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Cloud Based Driver Monitoring and Vehicle Diagnostics with OBD Telematics

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Abstract- ***Today's world is moving world. Everyone becomes multi-tasker. They want to handle multiple tasks at a time. While driving also the do another works like talking on the phone or another person, chatting, also they face traffic problems. So it is necessary to be aware while driving. If the driver mind is distracted, then it causes an accident. Today, 80% of death caused due to the accident and the main reason was the driver unawareness. To overcome this issue, we need to aware while driving.***

This article proposes the system for auto alerting the driver when it is distracted. Depending on the size of data to be collected from the OBD-II, numerous algorithms can be dedicated for data mining of DB such as a dedicated algorithm may be used for collecting data for distance covered by a vehicle, vehicle's speed, then for acceleration, rpm, etc. The reviews a range of issues pertaining to driver modeling for the detection and assessment of distraction. The areas addressed include 1) understanding driver behavior and distraction, 2) maneuver recognition and distraction analysis, 3) glance behavior and visual tracking, and 4) mobile platform advancements for in-vehicle data collection and human-machine interface.

Keywords: - Glance Behavior, Human Machine Interface, Face Detection, Distraction Detection, Alert Sound, OBD Data.

I. INTRODUCTION

Driver distraction [3][4][8] is defined as unsatisfactory or no attention given to activities critical for safe driving. Inattentiveness can either be an intentional or an unintentional distraction of attention by the driver. Driver distraction has been formally defined as anything that delays the recognition of information necessary to safely maintain the lateral and longitudinal control of the vehicle due to some action, object or person, inside or outside the vehicle. Driving distraction causes traffic accidents. The increasing use of navigation systems and infotainment systems has led to an increase in driver distraction. That requires encouraging the drivers shifting attention away from the fundamental driving task by compromising the drivers auditory, biomechanical, cognitive or visual faculties or combinations thereof. It is important to note that driver distractions are normally due to a competing trigger activity that may lead to driver inattention, which in turn decrease driving performance. Alternatively, other forms of driver distraction might not essentially be due to a trigger or competing activity, making inattention difficult to detect and even harder to control. By recognizing some of the reason for driver distraction, it is possible to isolate scenarios when the cause of distraction can be controlled.

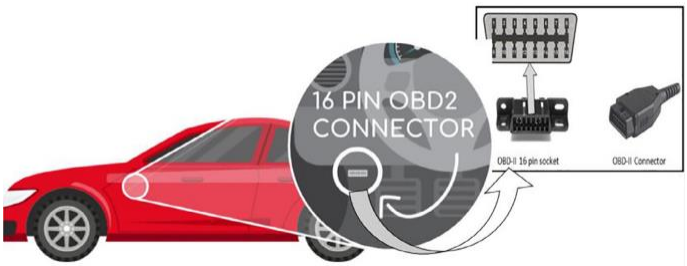

Figure: - OBD-II port in car (near driver wheel under dash board)

The proposed work is a realistic and cost-effective method for capturing/measuring/evaluating inefficient, uneconomical, and hazardous driving behaviors, including information on vehicle performance, fuel consumption, autonomy, and emissions. The suggested system includes a server that saves data from an OBD (On-board Diagnostics) scanner.

The suggested technology would identify tiredness automatically depending on the driver's performance. The many topics covered here include,

1) Understanding driver behavior,
2) Monitor the Driver distraction
2) Maneuver recognition and distraction analysis,
3) Glance behavior and visual tracking

The system first captures the drivers face image. Then by using HAAR classifier we can detect the face from captured images. If any distraction can happen then the alert sound is given to the driver. Driver status notification is sent to the admin.

II. LITERATURE SURVEY

This paper proposes to detect drivers who use mobile phones during driving which commonly causes accidents using a convolutional neural network (CNN) to detect these types of drivers which are also dangerous for passengers. Detecting driver's distraction can reduce and promotes safe driving. In order to detect distracted drivers who uses mobile phones during driving we record a driver's video through GoPro camera where every second of the footage is divided into 24 images. A deep learning algorithm is then applied on these images in order to train a distracted or non-distracted driver (Celaya-Padillaet al., 2019).

