International Journal of Innovative Research in Computerand Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488|

||Volume 8, Issue 6, June 2020||

Design and Implementation for Drowsiness and Alcohol Intoxication Detection of Driver

Swetha K B[1], Niveda R[2], Bindushree B S[3], Dhanyatha M[4], Sachin S[5]

Assistant Professor, Dept. of ISE., RR Institute of Technology, VTU, Karnataka, India[1]

UG Student, Dept. of ISE., RR Institute of Technology, VTU, Karnataka, India[2,3,4,5]

ABSTRACT: Drowsiness and drunken driving causes the road accidents. This paper proposes a real time detection of driver's drowsiness as well as alcohol intoxication and subsequently alerting them. The main aim of this proposed system is to reduce the number of accidents due to driver's Drowsiness and alcohol intake to increase the transportation safety. This proposed system contains 8-megapixels digital USB camera, PC loaded with Raspbian-OS, Alcohol sensor (MQ-3) is used to detect the intake of alcohol in percentage if the intoxication matching fails GSM get triggered on and transmits warning message. The PC with Open CV is serially interfaced with Arduino Uno. GSM, Bluetooth, relay circuitry and buzzers are interfaced with Arduino Uno. This will perform some task like the alarm notification and switching off the car power source.

KEYWORDS: Haar cascade classifier, facial landmark, Eye detection, Breathalyzer**.**

I. INTRODUCTION

Most of the road accidents are caused because of drowsiness and drunk driving and also working environments, reduced sleep and time factor. Driver drowsiness and fatigue drunk driving reduces the driver decision making capability and perception level. These two situations affect the ability to control the vehicle. There are some techniques which are used to detect drowsiness in drivers like by sensing of driver operation or physiological characteristics of driver like or vehicle movement etc. Traffic survey shows that driver fatigue may be a contributory factor in up to 20% and due to alcohol drinking it is about 31% of all road accidents [1].The primary purpose of this drowsiness and alcohol detection system is to develop a system that can reduce the number of accidents from drowsiness and drunk driving of vehicle.[2] In the first part of the this project is detection of drowsiness ,for that we use a camera for detecting image or face, Eye detection is the important part of this project will be done using OpenCV.[3][4]The Input 8 megapixel camera, which is capable of capturing real time images and video. The captured frame is to be processed by PC with Camera. algorithm is implemented using Python.[5] Eye close detection is based on Haar cascade classifier and canny edge detection technique and performs several comparisons from a database of positive value and negative value of images and returns a red border rectangle over the detected area on matching. [7] [8] Eye closing rate is calculated after each 10 seconds, and if it crosses a predefined threshold value, then PC s sends a high pulse signal serially to its slave device Arduino Uno. On receiving the high pulse signal, the Arduino performs a set of tasks like Alarm by buzzer or send message to its car owner.[9][10]On the other hand alcohol sensor (MQ-3) is work as a Breathalyzer and calculate blood alcohol content (BAC) from breath alcohol content (Br AC).The Arduino is interface with MQ-3,Bluetooth,buzzer and relay. Arduino continuously checks alcohol content present in the air and also computes blood alcohol content in Percentage from it.[11] If the calculated %BAC crosses the threshold limit at that time it will get alarm through buzzer and will turn off the relay. If over limit drunk that time send message through GSM to car owner.

II. LITERATURE SURVEY

A survey done by National Highway Traffic Safety Administration estimated that there were 56,000 sleep related road crashes in the U.S.A in 1996. Another survey done in 2007 says that 18% of accidents involved fatigue as the main factor. In Britain up to 20% of serious road accidents were caused due to fatigue. Similarly, survey done by the Road and Traffic Authority states that in the year 2007, fatigue contributed to 20% of accidents caused on road. Accidents due to drowsy was prevented and controlled when the vehicle is out of control. Also, the drunken driving is detected by using alcohol detector in the vehicle. The term used here for the identification that the driver is drowsy is by using eye blink of the driver.

