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Intelligent Vehicle Monitoring of Driver's Habits

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ABSTRACT: Vehicle collisions are occurring mainly because of the driver's habits. Drunk and drive is most important factor for accidents. In all time traffic police are not monitor. Many of them are violating traffic rules this will occur many accidents. The main objective of this paper is to develop an effective safety system by focusing on the driver's behaviour and their environment. In this paper monitor and control the activity of driver consumes alcohol and to maintain distance between the vehicle to vehicle. In vehicle unit ARM 7 processor, ultrasonic obstacle sensor, alcohol sensor and GSM (global system for mobile communication) are connected. Another GSM is used in the control room. Each sensor detects the operation then it will intimate to the driver three times then controlled by using ABS it will send to the GSM. It will be send to the control room along with the vehicle number.

KEYWORDS: Obstacle Detection; Alcohol Detection; ABS; GSM Modem.

I. INTRODUCTION

Driving is a compulsory activity for most people. People use their car to move from one place to other place. The number of vehicle is increasing day by day. Proportionally the numbers of accidents are also increasing. Nowadays, the numbers of accident is so high and uncertainly. Accident will occur every time and everywhere and cause worst damage, serious injury and dead. These accidents are mostly caused by the delay of the driver to hit the brake. We have to take measures to reduce these accidents carefully and also without any problems. Vehicle collisions are occurs due to the driver didn't obey the traffic rules. Many of them are violating traffic rules these are the main thing to occur an accident. Driver habits are more than 50% accidents are occur. Generally traffic police are monitor, the driver who doesn't follow the rules. The traffic police can't see in long distance and even a heavy traffic. The working of our project is to monitor the driver who violating the rules. This feature is very useful in the safety applications. This decreases several problems in automotive fields. The working of our project is divided into following sections.

A. GSM modem: GSM modem receives trigger pulse from the sensors. It transmits messages to police control room for detecting the situations. It is controlled by ARM processor.

B. Alcohol sensor: The driver consumes alcohol while driving it will detect by the sensor then give a chance to stop the vehicle. Until they won't stop the intimation of the message will transmit to the cops through the wireless protocol.

C. Obstacle sensor: The sensor is used to detecting insufficient following distance from one vehicle to another. If the driver enters the limit to collide another one then activates ABS. It will control the accident.

D. ABS (antilock brake system): ABS works with regular braking system by automatically pumping them. In vehicles not equipped with ABS, the driver has to manually pump the brakes to prevent wheel lockup. In vehicles equipped with ABS, your foot should remain firmly planted on the brake pedal, while ABS pumps the brakes for you so you can concentrate on steering to safety. This term of applying brake system is used for each situations are controlled.

II. GENERAL TERMINOLOGY

A. Vehicle unit: The vehicle unit is to detect the operations of the driver consume alcohol and insufficient following distance. If the embedded unit detects then activate the ABS through the ARM.

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B. Control room unit: A control room is a centre which monitors the traffic. Control section having a GSM to getting a SMS. If any other activity which takes on the road while driving.

C. ARM processor: ARM processor is a heart function of the system. It is a single chip which connects all the terminals which is used in the project.

D. SMS: Short message service (SMS) is a communication of sending a short text messages to the mobile telephone device.

E. GSM: Global system for mobile communication (GSM) is the most used communication for mobile phones in the world. It will communicate through SMS.

F. AT commands: AT commands are the instructions used to control a modem. These commands are started with "AT" or "at". AT abbreviation is Attention.

III. RELATED WORK

The following are the approaches followed today regarding [1] and [2] consume alcohol while driving and insufficient following distance. This will prevent the accidents. The intimation will be send to the cops by SMS. The cops will be monitor the law breakers would be penalized.

IV. PROPOSED SYSTEM

The architecture of the proposed system is shown in Fig1.