This paper [2] proposes a system which actively monitors driver vigilance level and alerts the driver to any insecure driving condition. Drowsiness detection of the driver is based on violations algorithm is used for face and eyes detection.
The paper gives an integrated driver state monitoring [3]. It combines gaze position, gaze variability, eyelid opening, as well as external environmental complexity from the driving scene to facilitate ToC in automated driving. This integrated system helps to inform relevant future research and development towards improved human-computer interaction and driving safety.

Driving data analysis includes driver behavior, driving data collection, driving algorithms and driving applications that would be useful for identifying the behavior of driver through different sensors, cameras, and different algorithms such as decision trees, Support Vector Machine (SVM), and most importantly the OBD-II device. This paper proposes identifying driving behavior using ADABOOST Algorithm and data preprocessing module which is Machine Learning, a branch of Artificial Intelligence. The mainelement of ADABOOST method is to generate a strong classifier by combining a lot of weak classifiers.
Input: Dataset to train, Output: Strong classifier. We are collecting the driving data for the training set and then tested using the ADABOOST algorithm (Chenet al., 2015). This paper proposes the use of OBD-II data of a vehicle information to examine the aspects that affects the driver's performance like speed, accuracy, driver expressions, etc.

Jheng-Syu Jhou et al. [5] proposed system is integrated with OBD-II, 3.5G wireless network, and cloud computing technologies. It can perform real-time vehicle status surveillance. The proposed system could classify the fault conditions depending on vehicle type and its model year. The system is able to greatly shorten the time to detect vehicle trouble condition. The system presented in this thesis has a very high value in the applications of vehicle maintenance and fleet management.

Vehicle data provided by OBDII (On Board Diagnostic) provides a data base for analyzing user driving behavior, which records vehicle data and driver behavior data during driving. The data gathered by OBD-II focused on dangerous driving behavior of the driver. This helps as an emergency driving; it will be notified through smart phones (internet connection) that warns to avoid any accidents. We calculate the possibility of dangerous driving by more than one km/min, which canraise the danger of dangerous driving. Classification method is used to predict the OBD-II data that is regression analysis which is a faster method. The data obtained from OBD-II contains four variables which are mileage(km), number of emergency brakes, maximum speed(km/hour), and driving time(hours) (Panet al., 2017).
In this paper, we have used the XGBOOST algorithm which is a decision-based algorithm used to predict, solve unstructured data and in neural networks. This paper proposes a Logistic Regression and XGBOOST algorithm for forecasting the presence of risk of accidents. We use a database of 2767 drivers under the age of 30 and their driving activity is recorded through the telematics program. The contained information from the insurance company about each driving. Logistic Regression uses a general linear method that incorporates coefficients. The XGBOOST algorithm can only detect the size of those particles if the primary reader allows it. XGBOOST and many other optimization algorithms are commonly used due to their precise estimates. While logistic regression and XGBOOST strive to estimate the incidence of accident claims without modeling procedures, the predicted effects of the XGBOOST algorithm were significantly higher than the computational rate (Pesantez-Narvaezet al., 2019).

III. PROPOSED SYSTEM

Here we propose an IOT Based Alert System for Drivers which can help to detect distraction of driver while driving. The system can help to reduce road accidents, by detecting the causes such as drowsiness, fatigue and to alert the driver.

The system will help to increase passenger safety and give information about the driver's behavior while driving to the admin. With the help of Haar cascade eye and face are detected from the captured image. If the driver is found to be yawning or sleeping or distracted from driving, then the continuous sound is played to alert him using buzzer and notification is sent to the driver. The

system also collects the data from the OBD sensor and monitors the vehicle conditions. Below figure shows the structural design of the proposed system.

