Research Article

Biomedical based driver health detection system

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Abstract

A novel driver's status estimation system based on driver's behavior in autonomous driving scene. To monitor the driver status is very important to ensure that he/she stays proper condition during driving. Healthcare monitoring system in driving time and many other health centers has experienced significant growth, and portable healthcare monitoring systems with emerging technologies are becoming of great concern to many countries worldwide nowadays. Smart health monitoring devices determine the health condition i.e. heart beat rate of the pulse, respiratory rate, the position of the body and other things by using sensors. Whenever the sensor values are not in the range of threshold value, the GPS module determines the location and this information is sent through GSM to the particular person. All these sensor operations are controlled by microcontroller.

Keywords: ARDUINO; Eye blink sensor; Heart beat sensor; Oxygen sensor; Temperature and Moisture sensor.

Introduction

Health is characterized as a full state of physical, mental, and social well-being and not merely a lack of illness. Health is a fundamental element of people's need for a better life [1]. IoT is making any objects internally connected in the recent decade and it has been considered as the next technological revolution. The most tremendous use of IoT is in healthcare management which provides health and environment condition tracking facilities. Nowadays, modern systems are providing a flexible interface assistant devices, and mental health management to lead a smart life for the human being. Heart rate and body temperature are the two most significant indicators for human health. Heart rate is the per-minute amount of heartbeats, commonly known as the pulse rate. To measure the pulse rate, an increase in the blood flow volume can be used by calculating the pulses. This paper proposes a customized healthcare system that monitors the pulse and body temperature of patients

Recent studies prove that road accidents occur mostly due to driver's ill health and inattention so health care monitoring system for drivers is given more importance in order to reduce increasing accidents [2]. It will be useful if smart health care monitoring system is available at an affordable price.

Thus, here is the system which continuously monitors the person's health parameters such as oxygen saturation, blood pressure, pulse rate, body temperature. And also an eye blinking sensor is used to detect whether the driver is sleepy. In this system the monitored values are compared with the preset values of (oxygen, pulse rate, body temperature) these parameters [4]. In case of any significant difference in the values, the abnormality is displayed on LCD and if the persons detected as alcoholic or drowsy an alarm is activated in the vehicle.

During these abnormality conditions the status of health is communicated to nearby hospital for ambulance and message is sent to the transport office using GSM modules [3]. The efficiency of the system in the proposed model is high comparably. There are few systems in which transmitters are used that will interface with other electrical equipment because of this interfacing efficiency of transmission and

receiving is affected, so in proposed system it is reduced by using GSM module and this is also useful in communicating longer distances.

Existing system

This system has Global Positioning System (GPS) which will receive the coordinates from the satellites among other critical information. Tracking system is very important in modern world. This can be useful in driver health monitoring. GSM modem, provided with a SIM card uses the same communication process as we are using in regular phone [4]. The system allows to track the target anytime and anywhere in any weather conditions.

Proposed system

The proposed system can be easily embedded on any vehicle. The Eye blink sensor is fixed to the driver with the help of goggles. The eye blink sensor senses the movement of the eyeball. The sensor output is connected to a microcontroller [5]. DC motor is used as an engine in this prototype. The motor is directly controlled by the microcontroller. If the sensor detects the no output from the sensor because there is no movement in the eyeball, it sends the signal to the microcontroller. The microcontroller gives warning signal and display the reason in an LCD. If repeatedly there is no movement in eyeball, then immediately microcontroller stops the engine.

The system also uses heartbeat sensor and temperature sensor [6]. Outputs of this sensor are analog, so we use ADC to convert signals to digital form so that they are processed by microcontroller. Initially the mention values for all sensors and phone numbers are stored in microcontroller memory. If any one of these three parameters are not in specified range of mention values the microcontroller automatically sends location information to the stored number with help of GSM. The proposed system monitors heartbeat, body temperature, breathe rate of the driver. Architecture of proposed system is shown in fig. 1.

