Smart Healthcare Kit for Cars Using Embedded System And IoT

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ABSTRACT

Health and well being are the basic needs of people. Now-a-days everyone wants to be fit and healthy which brings out a better version of themselves. In this modern era most of the people use car for travelling. They spent a lot of time in travelling a long distances for a long period of time. There is a significant rise in innovations that came up to enhance the technology of cars. We can also improve the health of the people who spent a lot of time in their cars by implementing smart sensors which monitor the internal environment of the car as well as the person who is driving the car. An air humidifier can be utilized which monitors the humidity level inside the car and keeps it at a healthy level. Furthermore pulse oximeter measures the blood oxygen levels of the driver. This can be implemented in the steering wheel of the car. The sensors which are used for monitoring the health parameters are heart rate, blood pressure, alcohol and temperature. Apart from these sensors an oxygen sensor monitors the oxygen levels in air which enters the car. Using this system we can keep track of the car's inside environment as well as the health of the people who travel in car. And we can also keep track of the route using GPS.

Keywords : Pulse Oximeter, Air Humidifier, Sensors, GPS

I. INTRODUCTION

In this 21st century almost every one owns a car and they travel from one place to another or they might go for long a drive which takes more time. And the emerging technology is also being improved in the automotive field tremendously. A lot of new features are being added in the car which provides entertainment as well as the safety to the people who travel. One among the safety features is the air bag system which provides the occupants a soft cushioning and restrain during the crash event to prevent or reduce any impact or impact caused injuries between the flailing occupant and the interior of the vehicle.

Not only the safety measures but also the innovations came up implementing the healthcare and wellness features into car. Using this system we can monitor the internal environment using sensors like Humidity – Air Humidifier and Oxygen. There might some situations like heavy traffic jam during which the environment inside the car might get affected. We can control these situations by providing a healthy environment for the occupants in car. Even if there are any irregularities in health of the person who is driving can be known and necessary help can be provided. This can be achieved by using the sensors which monitor the health of the driver.

These sensors are attached to the Arduino board which analyses the data and transfer the information to the emergency help service or the relatives of

concerned person who require medical assistance. Using this system we can also provide the necessary information regarding the location of the car and details of the person who is driving the car. Along with the healthy environment we can keep track on the car. The GPS provides the route by which the car is traveling to the person in the car and also to the people with whom we want to share the information. If the persons who are travelling in car need any immediate help then based on the tracking information they would receive it.
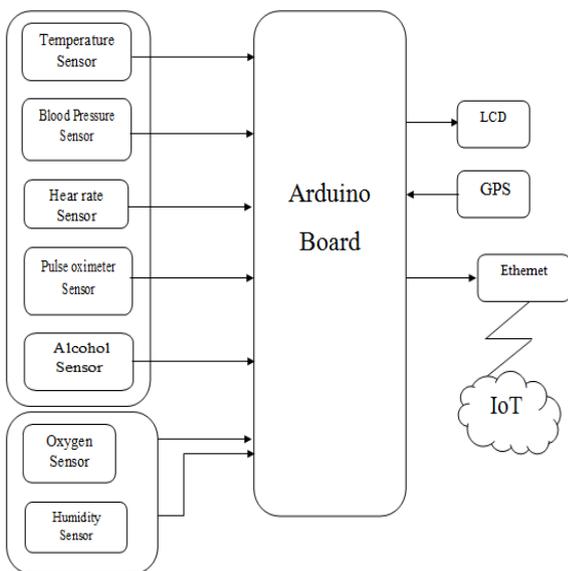
II. Block Diagram

Figure 1: Block Diagram

III. DESCRIPTION

A. ARDUINO:

Arduino is an open source microcontroller which can be easily programmed, erased and reprogrammed at any instant of time. Introduced in 2005 the Arduino platform was designed to provide an inexpensive and easy way for hobbyists, students and professionals to create devices that interact with their environment using sensors and actuators. It is also capable of receiving and sending information over the internet

with the help of various Arduino shields. Arduino uses a hardware known as the Arduino development board and software for developing the code known as the Arduino IDE (Integrated Development Environment). The hardware consists of a simple open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller. This development board can also be used to burn (upload) a new code to the board by simply using a USB cable to upload. The Arduino IDE provides a simplified integrated platform which can run on regular personal computers and allows users to write programs for Arduino using C or C++.