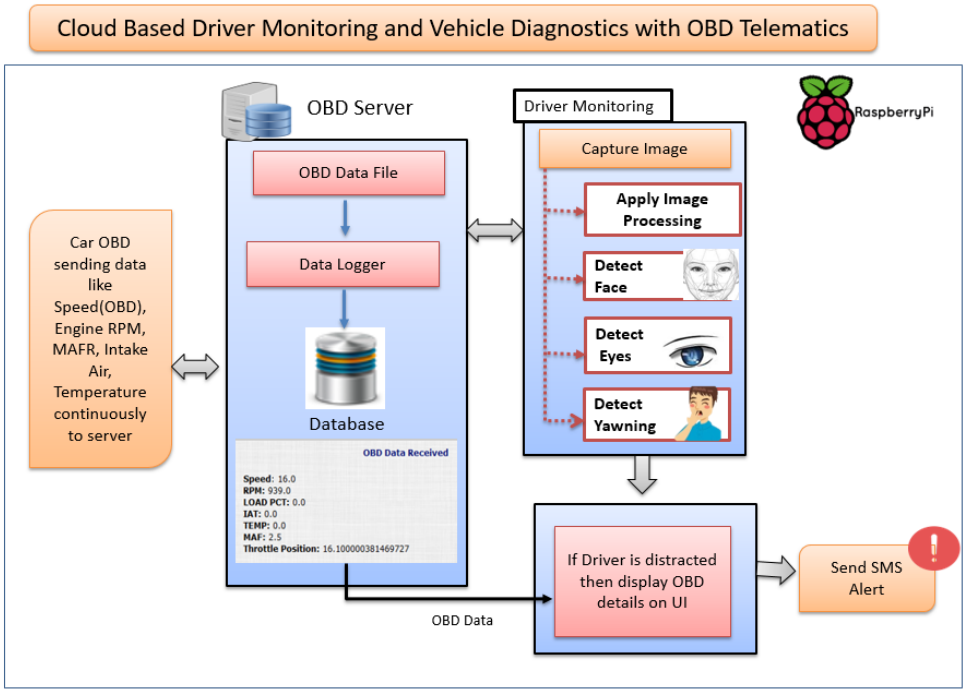

Figure 1: System Architecture

1. Data Gathering:

a. Vehicle data can be gathered using OBD port that is located below the steering wheel,

b. Once you connect an OBD-II interface it receives vehicle parameters such as Temp, engine load, RPM, VSS, fuel level, Oxygen Sensors.

c. In this project we will be using an already recorded OBD data and store it in database.

Capture Image: Raspberry pi based camera continuously captures the driver image and stores it on sd card. Capturing of images is done using Open CV and Java module.

Detect Eyes: Haar cascade is used to detect eye and face from the captured image. If a closed eye is found then an alert is made to driver.

Detect Yawning: Haar cascade is used to detect face from the captured image. Yawing is detected from the face image using eye, nose, and mouth order.

Detect Distraction from Driving: Project's primary aim is to identify alertness in driving. If the driver is found to be yawning or sleeping or distracted from driving, then continuous sound is played to alert him.

Play Buzzer, Glow LED and Notify Admin: Raspberry is connected to LED and buzzer modules. In case the driver is distracted, then buzzer is played and led glows ˆ

Send Data to Server: User driver statistics are synchronized to server.

A. System Flow

Figure 2 gives the detail flow of proposed system.