The values of all parameters are displayed on the LCD screen and a buzzer is activated if the driver is drowsy [7]. During abnormal conditions, the health status of driver is informed to transport company of driver.
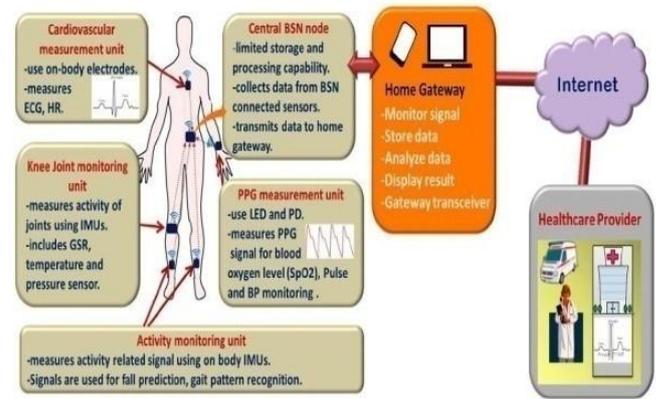

Fig. 1. Architecture of proposed system

It helps to prevent the accident due to health problems or abnormalities of driver while driving vehicle. Also, the used sensors must be small in size so that they can be easily incorporated into various system.

Block diagram

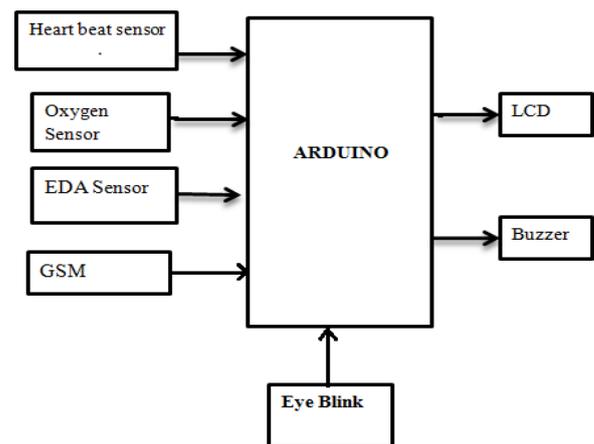The Fig. 2 show the block diagram of the proposed system.

Fig. 2. Block diagram of proposed system

Sensor description

Eye Blink Sensor

The Eye Blink Sensor works by illuminating the eye and eyelid area with infraredlight, then monitoring the changes in the reflected light using a phototransistor and differentiator circuit [1]. The exact functionality depends greatly on the positioning and aiming of the emitter and detector with respect to the eye. Instant output digital signal for directly Connecting to Microcontroller Great Quality, Easy to Use. Compact Size, Working Voltage +5V DC, TTL output 5V or 0V.

Oxygen Sensor

Accurate measurement and monitoring of physiological parameters, such as body temperature, heart rate, respiratory pattern, and, all above the respiration rate play a crucial role in a wide range of application in healthcare and sport activities [4]. Temporal changes of physiological parameters can indicate relevant variation of the physiological status of the subject. Among the wide range of parameter which can be measured in clinical setting, the respiratory rate is the most crucial vital sign to detect early changes in the health status. Conventional techniques for the measuring respiration parameter require sensors in content with the subject.

Measuring techniques based on the monitoring of several parameter sampled from inspiratory and/or expiratory flow are widely used. Sensors may also be attached directly on the torso or integrated in clothes fibers to collect respiratory-related chest or abdominal movements.

Heart Beat Sensor

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in accord with each heartbeat. This digital output can be connected to microcontroller directly to measure the Beat Per Minute (BPM) rate. A fingertip placed over the sensor will act as a reflector of the incident light. The amount of light reflected from the fingertip is monitored by the phototransistor. It works on the principle of light modulation by blood flow through finger at each pulse.

Moisture Sensor

A Soil moisture sensor can either use resistance or capacitance changes to measure the moisture content of the Human body. We can use an Arduino microcontroller to receive the moisture readings, which can then automatically send the SMS to the smart phone through GSM and turn on the buzzer.

