BLACK BOX SYSTEM FOR VEHICLES

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Abstract: Automobiles and computing technologies have created a new level of data services in vehicles. The Automobile Black Box has functions very similar to an airplane black box. It is used to analyze the cause of vehicular accidents and to prevent the loss of life and property arising from the vehicle accidents. This project proposes a prototype of an Automobile Black Box System that can be installed into vehicles. The system aims to achieve accident analysis by objectively tracking what occurs inside the vehicles. The system also involves enhancement of security by preventing tampering of the recorder data. The Arduino controllers are used to regulate the sensors. The main purpose of this project is to develop a prototype of the vehicle black box system that can be installed into any vehicle all over the world. This prototype are often designed with minimum number of circuits. This results in constructing safer vehicles, improving the treatment of crash victims, helping insurance companies with their vehicle crash investigations, and enhancing road status so on decrease the death rate..

This project discusses the configuration and functions of the Car Black Box System. It also focuses on monitoring of real-time driving and also records and saves the monitored data for further investigation in the case of an accident. This system helps the accident investigators as well as insurance companies to find out the cause of the crash. Other features such as navigation, speed tracking and Alcohol detection are also provided in the system. The perspective of this project is to form the user feel more safety about the car and to assist knowing the particular explanation for accidents if any.

1. Introduction

According to the WHO which is the World Health Organisation, more than a million people in the world die each year because of transportation-related accidents. In order to react to this situation, the black box system helps to solve this problem that crosses national boundaries and threatens the safety and health of people worldwide. In addition to improving the treatment of crash victims and therefore the road status so as to decrease the death rate, constructing safer vehicles, and helping insurance companies with their vehicle accidents investigations, the most purpose of this paper is to develop a recorder system which will be installed to any vehicle everywhere the planet. Like flight data recorders in aircraft, “black box” technology can now play a key role in automobile crash investigations. A significant number of vehicles currently on the roads contain electronic systems that record information within the event of a crash. Hence, 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 subjective input that is taken usually from victims, eye witnesses and police reports. This system is committed mainly to two approaches. The first is how to detect and record data from the vehicle. The second is how to present the data recorded to the user in a simplified way. To implement the primary approach, some major components and different sort of sensors were used. The second approach was implemented using a computer program. This program receives the info serially from the recorder memory. In order to understand what sort of sensors should be installed into the vehicle, research was administered to spot the most information needed for better accident analysis. After filtering the information and taking into consideration what could be done and what could help the most, the data shall be found to be the most important ones needed after an accident.

The purpose of using the black boxes in the car can be many but what we are trying to implement here and show is quite a few of them. The black boxes in the car could be used to improve road safety to a great extent. This is a current technology to monitor and educate all the drivers everywhere at all times. The main purpose of having a black box installed in the car is to get various types of information if in any case any mishap has occurred. In case of any accidents we show that the black box is capable of calculating and informing certain parameters that are further discussed and explained.

In this project, we have proposed the GPS (Global Positioning System) for driver assistance and car surveillance. Accelerometer and GPS tracking system is developed for monitor the accident. The system consists of cooperative components GPS device. The threshold algorithm is employed to work out speed of motorbike 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 and latitude. This system also logs the information like speed, maximum speed and distance information of the vehicle. The objectives of this project are as follows.

1. Speed of the Automobile.

2. To know the GPS Co ordinates

3. Alcohol Detection

4. Voice Recording and Playback

5. 3-axis tilting values

The Car black box is an electronic device, it is useful in storing and recording vehicle speed and vehicle's other status information. This is very helpful to discover and to analyze the reason of an accident easily. The aim is develop and implement the concept of Black Box for vehicles by using Microcontroller along with a number of physical parameter monitoring sensors in the project

