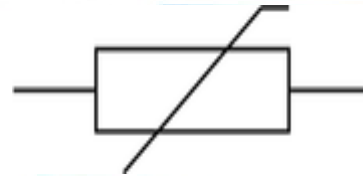


Fig.2 Thermistor

Circuit Description

In this circuit the thermistor is used to measure the temperature. Thermistor is nothing but temperature sensitive resistor. There are two type of thermistor available such as positive temperature co-efficient and negative temperature co-efficient.

Here the thermistor is connected with resistor bridge network. The bridge terminals are connected to inverting and non-inverting input terminals of comparator. The comparator is constructed by LM 324 operational amplifier.

The LM 324 consist of four independent, high gains, internally frequency compensated operational amplifier which were designed specifically to operate from a single power supply over a wide voltage range.

The first stage is a comparator in which the variable voltage due to thermistor is given to inverting input terminal and reference voltage is given to non-inverting input terminal.

Initially the reference voltage is set to room temperature level so the output of the comparator is zero. When the temperature is increased above the room temperature level, the thermistor resistance is decreased so variable voltage is given to comparator. Now the comparator delivered the error voltage at the output.

Then the error voltage is given to next stage of preamplifier. Here the input error voltage is amplified then the amplified voltage is given to next stage of gain amplifier.

In this amplifier the variable resistor is connected as feedback resistor. The feedback resistor is adjusted to get desired gain.

Then the AC components in the output are filtered with the help of capacitors. Then output voltage is given to final stage of DC voltage follower through this the output voltage is given to ADC or other circuit.

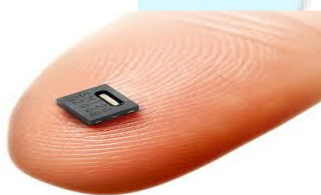


Fig.3 Temperature sensor

2.3 Pulse Rate Sensor

A device for holding a heartbeat sensor in a relatively fixed relationship with respect to the end of a user's fingertip. More particularly, a device is disclosed wherein a single sheet of resilient material is formed into a base

portion for holding the heartbeat sensor and three resilient bands that extend upwardly there from. The bands are adapted to grip the user's fingertip.

In one embodiment of the invention, the bands and base portion define a U-shaped channel of constant cross-sectional area. In this embodiment a holding structure for the heartbeat sensor is wedge-shaped, the wedge-shaped holding structure being adapted to be held by the base portion so that the cross-sectional area defined by each band and the wedge-shaped holding structure decreases along the longitudinal length of the base portion.

In another embodiment of the invention, each band defines a smaller cross-sectional area with respect to the base portion. Thus both embodiments result in more pressure being applied to the sensor at the portion of the user's fingertip closest to the end.



Fig.4 Pulse rate sensor

The invention provides a device for holding a heartbeat sensor in a relatively fixed relationship with respect to a user's fingertip. The device includes a base portion for holding the heartbeat sensor, and a pressure producing means connected to the base portion for holding the user's fingertip against the heartbeat sensor, the pressure producing means including means for causing pressure between the heartbeat sensor and the user's fingertip to be greater at the portion of the user's fingertip closest to the end than at the portion of the user's fingertip furthest from the end.

In a specific embodiment of the invention, a single sheet of resilient material is formed into a base portion and three flexible bands extending upwardly and over the base portion. Each of the bands partially forms an arch with respect to the base portion and is adapted to grip a portion of the user's fingertip. A holding structure for the heartbeat sensor is also provided, the holding structure being in the form of a wedge having its thickest portion closest to the end of the user's fingertip.

The holding structure is adapted to be held by the base portion. In a further embodiment of the invention, a single strip of material is again formed into a base portion and three upwardly extending bands, each band defining a smaller cross-sectional area along a longitudinal length of the base portion.

A holding structure for the heartbeat sensor is adapted to be held by the base portion. The user's fingertip is located between the bands and the base portion so that the fingertip end is gripped by the band defining the smallest cross-sectional area. The two embodiments above described thus effect a maximum pressure on the portion of the fingertip closest to its end rather than on the portion of the fingertip furthest from its end. The holding structure is adapted to position the heartbeat sensor at the maximum pressure portion, thereby minimizing movement between the sensor and the fingertip.

2.4 Respiration Sensor

A plurality of flow sensors are fabricated on a single substrate. The substrate is laid out to provide the proper physical relationship of the individual sensors. The resulting multiple sensor structure may be effectively used as a respiration detector by positioning a different sensor element at each of the airflow orifices (i.e., two nostrils and mouth) of a patient. In the preferred embodiment, the sensors are thermoresistive elements, which are screened on the substrate using conductive ink.

The change in temperature of the air flow in relation to the ambient at each orifice provides an indication of the flow and may be used to determine the extent of the flow. The substrate is packaged in a single piece adhesive strip which provides ease of proper attachment by the patient.

