

Automatic Alcohol Detection and Interlinking with the Police Headquarters Database

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ABSTRACT - The article is related to Automatic Alcohol Detection in vehicles, and their interfacing with the speed and indirectly to the engine potential which will help in locating the vehicle and will further assist in law enforcement. By the use of GPS (Global Positioning System) and geospatial information provided, authorities can track the location of all vehicles from their database. This concept, with the assistance of GPS, GIS (Geographic Information System) and engineering will be helpful in seizing the offender, relief, and also for security on roads. An Alcohol Detection System (ADS) is to be placed either on some part of the steering or around which will calculate the presence of alcohol in the driver's breath. This will be interlinked with Automatic Cruise Control (ACC) which will control the speed of the car at a certain rate and also prevent from accidents by maintaining definite distance from other vehicles on the road. The ADS and ACC are both interfaced with the engine potential. When the ignition is ON, the GPS in the car will automatically start working and so will the ADS. When the alcohol level detected is above the pre-determined threshold, the speed of the vehicle will be controlled by the ACC. As soon as the alcohol is detected in the vehicle, it will be marked in a different colour in the database provided to the police authorities. The control room will automatically send this information to nearest patrolling police vehicle, and the vehicle will thus be prosecuted under law.

Keywords: alcohol detection system, automatic cruise control, geographic information system, global positioning system

1.0 Introduction:

“War and drink are the two things man is never too poor to buy.”-William Faulkner.

Let's leave war now. But why alcohol? The harmful use of alcohol is a global problem which compromises both individual and social development. It causes harm far beyond the physical and psychological health of the drinker, including the harm to the well-being and health of people around the drinker.

Harmful use of alcohol results in the death of 2.5 million people annually, causes illness and injury to millions more, and increasingly affects younger generations and drinkers in developing countries and since India is one of the developing countries, there is a great need to take care.

More than 7,000 road traffic deaths could be prevented every year if alcohol detection devices were used in all vehicles.

Officially, Indians are still among the world's lowest consumers of alcohol – government statistics show only 21% of adult men and around 2% of women drink but the sales of alcohol have seen a growth rate of 8% in the past 3 years and teenagers are the one who spur the use of alcohol. The use of alcohol in India has increased from 2% to 14% in the last 15 years. What is known is that alcohol-related problems account

for more than a fifth of hospital admissions; 18% of psychiatric emergencies; more than 20% of all brain injuries and 60% of all injuries reporting to India's emergency rooms. India's alcohol beverage market comprising beer, wine and spirits which is clocking annual growth rates of 30% will cross 19,000 million litres by 2015 from current level of 6,700 million litres. Data shows that 45% of 12th grade students in metropolitan cities consume alcohol excessively, at least five to six times a month. Its result indicate an almost 100% increase in teenage drinking in the last 10 years.

6.2% of male deaths are related to alcohol, compared to 1.1% of female deaths. Nearly, 4% of all deaths related to alcohol. Most alcohol-deaths are caused by alcohol result from injuries, cancer cardiovascular diseases and liver cirrhosis. Alcohol is the world's third largest risk factor for disease burden; it is leading risk factor in western pacific and the Americas and the second largest in Europe. So, that is a great need and demand for a system not only in a specific country but in the whole world that can aid to such a serious issue. Efforts are made to prevent people from dying, getting injured and cause a misbalance to the society as well by reason of alcohol.

2.0 Material and Methods:

2.1 Alcohol Detection System (ADS)

An alcohol detection system consists of sensor system which is used to detect the presence of alcohol in the driver's breath, skin, sweat or blood. Now a day, ADS local police officials prefer to choose breathalyzer to check the alcohol

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presence in the suspects' body. The ADS which is to be used here is to be fitted somewhere in the car and positioned at a predefined threshold level which is sensitive to alcohol. When the alcohol is more than the marked out dot, the ADS will cross point the engine. The ADS can also detect alcohol by retina blinking and unusual eye accomplishment. A simple Alcohol Detection System is available in the market and can be bought by any one. Many renowned automobiles companies are currently working on their own and will be launching the alcohol detection techniques. Some of those are Nissan, Toyota, Hyundai and Volvo. Companies which currently manufacture and provide the systems for alcohol detection and are especially designed for vehicles, mainly cars, and are successfully tested and proved.