2. Block diagram

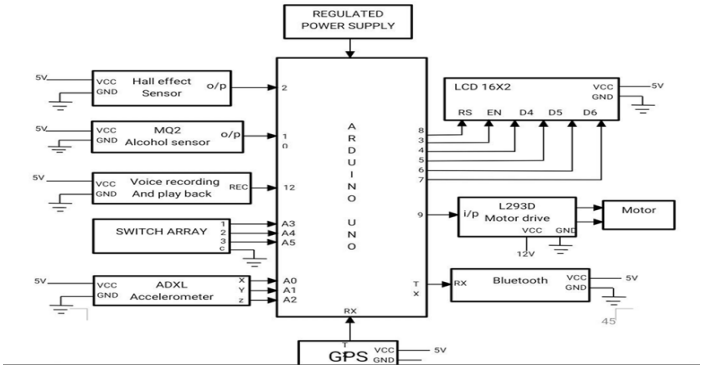


Figure Block diagram

3. Description

This Paper is framed as shown in block diagram. The present concept relates, in general, to a black box system for a vehicle, in which the circumstances after a vehicle accident are reliably recorded, thereby enabling objective and accurate determination of the causes of a vehicle accident, and, more particularly, to a black box system for a vehicle which is capable of significantly improving the accuracy of detection of accidents and the stability of accident recording data. This black box will be used to analyze the causes of a vehicle accident using various kinds of sensors .The system uses external sensors such as the Hall Effect Sensors and Global Positioning System (GPS) to collect data. The black box is meant to provide accurate information about the cause of the crash

4. Hardware

The hardware parts of the Black Box System is affordable and easily available on online and in Electronics Shop. Here a little description is given .

The Arduino Uno could even be a microcontroller board supported the ATmega328. Its 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, an influence jack, an ICSP header, and a push. It contains everything needed to support the microcontroller. Connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to urge started. The Uno differs from all preceding boards therein it doesn't use the FTDI USB-to-serial driver chip. Instead, this features the Atmega16U2 programmed as a USB- to-serial converter. Revision 2 of the Uno features a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has subsequent new features:1.0 pinout: added SDA and SCL pins that are almost the AREF pin and two other new pins placed almost the RESET pin, the IOREF that adapt to the voltage provided from the board. In future, shields are getting to be compatible both with the board that use the AVR, which operate with 5V and with the Arduino.

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins are 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin:50 mA
- Flash Memory:32 KB (ATmega328) of which 0.5 KB employed by bootloader

LIQUID CRYSTAL DISPLAY

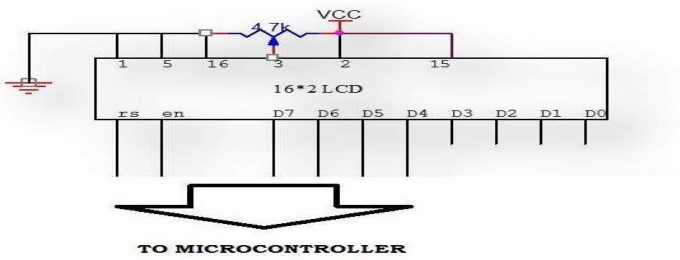


Figure Lcd

LCD (Liquid Crystal Display) screen is an electronic display module and find a good range of applications. A 16x2 LCD display is extremely basic module and is extremely commonly utilized in various devices and circuits. These modules are over seven segments and other segment LEDs. The reasons are: LCDs are economical; it is easily programmable; haven't any limitation of displaying special & even custom characters (unlike in seven segments), animations

REGULATED POWER SUPPLY

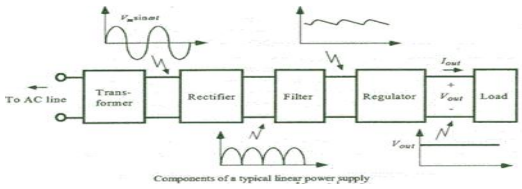
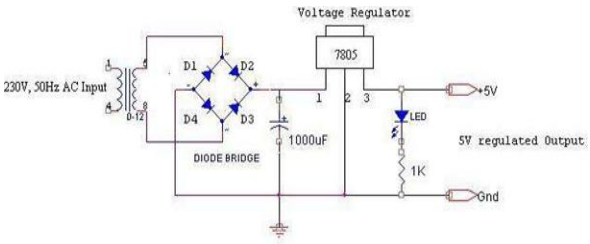


Figure Regulated power supply



Regulated power supply is the main component of electrical, electronics and as well as automation equipment. Mobile phone charger, oscillator, amplifier are needed the regulated power supply.