These types of accidents occurred due to drowsy and driver could not be able to control the vehicle, when the driver wakes. The drowsiness was identified by the eye blink closure rate through infrared sensor worn by driver by means

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of spectacles frame. If the driver is in drowsy state, then the system will give buzzer signal and the speed of the vehicle was reduced and the obstacle sensor is used to sense the adjacent vehicle to avoid collision with that, and if there is no vehicle in left adjacent side then the vehicle move to the left side of the road by auto steering and controlling and vehicle was parked with prior indications. In the recent years, many researchers worked on these devices and few approaches have been reported. In order to find the depressed individuals through social media we have to completely analyze and understand the behavior of users. The behavior of user's can be predicted by going through the massive amount of data generated by user's that is User Generated Contents (UGC). There are many researches that have carried out on depression level problem in order to solve it and still there are researches that is going on.

[12] One of the suggested methods is to monitor the movement of the vehicle to detect drowsiness of the driver. However, this method has limitations as the results are influenced by the type of vehicle and the condition of road. [12][15] Another method is to process the electrocardiogram (ECG) signals of driver. This approach also has limitations as ECG probes shall always be connected to the driver 's body. That would disturb the driver. [14] Few researches tried to assess the fatigue factor by monitoring the eye blink rate of the driver. Successful detection of eye blink rate has been the interest of many researchers proposed methods based on combination of projection and the geometry feature of iris and pupil. T. D Orazio and Z. Zhang use the fact that the iris and pupil are darker than skin and white part of the eye.

[16] Some works also are based on "Support Vector Machine" (SVM) classifier. The SVM classifier is used to detect state of the eye. F Smach used SVM classifier and Gabor filter to extract eye characteristic. In the above methods, the authors used some conditions which make some difficulties in the eye state recognition. The system detects the fatigue symptoms of the driver which consists of an eye blink sensor for driver blink attainment and an adaptive speed controller designed using stepper motor for providing actual positioning of the throttle valve to adjust the speed of vehicle. Advanced technology offers some hope to avoid these up to some extent. This paper involves measure and control of accidents by using both alcohol sensor and IR sensor.

It uses remotely located charge-coupled-device cameras with active infrared illuminators to acquire video images of the driver. Various visual signs that typically characterize the level of alertness of a person were extracted in real-time and systematically combined to infer the fatigue level of the driver. The visual cues employed characterize eyelid, gaze, head movements and facial expressions. A probabilistic model was developed to model human fatigue and to estimate fatigue based on the visual cues. The simultaneous use of visual cues and their systematic combination earns an accurate fatigue characterization. This system was validated under real-life fatigue conditions with the human subjects of different ethnic backgrounds with or without glasses; and beneath different illumination conditions. It was found to be reasonably reliable, and accurate in fatigue characterization.

[13] The computer vision-based method of Seshadri determine if a driver is holding a cell phone close of his/her ears using the Supervised Descent Method (SDM) which it tracks some facial landmarks to extract a crop of regions of interest (ROI) (the driver's ear region). Features are extracted from the ROIs and the phone usage is detected using previously trained classifiers. The system can be processed in near real time. The approach of Yang sends beeps of high frequency through the car sound equipment, network Bluetooth, and use software running on the phone for capturing and processing sound signals. The beeps are used to calculate the position where the cell phone is, and then we know when the driver (or another passenger in the car) is talking on it. The proposal achieved a classification accuracy of more than 90%. This approach works with hands-free usage, but it depends on the operating system and mobile phone brand, and the software has to be continually enabled by the driver.

[17] Another proposal identifies the behaviours of a distracted driver associated with text messaging. The approach uses a cell phone programmed to record any typing done (pressing and releasing any key). An analysis can be performed to verify distractions through these records. Experiments were done with six participants used the cell phone as passenger and driver what distinct patterns of typing frequency were shown in each situation. The driver cannot reply the text messaging with an average frequency of 2 press keys by the second. This constraint detects the driver in 99% of cases, but it works with offline data processing. The system could be applied to others equipment, i.e. the GPS.

