ISSN: 2321-7782 (Online)
Volume 2, Issue 3, March 2014
International Journal of Advance Research in Computer Science and Management Studies
Research Article / Paper / Case Study
Available online at: www.ijarcsms.com

An Effective approach to Prevent Drunken Driving Based on BAL

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Abstract: As is needless to say; a majority of accidents, which occur, are due to drunk driving. As such, there is no effective mechanism to prevent this. Here we have designed an integrated system for the same purpose. Alcohol content in the driver's body is detected by means of an infrared breath analyzer placed at the steering wheel. An infrared cell directs infrared energy through the sample and any unabsorbed energy at the other side is detected. The higher the concentration of ethanol, the more infrared absorption occurs (in much the same way that a sunglass lens absorbs visible light, alcohol absorbs infrared light).So here we propose a mechanism to avoid drunken driving using IR spectroscopy based on BAL (Blood Alcohol Level).since our paper is based on the BAL content shown in IR spectrometer actuator takes the action over ignition system. Though the driver in addled condition since BAL>0.8 because of extreme alcohol consumption, these can prevent the crashes.

Keywords: BAL, IR spectroscopy, symmetric, scissoring, actuator, microcontroller, harmonic oscillator.

I. INTRODUCTION

Beer is the drink of choice in most cases of heavy drinking, binge drinking, drunk driving and underage drinking. India reported the highest number of road traffic crashes, related injuries and deaths among all countries in the world wide with 105,725 road traffic fatalities and 452,922 nonfatal road traffic injuries in 2007. Forty-one percent of 1,672 motorcycle operators who died in single-vehicle crashes in 2004 had BAC levels of 0.08 g/dl or higher.

1) 50% of all accidents, occurring, are due to drunk driving.

2) Each year, around 12,000 people die.

3) Every half a minute, 1 person dies due to drunken driving.

II. OBJECTIVE

The table 1 shows the number of deaths in alcohol related crashes.

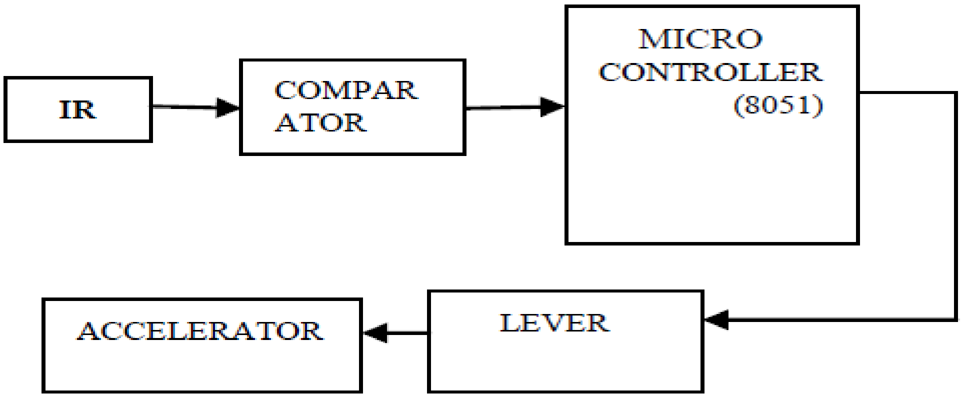
TABLE I
DRUNK AND DRIVING ACCIDENTS STATISTICS

Year	Total Number Of Fatalities	Total Number Of Alcohol Related Fatalities
1990	44,599	22,587
1991	41,508	20,159
1992	39,250	18,290
1993	40,150	17,908
1994	40,716	17,308
1995	41,817	17,732
1996	42,065	17,749
1997	42,013	16,711
1998	41,501	16,673
1999	41,717	16,572
2000	41,945	17,380
2001	42,196	17,400
2002	43,005	17,524
2003	42,643	17,013
2004	43,443	16,885
2005	42,532	15,829
2006	43,518	15,543

From the above table1 data, we can easily come to the conclusion that designing an efficient system to prevent drunk driving is of paramount importance. Till date, there are no systems, which are practically implement able. This new system can easily respond to the ever present threat of alcohol victim accidents, government authorities are implementing different anti fixed in existing vehicles and is very cost effective. So, I would like to come with this approach alcohol detection system based on IR spectroscopy.

