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AUTOMATIC DATA ANALYSIS FOR ACCIDENT AVOIDANCE USING EMBEDDED TECHNOLOGY

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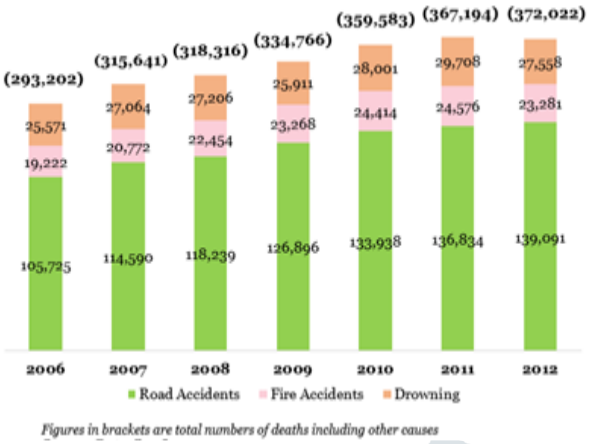
ABSTRACT

Now a days, the alarming rise of road accidents has become one of the major concerns. Unawareness and disrespect towards traffic rules, reckless driving, rapid growth of vehicles and theft etc can be identified as factors leading to this issue. The distress of the accident victims can be reduced if the detection of accidents can be done in no time. Often emergency supports can not be provided immediately due to unawareness of the accident to the concerned persons. On the other hand, vehicle theft has also become a common issue which everyone faces in insecure parking places. In this paper, an automated system has been proposed to deal with these affairs. Our proposed system will help the wretched victims by detecting and notifying the nearest necessary emergency supports, by controlling the speed of the vehicles in accident zones, notify the person driving the vehicle with the alcohol consumption range whether it is safe to drive and vibration sensors to detect the vibrabrations and the camera to detect and monitor the whole of the accident which can be later used for the insurance claiming purpose and which also acts as an evidence. Therefore, our cost effective proposed system will be efficacious for a developing country to diminish the distress of the people and to reduce the impact of the accidents occurring.

INTRODUCTION

A 80% of road accidents are caused by human error say senior police officials, according to a news report.



Statistics report on total number of road accidents

At present accidents are mostly occurs due to rash driving and over speed in road.The accidents rates are increasing year to year by more vehicles on to ground.. We go for IR module again there is a draw back in using this it works under line of sight so finally decided to use RF. RF transmitter is in the road zone areas and receiver is placed in the vehicle. Then it transfers the information to the controller. The current speed will be monitored by the separate module or by the use of ultrasonic sensor that also sends information to controller. The controller compares both speed and the driver does not decreases the speed the control transfers automatically but the driver again operate it manually and exceeds the limited speed means the information transferred to the nearest police station. The information contains the current speed and registration number of the vehicle. The controller transmits the information with the help of GSM module. Then the penalty amount is paid by the owner.

An engine control unit (ECU) is a type of electronic control unit that controls a series of actuators on an internal combustion engine to ensure optimal engine performance. It does this by reading values from a multitude of sensors within the engine bay, interpreting the data using multidimensional performance maps (called lookup tables), and adjusting the engine actuators accordingly. Functions of an ECU:

1. Control of Air/Fuel Ratio
2. Control of ignition timing
3. Control of idle speed
4. Control of variable valve timing

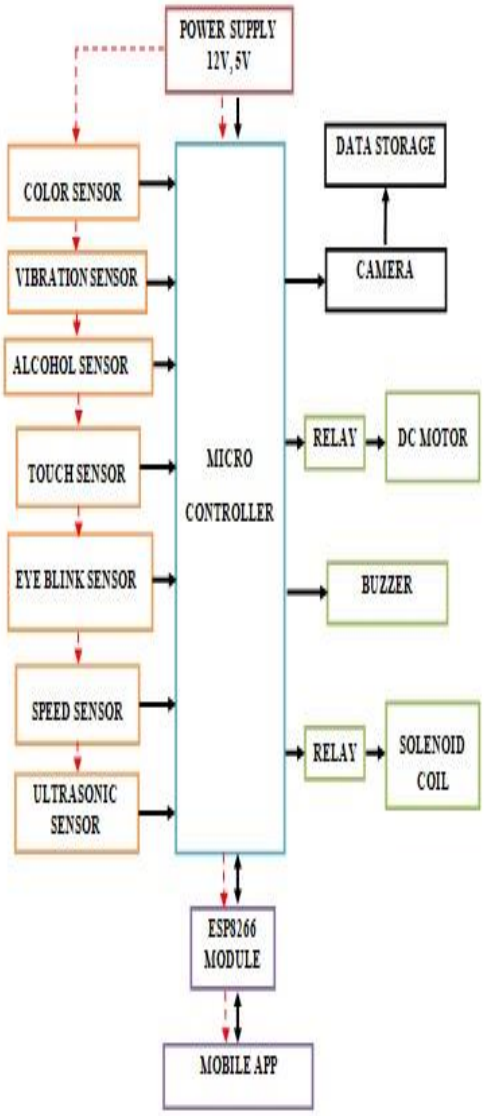
A special category of ECUs are those which are programmable.