There are a lot of researches and developments going on associated and allied to ADS. A number of companies are manufacturing and working in the field of advancement of the ADS according to the requirement and use.

2.2 Automatic Cruise Control (ACC)

Automatic or Autonomous cruise control is an automotive feature that allows a vehicle's cruise control system to adapt vehicle's speed to the traffic environment. It makes no use of satellite or roadside infrastructure or any cooperative support from other vehicles. A radar system or a laser system is attached to the subject vehicle which aids in the operation.

Types of automatic cruise control systems:

a) Laser-based ACC systems do not detect and track vehicles in adverse conditions nor do they consistently track extreme dirty tracks as they are non-reflective. Laser based ACC system measures distance as a function of speed and can monitor the traffic further and disregard the stationary objects such as telephone or electric poles etc.

b) Radar based sensors on the other hand can be hidden behind a plastic fascia. Radar based systems can monitor the vehicle up to 600 feet even in fog and rain conditions. This article discusses about the radar based ACC systems as they are widely used, preferred and works in unfavorable conditions.

If a slower vehicle is detected, the ACC will slow down the subject vehicle's speed and control the clearance between the ACC and the forward vehicle. If the system detects that no other vehicle is in the cruise control vehicle's path, the ACC will let the vehicle back to its set cruise control speed. This operation allows the subject vehicle (ACC vehicle) to automatically slow down and speed up with traffic without intervention from the subject vehicle's driver. This is the overall programming of the cruise control system. But when we take the case of a drunk driver, there is no option that even when the road environment is clear, the speed can go up. This process can be explained with the help of the following flowchart. [Refer Figure 1.]

Vehicle brands supporting automatic cruise control are BMW, Mercedes-Benzes', Volkswagen, Audi, Porsche, Bentley, Land Rover, Chevrolet, Volvo, Lexus, Subaru.

2.3 Interfacing Of Vehicle with Acc And Driver

The cruise control system has a lot more functions other than controlling the speed of the car.

i) The on button tells that to hit another button soon so as to continue the operation with ACC. The off button turns the cruise control off, even if it is in working. Some of the cruise control (CC) systems do not have on and off buttons; instead they turn off when the driver applies the brakes and turn on when the set button is knocked.

ii) The set/accel button tells the car to maintain the speed and make it as a default speed. For example, if the driver hits the set button at 50kmph holding down the set/accel button will set the default speed to 50kmph.

iii) Holding down the coast button will decelerate the car just as the driver took his foot completely out of the fuel.

2.4 Interfacing of vehicle with pre-charging brakes and collision warning system

Collision warning with brake support uses radar to detect moving vehicle ahead and warns the driver of danger with an alarming and warning light.

- The system provides an audible alert when it senses a reduction in traffic speed in vehicles ahead.
- When the danger of the collision is detected, it provides a red warning light that flashes on the windshield.
- If the driver removes his leg from the accelerator, signifying a desire to slow down, the system will apply the brakes to a nominal level to decelerate the vehicle faster than the driver.
- If the driver hit the brakes rapidly, the system is designed to provide full braking capability to avoid or mitigate the potential threat.

The Automatic Cruise Control will certainly work as a boon in the case of brake failure also.

2.5 GPS (Global Positioning System)

Over the years, the technology involved in manufacturing an automobile has become more advanced as automakers shift their focus from basic transportation to the design of features that make a vehicle safer, more comfortable and more easily to operated. Of them, one such feature is GPS. As a matter of fact, GPS is much safer than a map for an electronic device is automated and lets the driver focus on the road instead of map and also provides the shortest route, distance to the destination, utilities like ATM, bus stops, airports, mechanics, hotels etc.

A GPS is a space based radio positioning system that combines computer mapping techniques to provide 24-hour three-dimensional position, velocity and time information to suitably equipped users anywhere on or near the surface of earth. GPS is amongst the major developments of wireless telecommunication industry. It is basically divided into three major components which comprises of user segment, control segment and the space segment.

The space segment is composed of GPS satellites that transmit and position in the form of radio signals to the user. The whole set of 24 satellites is called the *constellation*.

The control segment is composed of ground based facilities that are used to monitor and control the satellites. Its master control station is located in Colorado, USA.