The present invention overcomes the disadvantages found in the prior art by providing a plurality of sensors fabricated on a single substrate. It is advantageous to employ multiple sensing elements positioned at the various orifices which vent the upper airway of a patient. In the normal case, the three orifices are the two nostrils and the mouth. During sleep, these three orifices are used in various combinations depending upon individual habits, condition of the respiratory system (e.g. colds, etc.), and type of sleep to monitor the total respiratory effort.

The substrate is packaged within a single adhesive strip, which enables the patient to readily apply the sensor to the upper lip. The substrate is not planar placing the individual sensing elements directly into the air stream

and out of contact with the skin of the patient. The sensing elements are each inclined from the plane of the substrate away from the patient.



Fig.5 Respiration sensor

The sensing elements may be produced using a number of technologies. In the preferred embodiment, a conductive ink having a high temperature coefficient of resistance and high resistance is applied to the substrate using a silk screening process. The individual sensing elements are interconnected in series using a conductive ink having a low resistance, and preferably low temperature coefficient of resistance. The interconnections are silk screened during a second processing step.

2.5 Alarm

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

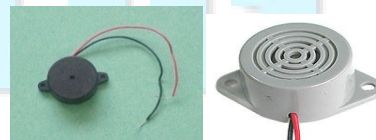


Fig.6 Alarm

Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to

implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Son alert which makes a high-pitched tone.

2.6 Block Diagram for monitoring patient health status

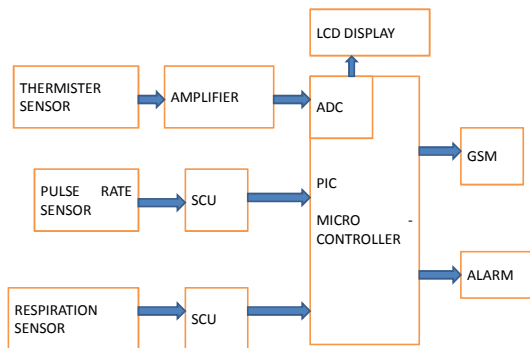


Fig.7 Block diagram

2.7 GSM Modem

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. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

For the purpose of this document, the term GSM modem is used as a generic term to refer to any modem that supports one or more of the protocols in the GSM evolutionary family, including the 2.5G technologies GPRS and EDGE, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA.



Fig.8 GSM Modem

A GSM modem exposes an interface that allows applications such as Now SMS to send and receive messages over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone.

2.8 LCD Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

An LED consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

One each polarisers are pasted outside the two glass panels. These polarisers would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarisers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarisers, which would result in activating / highlighting the desired characters.

The LCD's are lightweight with only a few millimeters thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCD does not generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's

have long life and a wide operating temperature range.

Changing the display size or the layout size is relatively simple which makes the LCD's more customer friendly. The LCDs used exclusively in watches, calculators and measuring instruments are the simple seven-segment displays, having a limited amount of numeric data. The recent advances in technology have resulted in better legibility, more information displaying capability and a wider temperature range. These have resulted in the LCDs being extensively used in telecommunications and entertainment electronics. The LCDs have even started replacing the cathode ray tubes (CRTs) used for the display of text and graphics, and also in small TV applications.

The power supply should be of +5V, with maximum allowable transients of 10mv. To achieve a better / suitable contrast for the display, the voltage (VL) at pin 3 should be adjusted properly. A module should not be inserted or removed from a live circuit. The ground terminal of the power supply must be isolated properly so that no voltage is induced in it. The module should be isolated from the other circuits, so that stray voltages are not induced, which could cause a flickering display.

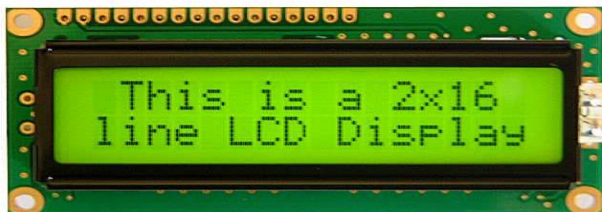


Fig.9 LCD Display

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly.

They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube (CRT) displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in. LCDs are more energy efficient and offer safer disposal than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an

electronically-modulated optical device made up of any number of pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in color or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals, dates from 1888. By 2008, worldwide sales of televisions with LCD screens had surpassed the sale of CRT units.

3. Conclusion

In this paper, a novel idea is proposed for human health monitoring principle in favor during the accidents or illness. With this system the various sensors can be maneuvered from the body of the patient to the hospital without time lag. Mainly preferred for elderly persons to be monitored continuously. Thus implemented in countries with large population like India can produce better results. The transmission of data is more accurate, simply through GSM. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the server.

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