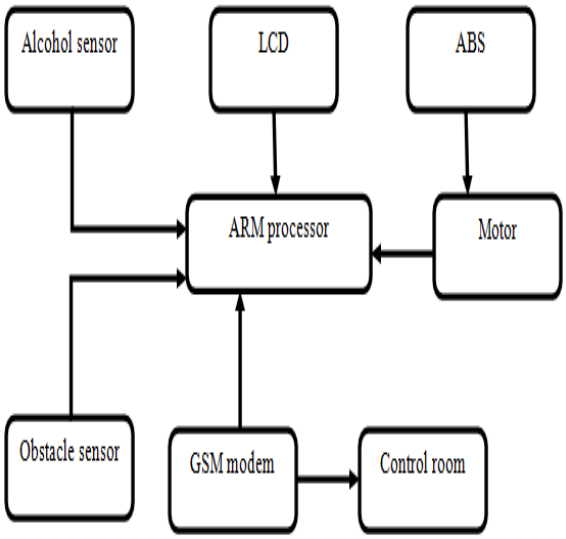

Fig. 1 The proposed architecture

It detects and control the activity of driver consumes alcohol while driving and insufficient following distance. It prevents them from diverting their concentration on the road, thus avoiding many accidents which take place due to the activity of the driver. The alcohol sensor detects the alcohol within a radius of 0.5m with the help of the voltage fluctuation in the signal. The ultrasonic obstacle sensor is used to detect the obstacle or person within the limitation of 10m if the vehicle enters the limit it will slow down by applying the brake gradually decreasing the speed. This device turns on the GSM modem and it will send the message to the control room section.

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The vehicle unit of the ARM board must be installed in the driver's door in a secure location. It provides us with the following advantages:

- It enables us to detect the alcohol when the drivers consume alcohol while driving.
- Distance between the vehicle to vehicle limitations is maintained.
- The ultrasonic sensor is used in the Automatic car parking system
- It has to send the message to the control.
- It will indicate the activity of driver is to display on the LCD and glow of LED in the vehicle unit.

A. ARM 7 PROCESSOR: LPC2148 microcontroller board based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontrollers with embedded high-speed flash memory ranging from 32 kobo to 512 kobo. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30% with minimal performance penalty. The meaning of LPC is Low Power Low Cost microcontroller. This is 32 bit microcontroller manufactured by Philips semiconductors. Due to their tiny size and low power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. It provides the following features: one or two 10 bit ADCs provide 6/14 analog inputs, single 10 bit DAC, two 32 bit timers/counters, on-chip oscillator and 60 MHz CPU clock.

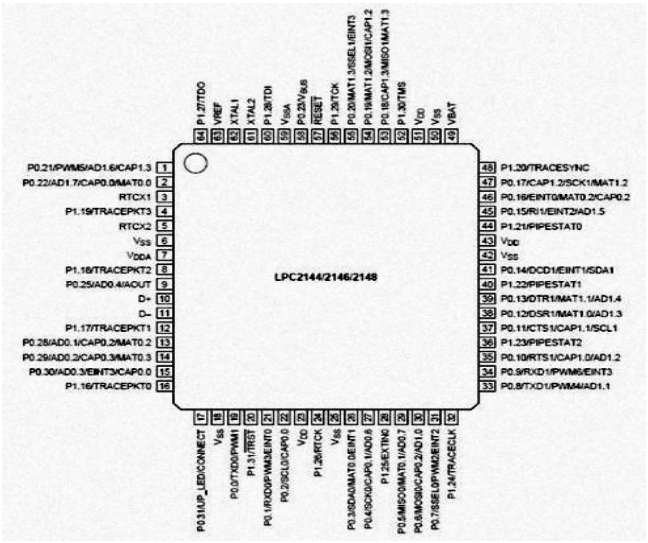

Fig. 2 Pin diagram of LPC 2148

B. GSM modem: A GSM Modem [4] is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card/PCMCIA Card. Typically, an external GSM Modem is connected to a computer through a serial cable or a USB Cable. A GSM Modem in the form of a PC Card/PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card/PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM Modem requires a SIM Card from a wireless carrier in order to operate. Both GSM Modems and dial-up Modems support a common set of standard AT commands. You can use a GSM Modem just like a dial-up Modem. In addition to the standard AT commands, GSM Modems support an extended AT commands are defined in the GSM standards.