The user segment consists of the GPS receivers. The GPS receiver is a specialized radio receiver to listen to the radio signals being transmitted from the satellites. This process requires four satellites to compute four dimensions: X, Y, Z (position) and time. Thus, with this ability, GPS has three main functions: navigation (for aircrafts, cars, ships, etc.), precise positioning (e.g. for surveying), and time for frequency dissemination (e.g. for telecommunication facilities). GPS receivers come in different sizes, shapes and price ranges.

Some of the top GPS receiver companies which provide their services in India are Map my India, GARIM, TomTom, Sat guide etc. The main functioning of GPS in our concept starts as soon as the ignition of the car is on. The GPS is connected to the alcohol detection sensor systems and if alcohol is detected, the ADS will automatically send notifications to the GPS and this notification will be send to the police central headquarters where the database is stored.

2.6 Database

A database is a collection of information that is organized so that it can easily be accessed, managed and updated. A database system is a system to achieve an organized, store a large number of dynamical associated data, facilitate for multi user accessing to computer accessing hardware, software and data. Every database is edited, updated and modified by a Database Management System and it provide users with the tool to add, delete, access, modify and analyze data stored in one location.

3.0 Working and Procedure:

The whole functionality of the system starts when the car ignition is on. When the ignition is switched to on, the GPS device enabled in the car gets started. As soon as the GPS starts, the driver is able to locate the car's position. The alcohol detection sensors start working and diagnosing if the alcohol is present in the driver. These ADS can be placed on the steering, gear, near shoulder on the seat, etc. If the amount of alcohol present in the driver is greater than the predetermined threshold of the alcohol content, the ADS will send the information to the ACC and GPS. And if the alcohol is not detected, there will be no changes. [Refer Figure 2]

3.1 Signals to ACC

When the alcohol is found in the driver, the ACC will be automatically on without any interaction of driver. Now the signals which are send to the ACC will further proceed and the alterations will now take place with the engine potential and the speed of the car will be set to the already fixed speed of the ACC cannot be customized even when the driver wants to (by

accelerator). When the preset speed of the ACC is more than the road's environment, the car will go by the road's traffic environment.

Before moving to the signals sent to GPS, taking the role of the database would be appropriate as it plays a very important role in law enforcement and abiding by the rules and instruction as is made in the laws.

The details of every car like, car owner, car model, car number, etc. will be specified, stored and modified from a database which will be governed by the police central headquarters. Hence, from the database it would be possible to track each and every car's location and details. This database will be interlinked with the GPS of the car. In this case too, there will be two cases; the driver is drunk or not. If the driver is not drunk, the location of the car in the database will be shown by a and if drunk, it will be shown by a . The pattern in which this all will appear on the database screen is shown. [Refer Table 3 and Fig 3]

3.2 Signals to GPS

The GPS will send the location details to the police central headquarters which will appear in the database as explained above whether it is the case of alcohol or not. If the alcohol is detected in the driver's body, the symbol shown in the database will be otherwise which will create no difficulty to the driver.

If the GPS is sending a symbol, then the database will spontaneously or by the commands of the officials send this information to the nearest police patrolling car from the subject vehicle and the suspect will be held.

3.3 Conclusions-Extended Versions:

This system will also help in the pollution control as pollution sensors are now available where are either placed on the silencer of the automobile or on some other part which can spot the amount of pollution produced by the automobile. This pollution control sensor (PCS) will be interlinked with the GPS and indirectly to the police database. Car security and theft will certainly come down as the whole information is running on the virtual world and location of each vehicle is being tracked. Police database system will be easily updated and modified and the traffic control can also be done by lookig to the vehicles' density on the signals. The violators of the rules will be siezed under law. Safety problems can also be solved by this system. The airbags are connected to the GPS via sensors. As the airbags pull out due to accident, the information will be sent to the database via GPS, and this information can directly go to the ambulance or nearest hospitals and many lives could be saved.

A free helpline number provided to the car owners will work as a boon. If there is a case of theft or some other mishappening, the police can send help.