A prime example of driver assistance systems is cruise control, which has the capability of maintaining a constant user pre set speed and its evolution, the adaptive cruise control (ACC), which adds to CC the capability of keeping a safe distance from the preceding vehicle .A drawback of these systems is that they are not independently capable of distinguishing between straight and curved parts of the road, where the speed has to be lowered to avoid accidents.

accidents, etc.), which would need the use of dynamically generated digital maps. The aim of this research is to maintain the speed control over restricted area like (schools, hospitals, colleges etc.,) by using GPS technology.

Nowadays operating system is not only on desktops but is available on handheld mobile devices also. Google has come out with the new open, and comprehensive platform for mobile devices called Android. The platform provided by Google comprises of operating system, middleware, user interface, and applications. This concept of “Black Box” was previously used in airplanes. We are trying to implement a homogenous concept for vehicles which help us to mitigate or forestall accidents. The previously proposed models of Black Box integrated with complex hardware, which we have replaced with Android Smartphone, which obviates the need for complex hardware design and provides high functionality. Also a significant number of vehicles currently on the roads contain electronic systems that record in the event of a crash. That is why it is so important to have recorders that objectively track what goes on in vehicles before, during and after a crash as a complement to the was used. Subjective input that is taken usually from victims, eye witnesses and police reports. This system is mainly committed to two sections. The first one is how to detect and collect the information from the vehicle. The second is how to present the data to the user in a simplified way. To implement the first section many components and various types of sensors are used. While the second section was implementing by using the Embedded C programming. This programming helps in not only recording the data but also retrieving the data from microcontroller memory to an LCD to display it. In the event of accident, if any injury happened to the car driver or passengers so maybe there will be loss of lives due to delay in medical help. Keeping this idea in our mind, we are proposing a system where car itself intimates the concern emergency service for immediate reaction in case of accident or any emergency situation. After the accident, this wireless device will send mobile phone short message indicating the position of vehicle by GPS system to family members, nearest police station and hospitals. The emergency medical service (EMS) is provided to the driver. The threshold algorithm is used to determine speed of motorcycle and fall or accident in real-time. The project works satisfactorily in real time, can locate the vehicle travel locations in the form of longitude, latitude with the margin of error not more than 6 meters from the actual location. This system also logs the information like speed, maximum speed and distance information of the vehicle.

METHODOLOGY



BLOCK DIAGRAM

Block diagram

WORKING:

Car Black Box is an Android Application, which can run on the Android phone.

When the application starts, it asks for user login. The user has to enter his login credentials provided by the Admin, then the login credentials entered by the user are verified, and the user is now authorized to use the application.

Once the user is permitted the Video Recording, and Speed Tracking get started immediately. Video recording is done using the rear camera of the Android Phone and after every specific interval (approx. 2mins) the video is split and stored on the Storage of the Android Phone so that we get each video of duration 2mins, this help to upload more videos on cloud storage with faster speed.

Contacts specified by the user are sent Emergency/Alert message when the user clicks on the Alert Button in the application.

In case if any accident occurs and the user in unable to press the alert button, even then the car can be tracked down using the Android Device Manager on the Android Phone.

When the accident occurs, the videos and the approximate speed of the car at a particular time and location can be viewed to find out the reason for the crash took place.

COMPONENTS AND OPERATION

MICROCONTROLLER:

The Microcontroller or the processing module is an interfacing and controlling module, that interfaces the various peripherals and other modules used in the circuit.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Power:

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

Memory:

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output:

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions.

Communication:

A ‗Software Serial' library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

Programming:

The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials.