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III. EXISTING APPROACH

There is much attentional impairment while driving that affect driver's reaction. Among which driving while drowsy is one of the major causes behind road accidents, and exposes the driver to a much higher crash risk compared to driving while alert. Therefore, the use of an assistive system that monitor a driver's level of vigilance and alert the driver in case of drowsiness can be significant in the prevention of accidents. The existing system tells about an approach towards detection of driver's drowsiness based on yawning measurement and head movement. This involves several steps including the real time detection and tracking of driver's face, detection and tracking of the mouth contour, the detection of yawning based on measuring both the rate and the amount of changes in the mouth contour area and head movement tracking. Before, sensor operated devices like goggles were introduced for drowsy detection using MATLAB and driver 's conditions were checked manually before starting the journey. Also, no intimation was given about the drowsiness of the driver. The life lost once cannot be re winded. Advanced technology offers some hope to avoid these types of accidents up to some extent. Sleep related accidents are more severe, because of the higher speeds involved and as the driver is unable to take any action to avoid accident, or even stamp the brake, prior to the collision. Horn describes sleep related accidents where the driver runs off the road or crash with another vehicle. Accidents are also caused when street lights are out especially on highways. So, when the driver fails to change the brightness level of the light when another car comes from the opposite side it plays a major role for accidents.

It is caused due to the opposite driver to miss the judgments and gives rise to accident. Accidents are also caused due to the invaders coming suddenly in either side of the vehicle due to which the driver miss the judgments and meets with an accident. Z. Xiaoronget proposed a model for automatic alcohol detection based on using alcohol sensor MQ-3 and IOT, he used STC12C516A microcontroller and alcohol sensor as main components, by using these he detect the alcohol contentment in the breath same as the breath analyser, author fits alcohol sensor, display, GPRS module in the vehicle, if the alcohol content detect over the limit then automatically buzzer ring at the same time it sends the information to owner with exact location of the vehicle and the vehicle automatically off.

IV. PROPOSED IDEA

Whole system is built upon Raspberry Pi board, Raspbian OS, OpenCV image processing library and QT as editor. The primary focus is given to the faster drowsiness detection and processing of data. The system is used to detect the eyes whether they are closed or open in real-time through the Logitech camera, where drivers are not connected to any external devices and also malfunctioning is highly impossible. Intimation services are provided to alert the drivers through IoT where eye ball detection, GPS and GSM modules are interfaced with the Raspberry pi board.

A Haar Classifier is a machine learning approach for visual object detection originally developed by Viola & Jones. It was originally intended for facial landmark and shape predicting but can be used for any object. In the proposed concept, the driver face is continuously recorded using a camera, to detect the hypo-vigilance level. Then the closed eye gesture was detected for drowsy detection. The eye blink frequency exceeding the normal rate is the fatigued state. The micro sleep that is lasts for 3 to 4 seconds are the good indicator of the fatigued state. This closed eye gesture was implemented using Open CV. It will alert the driver about his/her fatigue using a buzzer.

For tracking the location of the drunk driver for remote communication, satellite-based GPS (global positioning system) receiver module, with antenna is used. GPS module used in the system uses civilian GPS signal to provide location accuracy of 30-50 m within 5 minutes or less, the initial time required to lock the satellite in a moving vehicle [49]. The purpose of the active tracker is to get the real-time location information of vehicle with drunk driver and transmit the same to the client mobile using GSM modem attached to controller. Global positioning system, owned by USA, is a worldwide radio-navigation system formed from the constellation of 24-32 Medium Earth Orbit satellites and their ground stations. This work proposes a system to detect hand-held cell phone usage during the act of driving.