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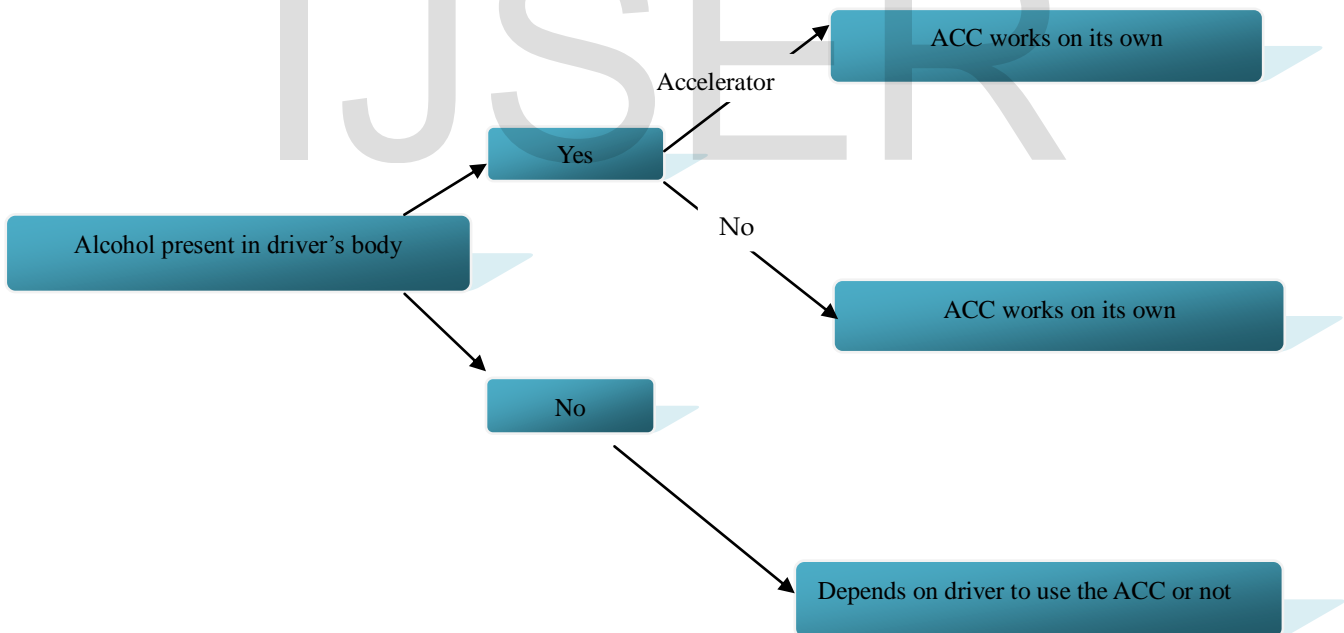


Fig. 1- Working of the ACC

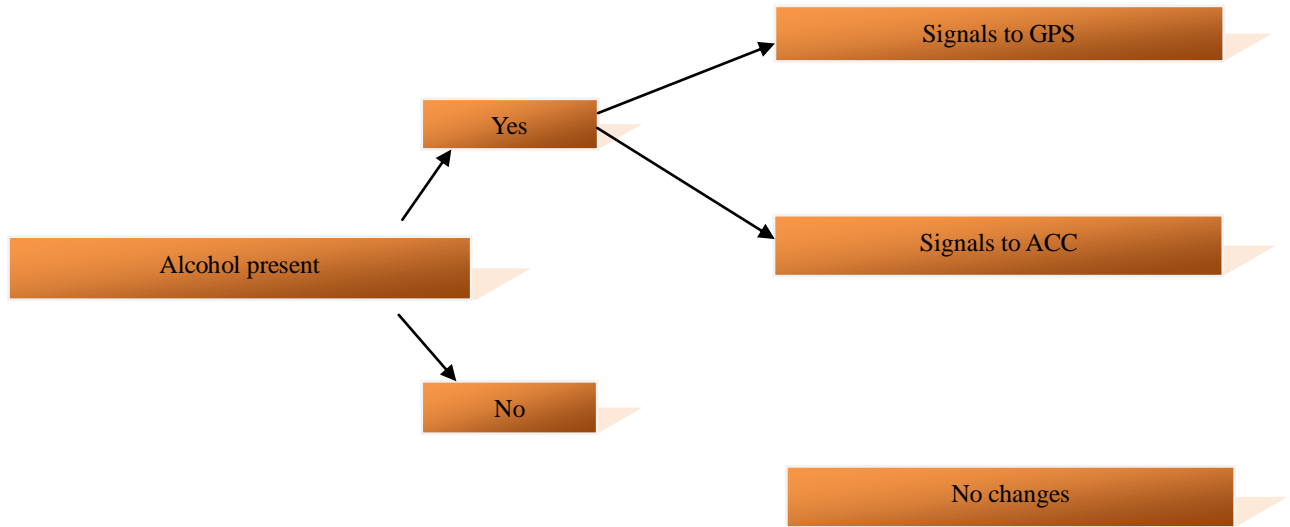




Fig. 2-Working of ADS

Table 3-Database records of every car

Car details	Car owner	Car name	Model	Pollution(1)	Past record	License and insurance expire on date-
1)	Shivam Parashari	Maruti-swift	2009		Seized once	20-11-2015
2)	Charlie Harper	Bmw-z1	2001		none	expired