The ATmega328 on the Arduino Uno comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).

You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details.

The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available.

The ATmega16U2/8U2 is loaded with a DFU bootloader, which can be activated by:

On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.

On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

POWER SUPPLY:

Voltage Regulators (7805, 7809, 7812):

A voltage regulator is designed to automatically maintain a constant voltage level.

HERE we use 3 types of voltage regulators of lm78XX series such as 7805,7809 and 7812.

The LM78XX series of three terminal positive regulators are available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications.

Diodes:

In electronics a diode is a two-terminal electronic component with asymmetric conductance. It has low (ideally zero) resistance to current flow in one direction and high (ideally infinite) resistance in the other. A semiconductor diode, the most common type today is a crystalline piece of semiconductor material with a p–n junction connected to two electrical terminals. A vacuum tube diode has two electrodes, a plate (anode) and heated cathode. Semiconductor diodes were the first semiconductor electronic devices.

Resistors:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment.

Light Emitting Diodes (LED):

A light-emitting diode (LED) is a semiconductor light source.

Electrolytic Capacitor:

An electrolytic capacitor is a capacitor that uses an electrolyte (an ionic conducting liquid) as one of its plates to achieve a larger capacitance per unit volume than other types, but with performance disadvantages

Electrolytic Capacitors (200V, 1000□F) is used here.

LIQUID CRYSTAL DISPLAY (LCD)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

Relay Module:

The relay module comprises of eight electro-magnetic relays which are controlled by the outputs on the digital pins of the Arduino microcontroller. The relays are used to switch on the required number of capacitors as required for power factor correction.

Relay Driver:

The ULN2001A, ULN2002A, ULN2003A and ULN2004A are high voltage, high current Darlington arrays each containing seven open collector Darlington pairs with common emitters.

Relay Operation:

The relays used in the control circuit are high-quality Single Pole-Double Throw (SPDT), sealed 12V Sugar Cube Relays. These relays operate by virtue of an electromagnetic field generated in a solenoid as current is made to flow in its winding.

ULTRASONIC MODULE

It emits an ultrasound at 40 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance.

ALCOHOL SENSOR

An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers.

COLOR SENSOR:

The type of photodiode (blue, green, red, or clear) used by the device is controlled by two logic inputs, S2 and S3.

For **Ret** photodiode both **S2 and S3** are **Low**

For **Blue** photodiode **S2-Low** and **S3-High**

For **Green** both **S2 and S3** are **High**

When **S2-High** and **S3-Low**,none of the filter is selected.

VIBRATION SENSOR:

This sensor module produce logic states depends on vibration and external force applied on it. When there is no vibration this module gives logic LOW output. When it feels vibration then output of this module goes to logic HIGH. The working bias of this circuit is between 3.3V to 5V DC.

CAPACITIVE TOUCH SENSOR:

The method of measurement of capacitance in touch sensors requires a reference plane located near by the sensing pad. In capacitive touch sensors, a finger trip forms the capacitance between the sensing electrode and reference plane.

The skin oils or sweat from human body may cause a false trigger.To distinguish between intended and false touches, additional sensing pads or software algorithms are used.

INFRARED SENSOR:

Infrared technology addresses a wide variety of wireless applications. The main areas are sensing and remote controls. The basic concept of an Infrared Sensor which is used as Obstacle detector is to transmit an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver.

IR Transmitter

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations.

IR Receiver

Infrared receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors.

EYE BLINK SENSOR

This Eye Blink sensor senses the eyeblink using infrared. The Variation Across the eye will vary as per eye blink. If the eye is closed the output is high otherwise the output is low. Eye Blink Sensor EYE Sensor kit 3-pin female header. This can be easily read by microcontroller to automate alert mechanism.

ESP8266 MODULE:

ESP8266 module is low cost standalone wireless transceiver that can be used for end-point IoT developments.

To communicate with the ESP8266 module, microcontroller needs to use set of AT commands. Microcontroller communicates with ESP8266-01 module using UART having specified Baud rate.

100 RPM GEARED MOTOR

A gear motor is a specific type of electrical motor that is designed to produce high torque while maintaining a low horsepower, or low speed, motor output. Gear motors are commonly used in devices such as can openers, garage door openers, washing machine time control knobs and even electric alarm clocks

GEAR MOTORS AND INCREASED FORCE

Gear motors are commonly used in commercial applications where a piece of equipment needs to be able to exert a high amount of force in order to move a very heavy object.