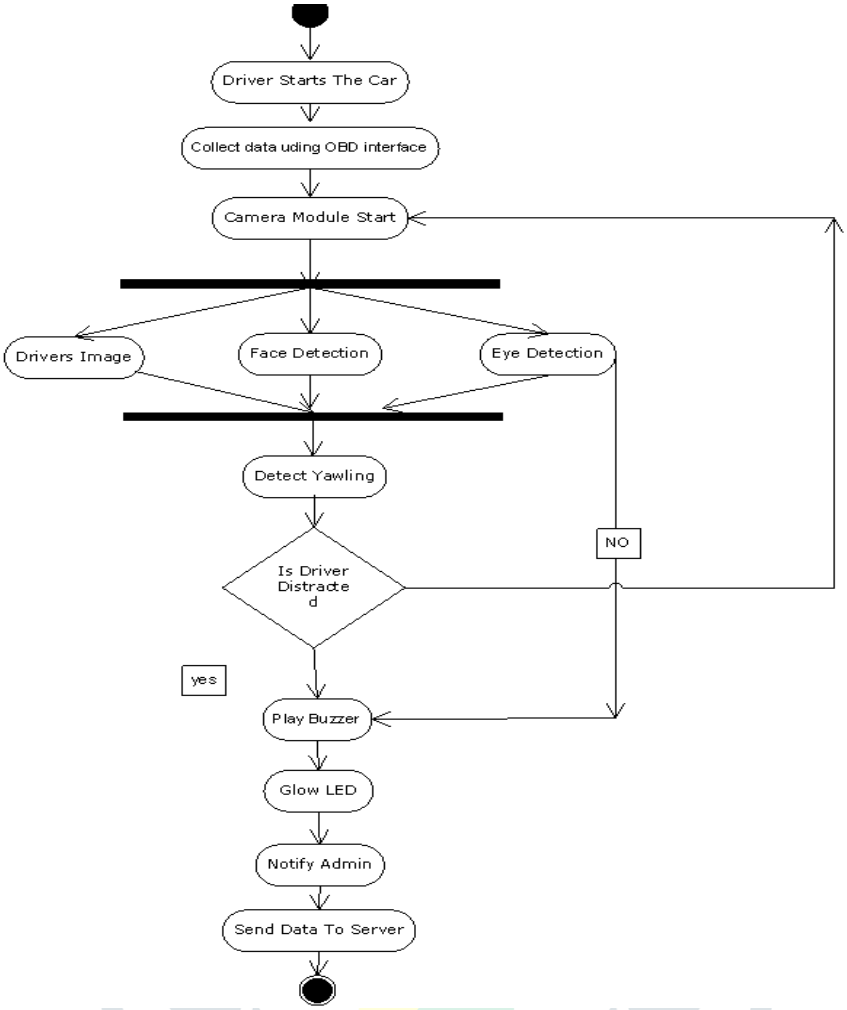

Figure 2: System Flow

IV. ALGORITHM USED

A. Haar Cascade Classifier

1. Haar Cascade is a classifier which is used for detecting a face from an image.
2. For training the classifier positive images which contain the wanted object i.e. face in the image and negative images which don't contain the face are needed. The classifier scans the features on the positive images and creates specific target values by using the sum values of the black area and the white areas in the features

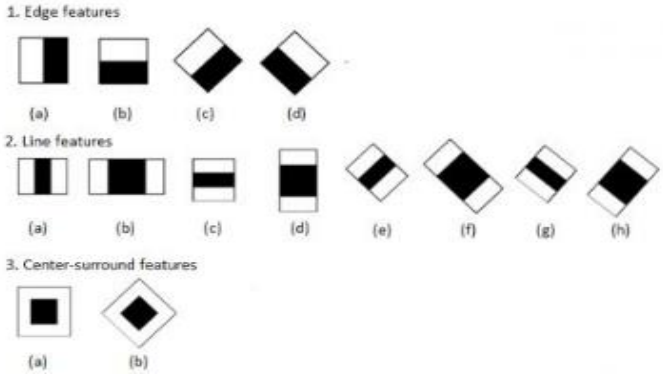

Fig. Features in the classifier

3. Classifier tries to create the most optimized target values for detecting and tracking the object by changing the sizes of the features. Features are the weak classifiers. Because they can't be a correct classifier with alone.
4. In an object, there are many features and a place where they are collected contains the wanted object in the image. Using a lot of positive and negative images facilitates the detection of the object in the image.
5. Classifier runs as mentioned above basically. Its speed of finding the objects in the image depends on the training method of the classifier and the number of positive and negative images. Training the Classifier for training the classifier positive and negative images are used. We train the classifier by giving positive images separately according to their type. The positive images are resized to 24*24 pixels and converted to a vector file with a script. After them, the number of positive images that will be used in training is determined. For determining this number (x) Equation (1) is used.

$$X \leq \frac{(\text{Number of Pos.Img.} - \text{Number of Neg.Img.})}{1+(\text{Number of Stages} - 1)*(1-\text{minhitRate})} \quad (1)$$

6. In this equation, the number of stages indicates that in how many stages the classifier reaches to the result and the min hit Rate indicates the minimum hit rate in every stage.
7. First of them represents the acceptable maximum false alarm rate for the training section of the object. The second one represents the memory allocated for training the classifier. After the training section, the XML files are created for each object types. By using these files, the objects can be detected and tracked.

V. EXPERIMENTAL RESULTS

The proposed system helps to detect the driver's behavior while driving. The camera continuously capturing the drivers image and by applying image processing we can detect the alertness in driving. The experimental setup of the proposed system is as shown in below figure 3.

Figure 3: Experimental Setup

VI. CONCLUSION

We develop a system, which Helps drivers in driving car effectively. Also increases passenger safety and give the information about the driver's behavior while driving and detect if the driver is yawning, sleeping or not concentrating on the road while driving. The proposed system can estimate the gaze which is used to warn the driver.