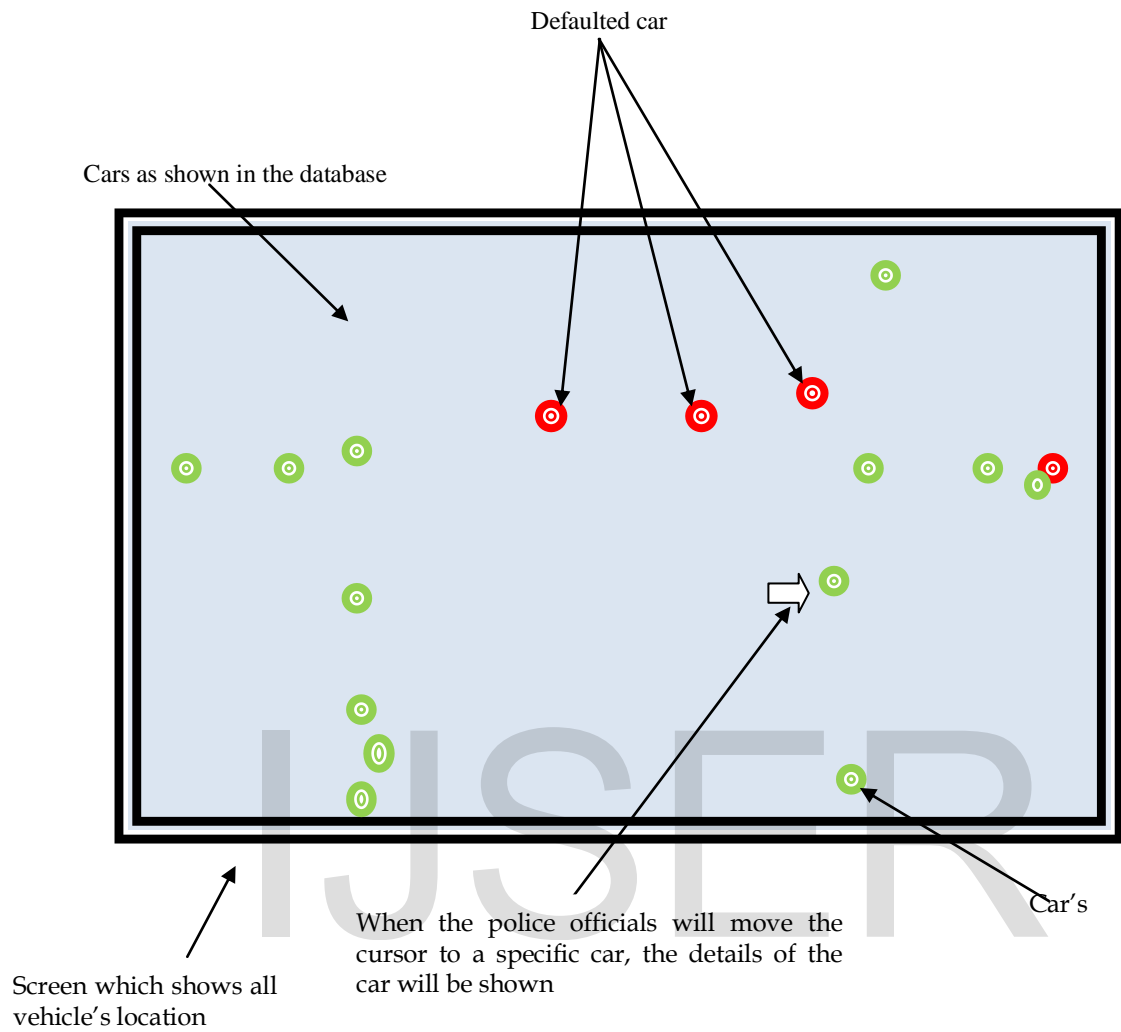


Fig. 3- Vehicle and database interlinking with the police headquarters



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