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C. AT commands: AT commands [4] are instructions used to control a modem. AT is the abbreviation of Attention. Every command line starts with "AT" or "at". That's why modem commands are called AT commands. Many of the commands that are used to control wired dial-up modems, such as ATD (Dial), ATA (Answer). ATH (Hook Control) and ATO (Return to online data state), are also supported by GSM/GPRS Modems and mobile phones. Besides this common AT command set, GSM/GPRS Modems and mobile phones support an AT command set that is specific to the GSM technology, which includes SMS-related commands like AT+CMGS (Send SMS message), AT+CMSS (Send SMS message from storage), AT+CMGL (List SMS messages) and AT+CMGR (Read SMS messages). Note that the starting "AT" is the prefix that informs the modem about the start of a command line. It is not part of the AT command name.

D. Obstacle detection: The HC-SR04 ultrasonic sensor [3] uses sonar to determine distance to an object like bats or dolphins do. It offers excellent range accuracy and stable readings in an easy-to-use package. It operation is not affected by sunlight or black material like Sharp rangefinders are (although acoustically soft materials like cloth can be difficult to detect). Similar in performance to the SRF005 but with the low-price of Sharp infrared sensor. The specification of the sensor is given below:

- Power Supply : 5V DC
- Quiescent Current : <2mA
- Ranging Distance : 2cm – 500 cm/1″ – 16ft
- Resolution : 0.3 cm
- Price : approx. 6 $

E. Alcohol detection: MQ-3 gas sensor has high sensitivity to Alcohol, and has good resistance to disturb of gasoline, smoke and vapor. The sensor could be used to detect alcohol with different concentration; it is with low cost and suitable for different application. Also it has Long life and low cost and simple drive circuit.

V. WORKING OF THE SYSTEM

A. GSM communication: GSM Modem [6] sends the message as "THE DRIVER IS CONSUME ALCOHOL WHILE DRIVING" when alcohol is detected by the sensor and also send the message as "OBSTACLE DETECTED" when the ultrasonic sensor detects an obstacle within the limit along with the "VEHICLE NUMBER PLATE" to the control room of the cops using AT commands as AT commands +CMGS can be used to send SMS messages from a computer / PC AT+CMGS="9135792"<CR> Sending text messages is easy. <Ctrl+z>.GSM Modem is controlled by using Microcontroller which is interfaced with RS-232. RS-232 and Microcontroller is interfaced using MAX-232.

B. Insufficient following distance: The system consists of an [7] ultrasonic sensor that detects the distance to the target vehicle. For this system, two car models are represented. The sensor fulfils the tasks of headway control and obstacle detection. One car will be equipped with an ultrasonic sensor which will continuously compare the distance given by the ultrasonic sensor. If the next car is a safe distance then car will keep going at the same speed.

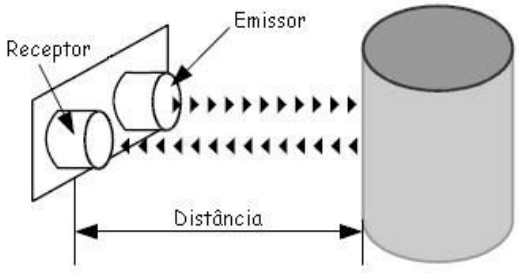

Fig. 3 Principle of ultrasonic sensor

The IC U1 is a 555 timer in astable configuration to oscillate at 40 KHz. Instead of using exact values for the two resistors that is placed between pin 6 and 7, a 10KΩ potentiometer (VR1) was used. This also allows for some fine

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tuning of the output frequency. The output (pin 3) is then attached to a 40 KHz ultrasonic transmitter (UTR1). The receiving circuit is a dual LM358N (U2) op-amp. An ultrasonic receiver (UTR2) is connected to pin 3, the non-inverting input of U2a which is a non-inverting amplifier with a gain of 220. The output of U2a is put through a low pass filter via D1, C3 and R4 to produce a somewhat stable DC voltage.