III. DETECTION, INDICATION & CONTROLLER

Our paper is based on optical technology which is non-invasive. One is controller 8051 and the other one is IR spectrometer, these two are used to detect, indicate and control this system. Following to IR spectrometer, actuator is used to cut-off the buretor supply to the engine to shut ignition. Askance, controller does the operation of lock accelerator with lever. Based on BAL content shown in IR Spectrometer actuator takes the action over ignition system which is illustrated in below block diagram. Though the driver in addled condition since BAL>0.8 because of extreme alcohol consumption, these can prevent the crashes. Hardwares used are IR spectrometer, A Calibrated Scal, An Automated Electromechanical Valve, Toroidal Coil, Variable Resistor, buretor/Injection Pump, 8051 controller Accelerator with lever.

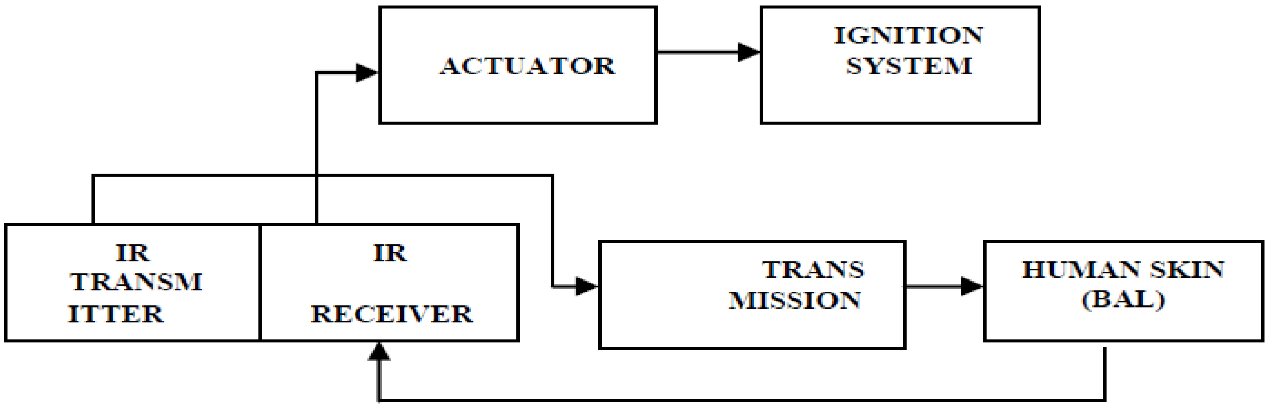


IV. IR SPECTROSCOPY

The electromagnetic portion of the IR spectroscopy is divide into three regions the near-, mid- and far- infrared, named for their relation to the visible spectrum. The far infrared, approximately 400-10 cm-1(1000–30 μm), lying adjacent to the microwave region, has low energy and may be used for rotational spectroscopy. The mid-infrared, approximately 4000-400 cm-1 (30–1.4 μm) may be used to study the fundamental vibrations and associated rotational vibration structure. The higher energy near-IR, approximately 14000-4000 cm- 1 (1.4–0.8 μm) can excite overtone or harmonic vibrations. The names and classifications of these sub regions are merely conventions. They are neither strict division nor based on exact molecular or electromagnetic properties. Infrared spectroscopy exploits the fact that molecules have specific frequencies at which they rotate or vibrate corresponding to discrete energy levels. These resonant frequencies are determined by the shape of the molecular potential energy surfaces, the masses of the atoms and, by the associated vibronic coupling.

In order for a vibration mode in a molecule to be IR active, it must be associated with changes in the permanent dipole. In particular, in the Born-Oppenheimer and harmonic approximations, i.e. when the molecular Hamiltonian corresponding to the electronic ground state can be approximated by a harmonic oscillator in the neighborhood of the equilibrium molecular geometry, the resonant frequencies are determined by the normal modes corresponding to the molecular electronic ground state potential energy surface. Nevertheless, the resonant frequencies can be in a first approach related to the strength of the bond, and the mass of the atoms at either end of it. Thus, the frequency of the vibrations can be associated with a particular bond type. Simple diatomic molecules have only one bond, which may stretch. More complex molecules have many bonds, and vibrations can be conjugated, leading to infrared absorptions at characteristic frequencies that may be related to chemical groups. For example, *the atoms in a CH2 group*, commonly found in organic compounds can vibrate in six different ways: ***symmetrical and antisymmetrical stretching, scissoring, rocking, wagging and twisting***.