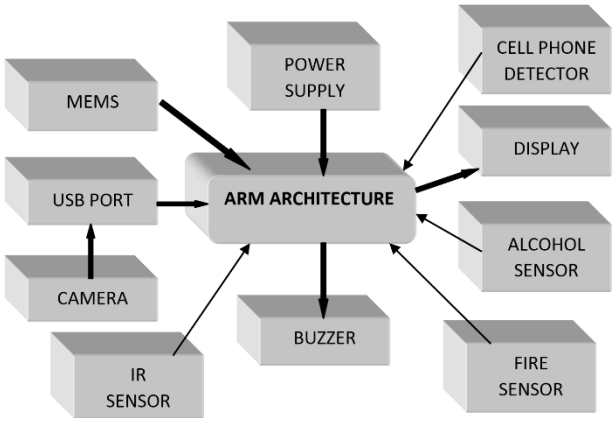
The system uses ring indicator for detecting this activity. The system 's output could be a warning that can regain the driver 's attention exclusively to the vehicle and the road or a warning for a transport company or enable a buzzer. We are using the alcohol sensors to sense the consumption of the alcohol up to the pre-set percentage. If the driver 's alcohol consumption exceeds the limit, the buzzer turns on to warn the driver and ignition will not turn on.

This project involves measure and control of the eye blink using IR sensor. The IR transmitter was used to transmit the infrared rays in the eye. The IR receiver was used to receive the reflected infrared rays of eye. If the eyes were closed, it means that the output of IR receiver is high otherwise the IR receiver output is low. This is to know whether the eyes are in closing or opening position. This output is given to a logic circuit to indicate the alarm. This project

involves the control of accidents due to unconscious through Eye blink. Here, one of the eye blink sensors was fixed in vehicle to detect unconsciousness and was indicated through an alarm.

V. SYSTEM DESIGN

System design is the phase that bridges the gap between problem domain and the existing system in a manageable way. This phase focuses on the solution domain, i.e. ―how to implement? ‖ It is the phase where the SRS document is converted into a format that can be implemented and decides how the system will operate. In this phase, the complex activity of system development is divided into several smaller sub-activities, which coordinate with each other to achieve the main objective of system development.



Block diagram of ARM Architecture

In this project, ARM 11 architecture is used. ARM, previously Advanced RISC Machine, originally Acorn RISC Machine, is a family of reduced instruction set computing(RISC)architectures for computer processors, configured for various environments. British companyARM Holdings develops the architecture and licenses it to other companies, who design their own products that implement one of those architectures— includingsystems-on-chips(SoC) and systems-on-modules(SoM) that incorporate memory, interfaces, radios, etc. It also designscoresthat implement thisinstruction setand licenses these designs to a number of companies that incorporate those core designs into their own products.

Processors that have a RISC architecture typically require fewer transistorsthan those with acomplex instruction set computing(CISC) architecture (such as thex86processors found in mostpersonal computers), which improves cost, power consumption, and heat dissipation. These characteristics are desirable for light, portable, battery-powered devices— including Smart-phones ,laptopsand tablet computers, and other embedded systems. For super computers, which consume large amounts of electricity, ARM could also be a power-efficient solution.

ARM Holdings periodically releases updates to architectures and core designs. All of them support a32-bitaddress space(only pre-ARMv3 chips, made before ARM Holdings was formed, as in original Acorn Archimedes, had smaller) and 32-bit arithmetic instructions for ARM Holdings cores have 32-bit fixed-length instructions, but later versions of the architecture also support a variable-length instruction set that provides both 32- and 16-bit instructions for improvedcode density. Some older cores can also provide hardware execution ofJava byte-codes. The ARMv8-A architecture, announced in October 2011, adds support for a64-bitaddress space and 64-bit arithmetic with its new 32-bit fixed-length instruction set.