FOUR WHEEL DRIVE ROBOT CHASSIS :

SPECIFICATIONS:

Chassis Length: 12inch

Chassis Width: 10.5inch

Chassis Height: 2.5inch

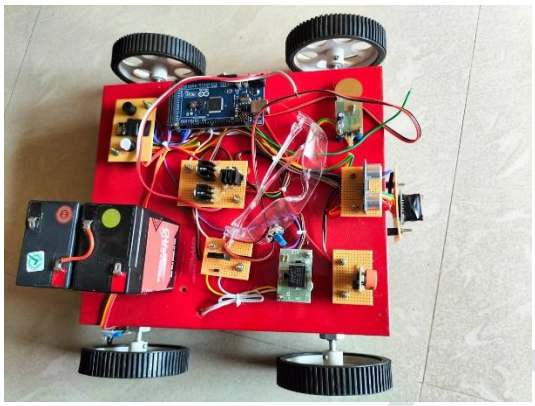
Material: MS

70mm Diameter x 19mm Thick x 6mm Bore Wheel.

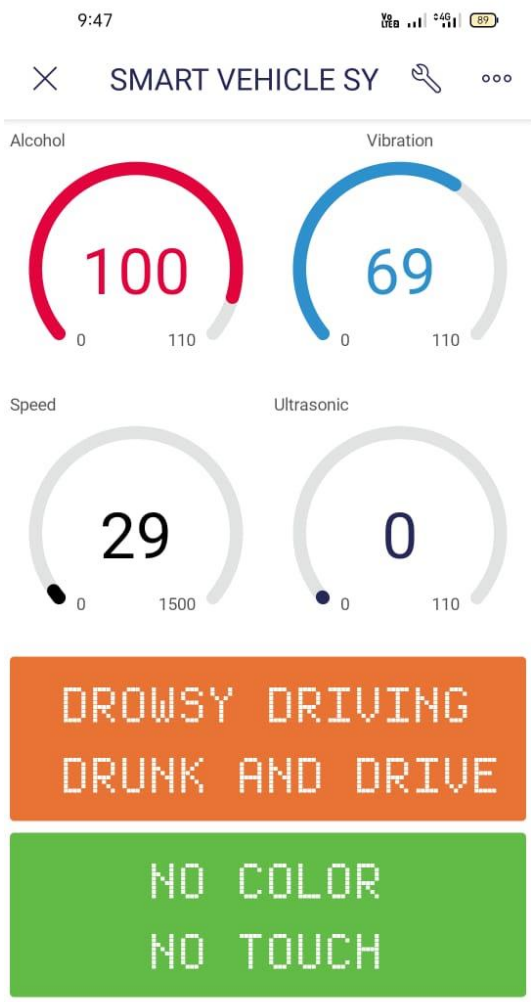
12V 4.3AH SEALED LEAD ACID BATTERY

The 'Online' range of sealed lead acid batteries are maintenance free, valve regulated and leak proof ideally suited to all 'standby applications' There will be no loss in power output over the battery life.Wide operating temperature range operating between -15° C to +50 ° C when fully charged.

HARDWARE MODEL



OUTPUT



CONCLUSION

Accident detection operation is not an easy task to handle; it can be an extremely complicated process when it comes to real time applications, which is the main reason why it is not implemented yet on a large scale. The proposed system will help to improve the present scenarios

In this paper, we present the design of Embedded controller for Car Black Box. We made a System on Chip design for Car Black Box through integrating and verifying controller and other components. The design result for Car Black Box system IC is implemented and is verified in the test board system for demonstration.This paper has presented a new vision for the vehicles industry, which is the Black Box system used for vehicles. A full and detailed description was made for every part of this system. This paper has also offered a user friendly embedded program to analyze the data of the accident. The Black Box system built can be implemented in any vehicle. As soon as the driver runs the motor, this system will begin saving the events of the corresponding vehicle. The last are always saved in the EEPROM of the Black Box, and in case of an accident, an additional 10 seconds of events after this accident will be saved. The data saved can be retrieved only after the accident for privacy purposes. Using serial transmission the EEPROM and display it to the user. In addition, a detailed report will be given to the user containing the recorded data in the memory. The objectives of the project i.e., Speed, vibration, drunk and drive, drowsiness and Maximum Speed of the Vehicle has been accomplished and tested in real time.

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