GLOBAL POSITIONING SYSTEM

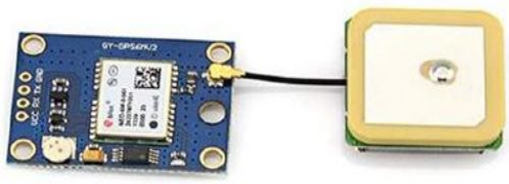
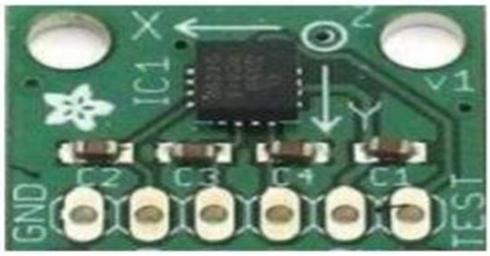


Figure NEO6M GPS Module with EEPROM, Battery & Patch Antenna

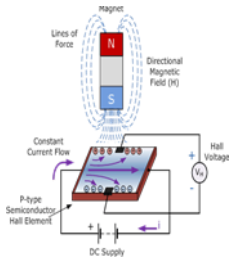
The GPS satellites continuously transmit data about their current time and position. A GPS receiver monitors multiple satellites and solves the equations to determine the precise position of the receiver and its deviation from true time. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities (three position coordinates and clock deviation from satellite time).

ACCELEROMETER ADXL335



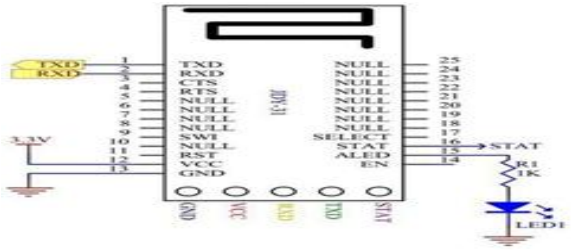
The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full scale range of +/-3 g. It can measure the static acceleration of gravity in tilt sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The features include 3-axis sensing, Low power - 350 ua (typical), Single-supply operation 1. 8v to 3. 6v (built in regulator on the pcb for the input of 5v). Analog data output. 10,000 g shock survival. Excellent temperature stability. Bandwidth adjustment with a single capacitor per axis.

HALL EFFECT SENSOR



A hall effect is a transducer that varies its output voltage in response to a magnetic field. Hall Effect sensors are used for proximity switching, positioning, speed detection, and current sensing applications. Hall sensors are commonly used to time the speed of wheels and shafts, such as for internal combustion engine ignition timing, tachometers and anti-lock braking systems. They are used in brushless DC electric motors to detect the position of the permanent magnet. In the pictured wheel with two equally spaced magnets, the voltage from the sensor will peak twice for each revolution. This arrangement is commonly used to regulate the speed of disk drives.

JDY-31 BLUETOOTH MODULE



JDY-31 Bluetooth is based on Bluetooth 3.0 SPP design, which can support Windows, Linux, android data transmission, working frequency band 2.4GHZ, modulation mode GFSK, maximum transmission power 8db, maximum transmission distance 30 meters, support users to modify device name through AT command The baud rate and other instructions are convenient and quick to use.