Types of Arduino Boards:

Arduino boards are available with many different types of built-in modules in it. Boards such as Arduino BT come with a built-in Bluetooth module, for wireless communication. These built-in modules can also be available separately which can then be interfaced (mounted) to it.

Figure 2: Arduino Board

B. SENSORS:

1) Heart Beat sensor:

The Heart Beat Sensor provides a simple way to study the heart's function. This sensor monitors the flow of blood through ear lobe. As the heart forces blood

through the blood vessels in the ear lobe, the amount of blood in the ear changes with time. The sensor shines a light lobe (small incandescent lamp) through the ear and measures the light that is transmitted. The clip can also be used on a fingertip or on the web of skin between the thumb and index finger. The signal is amplified, inverted and filtered, in the box. By graphing this signal, the heart rate can be determined, and some details of the pumping action of the heart can be seen on the graph. Blood flowing through the earlobe rises at the start of the heartbeat. This is caused by the contraction of the ventricles forcing blood into the arteries and by shutting of the heart value at the end of active phase.

2) Temperature sensor:

The temperature sensor in the circuit will read the temperature from the surroundings and shown the temperature in Celsius (degrees). The LM35 is a low voltage IC which uses approximately +5VDC of power. This is ideal because the Arduino's power pin gives out 5V of power. The IC has just 3 pins, 2 for the power supply and one for the analog output. The output pin provides an analog voltage output that is linearly proportional to the Celsius temperature. Pin 2 gives an output of 1millivolt per 0.1°C (10mV per degree).

3) Blood Pressure sensor:

The Blood   Pressure   Sensor is   a   non-invasive sensor designed   to   measure   human blood pressure. It measures systolic, diastolic and mean arterial pressure utilizing the oscillometric technique. Monitoring blood pressure at home is important for many people, especially if you have high blood pressure. Blood pressure does not stay the same all the time. It changes to meet your body's needs. It is affected by various factors including body position,

breathing or emotional state, exercise and sleep. It is best to measure blood pressure when you are relaxed and sitting or lying down.

4) Alcohol Sensor:

Alcohol sensor is suitable for detecting alcohol concentration on your breath, just like the common breathalyzer. MQ-3 is the alcohol gas sensor used. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple; all it needs is one resistor. A simple interface could be a 0-3.3V ADC.

Features:

- ➤ 5V DC or AC circuit
- ➤ Requires heater voltage
- ➤ Operation Temperature: -10 to 70 degrees C
- ➤ Heater consumption: less than 750mW* 16.8mm diameter
- ➤ 9.3 mm height without the pins

5) Humidity Sensor:

Humidity is the presence of water in air. The amount of water vapor in air can affect human comfort. The presence of water vapor also influences various physical, chemical, and biological processes. Humidity measurement is critical because it may affect the health and safety of the personnel. In medical applications, humidity control is required for respiratory equipments, sterilizers, incubators, pharmaceutical processing, and biological products. In many applications **humidity sensors** are employed to provide an indication of the moisture levels in the environment. Humidity measurement can be done using dry and wet bulb hygrometers, dew point hygrometers, and electronic hygrometers. There has been a surge in the demand of electronic hygrometers, often called humidity sensors.

Humidifiers can ease the problems caused by dry indoor air. This increases the comfort for the driver and the condition of mucosa.

6) Pulse Oximeter:

Pulse oximeter is used to measure the oxygen level in the blood. A clip on the finger measures the oxygen level using red and infrared light. The principle of pulse oximeter is based on the red and infrared light absorption characteristics of oxygenated and deoxygenated hemoglobin. Oxygenated hemoglobin absorbs more infrared light and allows more red light to pass through. Deoxygenated (or reduced) hemoglobin absorbs more red light and allows more infrared light to pass through. Red light is in the 600-750 nm wavelength light band. Infrared light is in the 850-1000 nm wavelength light band. People suffering from obstructive lung disease, asthma, heart failure or other diseases need this device to monitor their condition. It is a noninvasive method for monitoring a person's oxygen saturation (SO2). A pulse oximeter is a medical device that indirectly monitors the oxygen saturation of a patient's blood (as opposed to measuring oxygen saturation directly through a blood sample) and changes in blood volume in the skin, producing a photoplethysmogram. The oxygen level can be improved if it is not an optimum level which inturn enhances the overall well being.