The system could warn the driver to pay attention whenever the driver's gaze gets distracted on a position other than the road. The Haar cascade algorithm used to detect Face, eye and yawning very efficiently as compared to the Viola-Jones algorithm which only detects frontal faces. Haar cascade has high performance as compared to viola Jones performance i.e. viola Jones performance cannot easily be estimated. Haar cascade has a good solution as compared Adaboost algorithm is a suboptimal solution. In future the warning mechanism will be given in the form of visual, audio or some kind of positive feedback can be incorporated that can influence driving behavior in a positive manner. If Driver is distracted, then display OBD details (Temp, engine load, RPM, VSS, fuel level, Oxygen Sensors) and alert is given to the user in case the driver is distracted.

REFERENCES:

[1] Shinko Y. Cheng and Mohan M. Trivedi,\Real-time Vision-based Info- tainment User Determination for Driver Assistance".2008 IEEE Intel- ligent Vehicles Symposium Eindhoven University of Technology Eind- hoven, The Netherlands, June 4-6, 2008.

[2] Christopher Cabrall, Nico Janssen ,Joel Goncalves, Alberto Morando,Matthew Sassman,Joost de Winter\Eye-Based Driver State Monitor of Distraction, Drowsiness, and Cognitive Load for Transitions of Control in Automated Driving" 2016 IEEE International Conference on Systems , Man, and Cybernetics' SMC 20161 October 9-12 , 2016' Budapest.

[3] Nanxiang Li ; Carlos Busso,\Predicting Perceived Visual and Cognitive Distrac- tions of Drivers With Multimodal Features", IEEE Transactions on Intelligent Transportation Systems (Volume: 16 , Issue: 1 , Feb. 2015) .

[4] Whui Kim ; Hyun-Kyun Choi ; Byung-Tae Jang ; Jinsu Lim \Driver distraction detection using single convolutional neural network", 2017 International Confer- ence on Information and Communication Technology Convergence (ICTC).

[5] Driver Modeling for Detection and Assessment of Distraction", John H.L. Hansen, Carlos Busso, Yang Zheng, and Amardeep Sathyanarayana, IEEE Signal Processing Magazine | July 2017 | 1053-5888/172017IEEE .

[6] Lorraine Saju, ChristeenaJestine, Farzana Yasmin, and Surekha Mariam Varghese, Drowsiness Detection System for Drivers using Haar training and Template Matching , International Journal of Engineering Applied Sciences and Technology, Vol. 1, Issue 6, pp. 106 - 110, 2016.

[7] T.D Prasanthi, K.Rajasekhar, T.V.Janardhanarao, and B.V.V.satyanarayana, Design of ARM-based face Recognition system using Open CV library , Inter- national Journal of Advanced Research in Computer.

[8] Andrade, C., Correia, J., Costa, C. and Santos, M.Y., 2019. Intelligent event broker: a complex event processing system in big data contexts.

[9] Andrade, C., Correia, J., Costa, C. and Santos, M.Y., 2019. Intelligent event broker: a complex event processing system in big data contexts.

[10] Celaya-Padilla, J.M., Galván-Tejada, C.E., Lozano-Aguilar, J.S.A., ZanellaCalzada, L.A., Luna-García, H., Galván-Tejada, J.I., Gamboa-Rosales, N.K., Velez Rodriguez, A. and Gamboa-Rosales, H., 2019. "Texting & Driving" Detection Using Deep Convolutional Neural Networks. Applied Sciences, 9(15), p.2962.

[11] Chen, S.H., Pan, J.S. and Lu, K., 2015, March. Driving behavior analysis based on vehicle OBD information and adaboost algorithms. In Proceedings of the international multiconference of engineers and computer scientists (Vol. 1, pp. 18-20).

[12] Huang, C., Wang, X., Cao, J., Wang, S. and Zhang, Y., 2020. HCF: a hybrid CNN framework for behavior detection of distracted drivers. IEEE Access, 8, pp.109335-109349.

[13] Pan, Y.J., Yu, T.C. and Cheng, R.S., 2017, May. Using OBD-II data to explore driving behavior model. In 2017 International Conference on Applied System Innovation (ICASI) (pp. 1816-1818). IEEE.

[14] Pesantez-Narvaez, J., Guillen, M. and Alcañiz, M., 2019. Predicting motor insurance claims using telematics data—XGBoost versus logistic regression. Risks, 7(2), p.70.