This DC voltage is fed into the non-inverting input of U2b configured as a non-inverting comparator. Sensitivity of U2b is controlled by VR2 to set the threshold trigger value. The output of U2b is connected through R5 to the base of a bipolar 2N2222 transistor (Q1) acting as an inverter with a LED (LED1) to indicate if an obstacle has been detected. Finally, the collector of Q1 goes to the Handy Board's digital port (Handy Board uses inverted logic levels, 0V is a logic 1 and +5V is a logic 0). The following is the procedure to calibrate the circuit without the use of an oscilloscope:

- Adjust VR1 till the value between Vcc and pin 7 is approximately 1.2K Ω.
- Place UTR1 and UTR2 parallel to each other (about 1.5 inches apart) with a solid object about 6 inches in front of them (similar to figures UTR1 and UTR2 in the above schematic).
- If LED1 is off, turn VR2 CW till LED1 is on and then back off a bit till it is just off. If LED1 is on, turn VR2 CCW till LED1 is just off.
- Adjust VR1 (should only be about 1/4 turn CW or CCW) till LED1 turns on.
- Repeat steps 3) and 4) as needed for optimal distance and sensitivities.

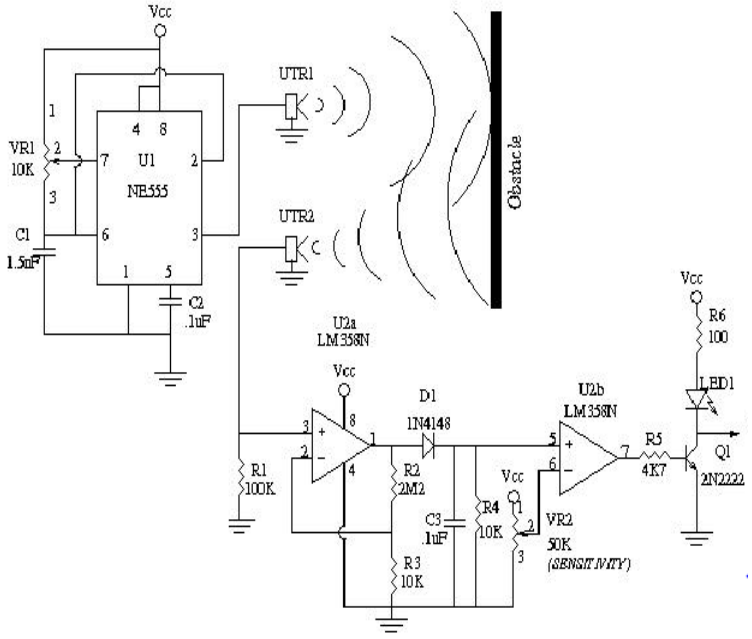

Fig. 4 Circuit diagram of ultrasonic sensor

C. Drivers consume alcohol: Drinking alcohol and then driving is very dangerous and a serious problem. People who drink alcohol are involved in traffic accidents resulting in over 20,000 deaths every year. Alcohol impairs muscle coordination, reaction time, depth perception, and night vision. It also affects the parts of the brain that control judgment and inhibition. For some people, one drink is all it takes to show signs of impairment. Alcohol goes directly into the blood stream and is carried to the brain. After passing through the brain, a small percentage is removed in urine, perspiration, and by breathing, while the rest is carried to the liver. The liver can only process one-third an ounce of alcohol per hour, which is considerably less than the alcohol in a standard drink. This is a fixed rate, so only time, not black coffee or a cold shower, will sober you up. If you have drinks faster than your body can get rid of them, you will have more alcohol in your body, and your driving will be more affected. The Blood Alcohol Concentration (BAC)

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commonly measures the amount of alcohol in your body. All of the following drinks contain the same amount of alcohol:

- A 12-ounce glass of 5% beer.
- A 5-ounce glass of 12% wine.
- A 1.5-ounce shot of 80% proof liquor.