Temperature Sensor

We integrated this with the Microcontroller to measure the temperature. The microcontroller will then read this measured value from the LM35 and translate into degrees Fahrenheit and Celsius, which we will be able to read from the Microcontroller to the LCD. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The output of sensor converted to digital that easy connecting with microcontroller.

Arduino UNO

Arduino UNO is a microcontroller board based on 8-bit ATmege328P microcontroller. Arduino UNO 14 digital input/output pins, 6 analog ins, a USB connection, a power barrel jack, ICSP header and a reset button. Arduino can be used to communicate with a computer, another arduino board or other microcontrollers.

GSM

GSM/GPRS RS232 Modem from rhydoLABZ is built with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, 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 Modem is designed with RS232 Level converter circuitry, which allows you to directly interface PC Serial port.

The baud rate can be configurable from 9600-115200 through AT command. Initially Modem is in Auto baud mode. This GSM/GPRS RS232 Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface. The modem needed only 3 wires (Tx, Rx, GND) except Power supply to interface with microcontroller/Host PC [8]. The built in Low Dropout Linear voltage regulator allows you to connect wide range of unregulated power supply (4.2V -13V). Using this modem, you will be able to send & Read SMS, connect to internet via GPRS through simple AT commands.

Experimental setup

Implementation setup of the proposed system is shown in fig. 3.

System implementation

The implemented design aims to substantially alleviate the standards of road safety. Unavoidable medical emergencies which can consequently reduce the driver's control of the vehicle have, in numerous instances, led to

serious road catastrophes and have resulted in multiple driver-passenger deaths. The project makes use of two biomedical sensors in particular- Blood pressure and heart rate to continuously monitor the health dynamics of the driver[9]. Anomalies recorded prompt the system to gradually slow down the vehicle and simultaneously send crises messages to concerned authorities-medical personnel and close emergency contacts.
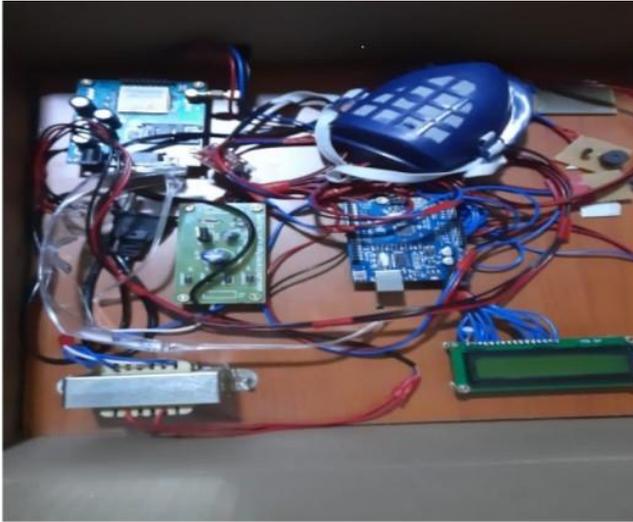

Fig. 3. Implementation setup

A Capacitive occupant detector, a seat belt position sensor and a seat belt occupant monitoring circuit to provide a vehicle start disable signal and an alarm signal if either an unoccupied seat has its associated seat belt buckled or if an occupant buckles his seat in the vehicle [10]. proposed a system that detects the sleepy driver and it will stop the vehicle immediately and it monitors the heartbeat, respiratory rate and temperature of the driver and its display of the LCD.

Conclusions

The proposed system is used to avoid the major accidents that are occurring due to fatigue and drowsy driving of driver. The model consists of Eye Blink sensor which determines the eye status (open or closed) and Heart Beat sensor is used to check the heart rate for every minute. When the parameter value is more than the threshold value the buzzer is raised to alert the driver. Thus, the accidents caused by the drowsiness can be overcome as much as possible by using such a system. Rather using alarm, we can use automatic braking system which will reduce the speed of the vehicle. By using

automatic braking system, first will reduce the speed of the vehicle and concurrently will turn on the parking lights.

Conflicts of interest

Authors declare no conflict of interest.

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