VI. IMPLEMENTATION

To implement a system successfully, a large number of inter-related tasks need to be carried out in an appropriate sequence. Utilising a well-proven implementation methodology and enlisting professional advice can help but often it is the number of tasks, poor planning and inadequate resourcing that causes problems with an implementation project, rather than any of the tasks being particularly difficult. Similarly, with the cultural issues it is often the lack of adequate consultation and two-way communication that inhibits achievement of the desired results.

Developing safety measures to prevent drunk and drowsy driving is a major challenge for the car industry. Here are some of the ideas on how to prevent drowsiness and drunk driving while driving. When a driver enters a car, starts the ignition at first, he would be told to provide breath sample, by using an alcohol sensor, it would be detected whether the

driver is in drunk state or not. If yes, then the ignition would turn off. If driver not drunk, then next step would be face capture. Face capture would be done by a web camera that would be placed in front of the driver near dashboard.

The camera would capture the face of driver along with eye and mouth tracking. Eye tracking is done to detect whether the driver eyes are open or closed to measure drowsiness level and mouth capture done to check for yawning while driving. After detection and tracking of face, eyes and mouth capture while driving, the system continuously keeps checking for any variations in above parameters. By using Visual Studio 2013 and OpenCV with Emgu tracking and detection of facial features is being done.

OpenCV using Emgu being open library contains all XML files for eye closeness detection and yawn detection would be carried out using template matching where picture already stored will be compared to find whether the driver is in a drowsy state or not. If any one of the parameters gets checked that is if driver found drunk while driving or in drowsy state then an alarm would go off and seats would vibrate, thus making the driver alert again. If the alarm goes off again and again within a certain time interval, then the system would turn off the ignition and turn on the indicator lights to warn vehicles coming from behind to avoid crashing of vehicles.

VII. RESULTS

Our drowsiness detector hinged on two important computer vision techniques:

- Facial landmark detection
- Eye aspect ratio

Facial landmark prediction is the process of localizing key facial structures on a face, including the eyes, eyebrows, nose, mouth, and jawline.Specifically, in the context of drowsiness detection, we only needed the eye regions. Once we have our eye regions, we can apply the *eye aspect ratio* to determine if the eyes are closed. If the eyes have been closed for a sufficiently long enough period of time, we can assume the user is at risk of falling asleep and sound an alarm to grab their attention.

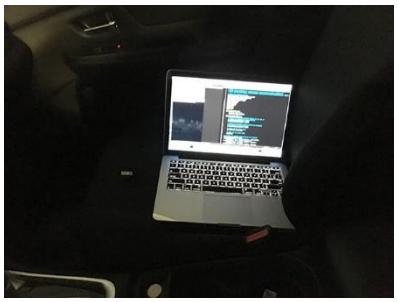
Mounting camera to car dash for drowsiness detection

The camera used for this project was a Logitech C920. It:

- Is relatively affordable.
- Can shoot in full 1080p.
- Is plug-and-play compatible with nearly *every* device that was tried it with (including the Raspberry Pi).

We took this camera and mounted it to the top ofdash using some double-sided tape to keep it from moving around during the drive. The Raspberry Pi isn't quite fast enough for real-time facial landmark detection.In future we

can *optimize* the Raspberry Pi along with the dlib compile to enable real-time facial landmark detection. However, for the time being, we'll simply use a standard laptop computer.

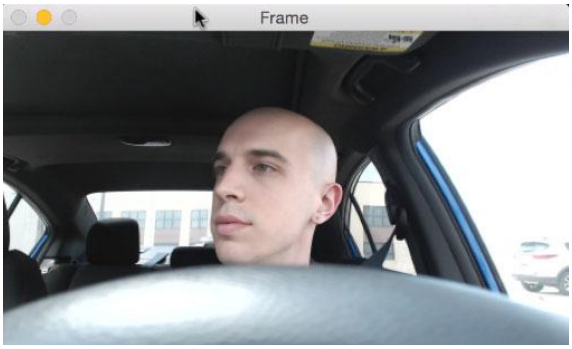


Using laptop to run the actual drowsiness detection algorithm.