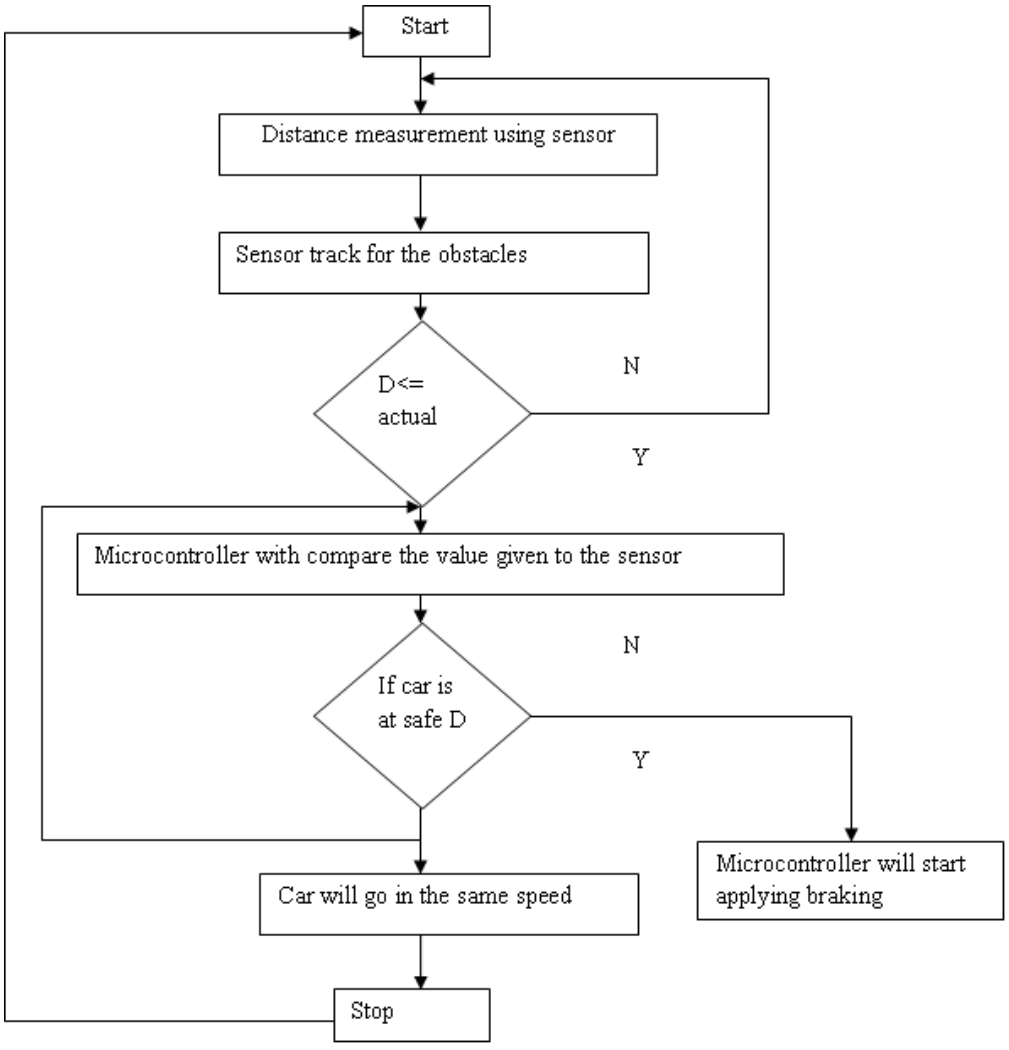

Fig. 5 Flow diagram of detecting obstacle

D. SMS notification: Whenever the driver's activity is change while driving, the cops would be intimated by the message saying that the driver consume alcohol and also saying that the vehicle have insufficient following distance while driving along with the number plate details which is pre-programmed to the microcontroller.

E. Breaking System: Here a DC motor based BUGGY is used. The µC will increase and reduce DC speed control via Pulse width modulation. The µC will increase or decrease the ON time and OFF time of the entire pulse time. If we decrease the ON time then the voltage applied to the DC motor will reduce and the speed of the DC motor will be reduced.

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VI. COMPONENT DETAILS

TABLE. 1 THE VARIOUS HARDWARE REQUIREMENTS

S.NO	COMPONENTS
1	ARM 7 processor
2	Alcohol sensor
3	Ultrasonic sensor
4	DC motor
5	GSM module
6	Brake circuit
7	RS-232

VII. CONCLUSION AND FUTURE WORK

Thus, this system would act as an effective and quick response from the vehicle unit to the control unit for reporting about the driver's activity of alcohol consume and distance limit of another vehicle.

This project could help to save precious human lives by reporting the driver's activity while driving then the theme of the project is achieved.

In future, adding the driver's activity like using mobile phone, feeling sleepy while driving are monitor and control. This may avoid many accidents on the spot as the life of human beings is more important than anything.

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