The infrared spectrum of a sample is collected by passing a beam of infrared light through the sample. Examination of the transmitted light reveals how much energy was absorbed at each wavelength. This can be done with a monochromatic beam, which changes in wavelength over time, or by using a Fourier transform instrument to measure all wavelengths at once. From this, a transmittance or absorbance spectrum can be produced, showing at which IR wavelengths the sample absorbs. Analysis of these absorption characteristics reveals details about the molecular structure of the sample. This technique works almost exclusively on samples with covalent bonds. Simple spectra are obtained from samples with few IR active bonds and high levels of purity. More complex molecular structures lead to more absorption bands and more complex spectra. The technique has been used for the characterization of very complex mixture illustrated in below figure.



V. TRANSMITTER AND RECEIVER

The infrared transmitter is a GaAs infrared emitting diode, fabricated in a liquid phase epitaxial process. It is highly reliable and has a capability of high pulse handling. Receiver is usually used to absorb the equivalent amount of infrared rays emitted by the transmitter. The maximum extension distance is 8m or more. The amount of alcohol in the blood stream is referred to as Blood Alcohol Level (BAL). It is recorded in milligrams of alcohol per 100 millilitres of blood, or milligrams percent. For example, a BAL of .10 means that 1/10 of 1 percent (or 1/1000) of the total blood content is alcohol. When a person drinks alcohol it goes directly from the stomach into the blood stream. This is why people typically feel the effects of alcohol quite quickly, especially if drinking on an empty stomach. BAL depends on the amount of blood (which increases with body weight), and the amount of alcohol consumed over time. Drinking fast will quickly raise a drinker's BAL because as the liver can only handle about a drink per hour--the rest builds up in your blood stream. With a BAL of .02, you may experience an increase in body warmth, and a lowering of inhibition; at .05, you are less alert and begin to experience impaired coordination. A BAL of .08 is the legal limit for drunk driving in most states. With a BAL of .15, you experience impaired balance and are noticeably drunk. Many people lose consciousness with a BAL of .30 or higher, and breathing can stop with a BAL of .50, at which point many people die.

VI. SOLUTION TO THE PROBLEM

The infrared rays can be obtained with the help of ordinary infrared lamps. These have tungsten filament that can **withstand heat up to 3000 c** and they emit infrared light In case the driver is drunk there will be a certain amount of alcohol in his blood stream. This alcohol content in the blood will be relatively proportional to the amount of alcohol intake. The alcohol in the vapor state has the property of absorbing infra red light. The infrared light emitted passes through the air medium and reaches the sensor, which **detects the loss of the infrared light due to the absorption of alcohol present in the**

surroundings. This sensor then measures the loss by comparing the received amount of radiations with a fixed parameter that is predefined. The sensor is calibrated in such a way that the amount of loss is directly equal to the amount of alcohol present in the atmosphere. The energy consumed by the IR system is very less. Also the detection need not take place continuously. It can be done at discrete intervals.

The detection system must not be affected due to other extraneous elements. So the **sensitivity of the system must be limited to a very small distance**. The emitter and detector are placed on the accelerator rod of the vehicle. The BAL content of the driver is noted through the palm from his blood stream. Once the drunken driving case is detected, and then an automatic signal is generated and sent to the actuator. This controls the working of a valve, which controls the supply of the fuel. This valve can be in only one of two states. It is open or it is closed. So, the fuel supply can be cutoff when required. An important point to be taken into consideration is that the vehicle does not stop abruptly. Once the valve is closed, the vehicle slows down and finally comes to a stopping position. In addition to that, controller sets the value for lever to react. So that accelerator rod is locked to stop the vehicle instantly.

VII. ADVANTAGE

The advantage of the system is that the driver cannot even tamper with it. Because the fuel supply valve is open only when all the components are working properly and the IR light detected is comparable to the standard value. So, if anyone tampers with it or if the alcohol content is above a particular limit, fuel is not supplied and the vehicle cannot be started. Budget for this project is comparatively less however it need little modification accelerator.

VIII. CONCLUSION

Acts of drunk and drive creates major debacle over lives. As a remedy our proposed system can make an impact over this to avoid major crashes due to alcohol consumptions. Hence major accidents can be weeded out due to boozing. The alcohol detection system aims to minimize the loss of lives by terrorizing the alcohol consumers while driving. Hence this new innovation can lead to safer drive in online roads.

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