With all hardware setup, we can move on to building the actual drowsiness detector using computer vision techniques.

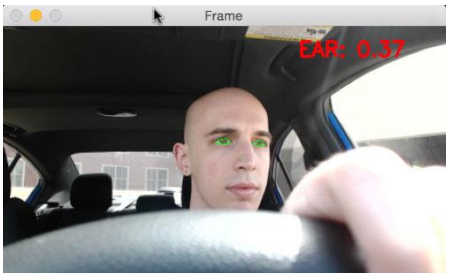
The drowsiness detector algorithm:

The general flow of our drowsiness detection algorithm is fairly straightforward.First, we'll setup a camera that monitors a stream for faces:



Look for faces in the input video stream.

If a face is found, we apply facial landmark detection and extract the eye regions:



Apply facial landmark localization to extract the eye regions from the face.

Now that we have the eye regions, we can compute the eye aspect ratio (detailed here) to determine if the eyes are closed.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488|

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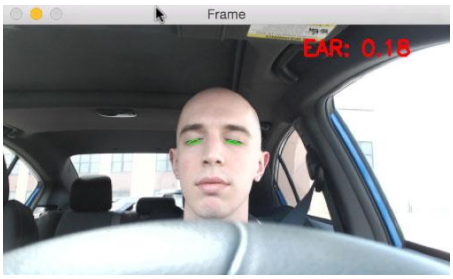
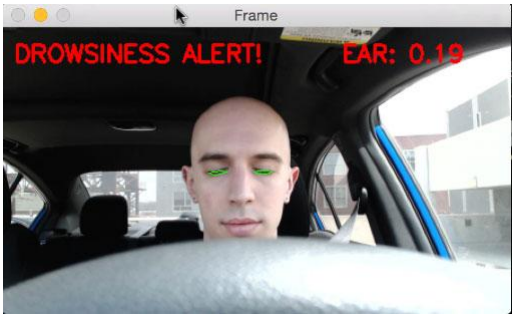


Compute the eye aspect ratio to determine if the eyes are closed.

If the eye aspect ratio indicates that the eyes have been closed for a sufficiently long enough amount of time, we'll sound an alarm to wake up the driver.



Sound an alarm if the eyes have been closed for a sufficiently long enough time.

As the results show, our drowsiness detector is able to detect when driver is at risk of dozing off and then plays a loud alarm to grab my attention.The drowsiness detector is even able to work in a variety of conditions, including direct sunlight when driving on the road and low/artificial lighting while in the concrete parking garage.

VIII. CONCLUSION AND FUTURE ENHANCEMENT

A driver alertness detection system was proposed based on fatigue detection in real-time. The proposed method easily detects the eye blink and the drowsiness. Information about the eyes position was obtained through image processing algorithms. Image processing offers a non-invasive approach to detect drowsiness without any annoyance and interference. An algorithm for performing face recognition was used. It was found that with this algorithm, a good measurement of the blink rate was obtained. The proposed algorithm was able to detect the eyes at medium and high illumination and independent of gender and age, but for optimal detection the camera had to be positioned as front as possible. In order to prevent the effects of poor detection due to insufficient light, night vision camera was implemented so that better results, unaffected by lack of brightness, will be obtained. Safe driving will be ensured by indicating the driver using a buzzer indicator. Drunk and driving accidents are one of the major problems now-a – days. This paper provides much advanced facility in now a day's life as it can easily have implemented in vehicles with multi stage testing such a way that we can avoid accidents caused by Drunken driving. Thus, by this we can reduce the alcohol related road accidents and hence these kinds of detectors have great importance in the future which we are going to implement with IOT. Through this project we present hardware programming of IOT device to facilitate as alcohol detector and preventive device. This work proposed a system to detect hand-held cell phone usage during the act of driving. The system uses ring indicator for detecting this activity. The system's output could be a warning that can regain the driver's attention exclusively to the vehicle and the road or a warning for a transport company or enable a buzzer. We are using the alcohol sensors to sense the consumption of the alcohol up to the pre-set percentage.