L293D Motor Driver

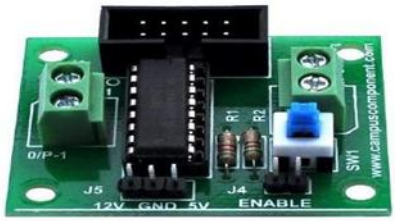


Figure Motor driver

The L293D motor driver is available for providing User with ease and user friendly interfacing for embedded application. L293D motor driver is mounted on a good quality, single sided non-PTH PCB. The pins of L293D motor driver IC are connected to connectors for easy access to the driver IC's pin functions. The L293D is a Dual Full Bridge driver that can drive up to 1Amp per bridge with supply voltage up to 24V. It can drive two DC motors, relays, solenoids, etc. The device is TTL compatible. Two H bridges of L293D can be connected in parallel to increase its current capacity to 2 Amp**.**

FRC Cable:

Two FRC Connectors can be connected with the help of FRC cable. FRC cable has following pin configuration

APR

Operating Voltage Range: 3V ~ 6.5V

No External ICs Required

680 sVoice Recording Length in APR33A3

Powerful 16-Bits Digital Audio Processor.

No Battery Backup Required

Very Low Standby Current: 1uA

High Quality Line Receiver

High Quality Analog to Digital and PWM module

APR VOICE RECORDER PLAYBACK

Today's consumers demand the best in audio/voice. They want crystal-clear sound wherever they are in whatever format they want to use. The aPR33A series is a powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series is a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series has all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

The APR33A series is specially designed for simple CPU interface, user can record or playback up to 1024 voices by 5 I/Os only. This mode built in one complete memory-management system. The control side doesn't need to be burdened complicated memory distribution problems and it

only needs to be through a simple instruction to proceed the audio/voice recording & playback so it largely shorten the developing time. Meanwhile, the chip provides the power-management system too. Users can let the chip enter power-down mode when unused. It can effectively reduce electric current consuming to 15uA and increase the using time in any projects powered by batteries.

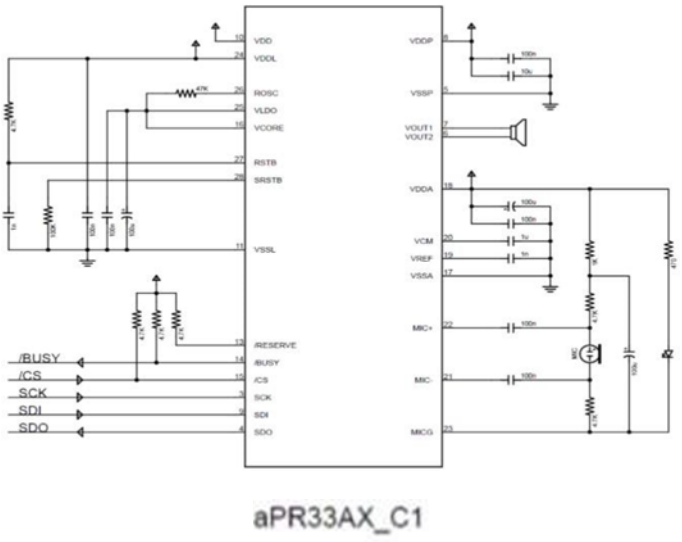


Figure Connection diagram

5. Result

All the hardware components used in the integrated system for the project "BLACKBOX FOR VEHICLES" have been developed. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. The objectives of the project that is the Speed, the position of the vehicle where the accident has taken place and check if alcohol was present or absent during the time of accident.

This Car Black Box Application aims to help Accident Investigators and Insurance Companies to perceive the cause of the accident; this should help investigators to speed up their investigation process and provide fast results. After the accident is occurred then every details of sensor is calculated and stored in memory. These values are very useful to know How the accident is occurred. The proposed system would serve as an effective source of information at the event of an accident. When any type of accident occurs due to any reason, the vehicle's black box provides necessary information and the data to generate the report of accident and about its causes. This project has offered a user friendly program to analyze the data of the accident and this can be implemented on any vehicle.

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