7) Oxygen Sensor:

An oxygen sensor (or lambda sensor) is an electronic device that measures the proportion of oxygen (O2) in the gas being analysed or in ambient air. In most recent days due to pollution the oxygen levels are being decreased while the carbondioxide levels are increasing significantly. The most common application is to measure the exhaust gas concentration of oxygen for internal combustion engines in automobiles and other vehicles. Their structure is simple and reliable to use. They are cost effective and consume less power. Sometimes the person who is driving the car might feel sleepy or concentration might be decreased due the shortage of oxygen in vehicle thought to be one of the causes. In confined spaces, the levels of oxygen directly affect the persons inside, and have no open area, that is when travelling in a car while A/C is running. The oxygen content of atmosphere is about 21%. Oxygen deprivation also affects the functions of human brain.

8) Ethernet:

Ethernet is a family of computer networking technologies commonly used in local area networks (LAN); metropolitan area networks (MAN) and wide area networks (WAN).). Systems communicating over Ethernet divide a stream of data into shorter pieces called frames. Each frame contains source and destination addresses, and error-checking data so that damaged frames can be detected and discarded.

9) Graphics LCD:

Graphical LCD are different from the ordinary alphanumeric LCD, like 16x1 16x2 16x4 20x1 20x2 etc. They (ordinary) can print only characters or custom made characters. They have a fixed size for displaying a character normally 5x7 or 5x8 matrixes. Where as in graphical LCD we have 128x64=8192 dots each dot can be lit up as our wish or we can make pixels with 8 dots i.e. 8192/8=1024 pixels. We can design a character in a size which we need. We can make a picture on a graphical LCD as well. Graphical LCD is controlled by two KS0108 controllers. A single KS0108 controller is capable of controlling 40 characters. So for controlling a graphical LCD we need two KS0108 controllers. The 128x64 LCD is divided into two equal halves with each half being controlled

by a separate KS0108 controller. Such LCDs (using KS0108 controller) involve paging scheme, i.e., whole LCD is divided equally into pages.
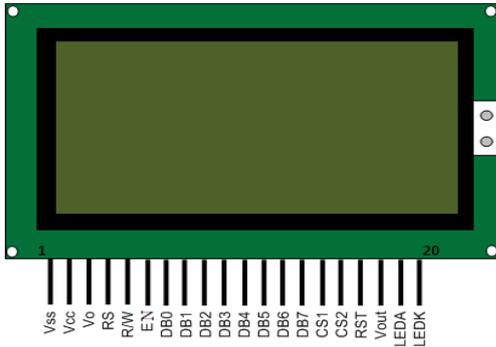

Figure 3: Graphics LCD

10) GPS:

Global Positioning System tracking is a method of working out exactly where something is. A GPS tracking system, for example, may be placed in a vehicle, on a cell phone, or on special GPS devices, which can either be a fixed or portable unit. GPS works by providing information on exact location. It can also track the movement of a vehicle or person. So, for example, a GPS tracking system can be used by a company to monitor the route and progress of a delivery truck, and by parents to check on the location of their child, or even to monitor high-valued assets in transit. A GPS tracking system uses the Global Navigation Satellite System (GNSS) network. This network incorporates a range of satellites that use microwave signals that are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of journey.

IV. IMPORTANT COMPONENTS

- Arduino Board
- Temperature Sensor
- Heart Rate Sensor
- Blood Pressure Sensor
- Alcohol Sensor
- Pulse Oximeter Sensor
- Oxygen Sensor
- Humidity Sensor
- GPS
- Graphics LCD

V. SOFTWARE TOOL

Arduino IDE (Integrated Development Environment):

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. A program written with the IDE for Arduino is called a sketch. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

VI. ADVANTAGES

By using this system we can maintain a healthy atmosphere inside the car.

- It keeps the person healthy and fit who is driving the car
- It is portable and cost effective
- This also provides medical assistance by transferring the information to the concerned people.
- It also provides the location of the car.

VII. APPLICATIONS

- This system can be used as an emergency kit in industries also.
- It can be used in homes, offices, schools etc

VIII. CONCLUSION

Monitoring the health of people regularly is the major concern at present. This was made easy by implementing health care system in almost all the fields like automotive field, industrial field, etc. Emergency medical services are also being provided when it is necessary for the people. Using this system the health of the car as well as the people in it can be enhanced. The sensors collects the information required to analyze and take proper action based on the result obtained. A healthy and comfortable environment can be provided to the people who travel a lot in car using this system and can track their location or provide the details of the route to the concerned people.

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