IX. FUTURE ENHANCEMENT

The cell phone detection enhanced by the hybrid system solution was possible with machine learning for Movement Detection and new features from Optical Flow as: horizontal movement, the area of connected components, and the dimensions of region movement detected. The increase of the frame per second processing and the image resolution.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488|

||Volume 8, Issue 6, June 2020||

REFERENCES

1. Data from NCRB, Government of India, available at http://ncrb.nic.in/StatPublications/ADSI/ADSI2014/ADSI2014.asp
2. "Internet of Things Global Standards Initiative". ITU. Retrieved 26 June 2015. - http://www.itu.int/en/ITU-T/gsi/iot/Pages/default.aspx
3. Z. Xiaorong et al, ―The Drunk Driving Automatic Detection System Based on Internet of Things‖, International Journal of Control and Automation.
4. J. Dai, J. Teng, X. Bai, Z. Shen, and D. Xuan. "Mobile phone based drunk driving detection." In 2010 4th International Conference on Pervasive Computing Technologies for Healthcare, pp. 1-8. IEEE, 2010
5. A. R. Varma, S. V. Arote, C. Bharti, and K. Singh. "Accident prevention using eye blinking and head movement." IJCA Proceedings on Emerging Trends in Computer Science and Information Technology-2012 (ETCSIT2012) etcsit1001 4 (2012)
6. V. Savania, H. Agravata and D. Patela , ―Alcohol Detection and Accident Prevention of Vehicle‖, International Journal of Innovative and Emerging Research in Engineering, Volume 2, Issue 3, 2015, pp 55-59
7. http://en.wikipedia.org/wiki/Global_Positioning_System.
8. http://www.dadss.org/breath-based-technology.
9. http://www.dadss.org/touch-based-technology.
10. S sahabiswas, S sourav, ―Drunken driving detection and prevention models using Internet of things‖, Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2016 IEEE 7th Annual, pp.1-16, IEEE,2016
11. Open CV 2.4.11.0 documentation; Open CV Tutorials; objdetect module;Object Detection.
12. Bagus G. Pratama, Igi Ardiyanto, Teguh B. Adiji "A Review on Driver Drowsiness Based on Image, Bio-Signal, and Driver Behavior" 2017 3rd International Conference on Science and Technology-Computer(ICST)
13. Keshav Seshadri1, Felix Juefei-Xu1, Dipan K. Pal1, Marios Savvides1 and Craig P. Thor2 "Driver Cell Phone Usage Detection on Strategic Highway Research Program (SHRP2) Face View Videos"
14. Omar Rigane, Karim Abbes, Chokri Abdelmoula and Mohamed Masmoudi-Micro Electro Thermal System Research Group (METS) "A Fuzzy Based Method for Driver Drowsiness Detection"
15. Brandy Warwick, Nicholas Symons, Xiao Chen, Kaiqi Xiong-Department of Computer Science "Detecting Driver Drowsiness using Wireless Wearables" 2015 IEEE 12th International Conference on Mobile Ad Hoc and Sensor Systems
16. Fethi SMACH, Johel MITERAN, Mohamed ATRI, Julien DUBOIS, Mohamed ABIDand Jean-Paul GAUTHIER "An FPGA-based accelerator for Fourier Descriptors Computing for color object recognition using SVM" Springer
17. Robert D. Foss, Ph.D. *, and Arthur H. Goodwin, M.A.-Highway Safety Research Center, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina "Distracted Driver Behaviors and Distracting Conditions Among Adolescents Drivers: Findings From a Naturalistic Driving Study"- ELSEVIER January 3, 2014.