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DISTRACTED DRIVER DETECTION SYSTEM: A COMPARATIVE ANALYSIS

[1]Khushboo Srivastava, [2]Deepti Tiwari, [3]Sudha Singh
[1]Student, [2]Student, [3]Assistant Professor
CSE Department,
Shri Ramswaroop Memorial Group of Professional Colleges, Lucknow, India

Abstract: In recent years, accidents related to driver distractions have increased exponentially. It can be a nightmare for the safety of fellow passengers and other drivers on the road too. The number of cases due to distracted drivers is steadily increasing. Activities that contribute to this distraction include using mobile phones, talking, eating, drinking, engaging in radio, etc. The two different components of this system could be Drowsiness detection and distraction detection. This paper presents the reviews of existing writings related to drowsiness and distraction detection. Modules and libraries like OpenCV and Dlib benefit for drowsiness detection. And RGB-D sensors, HOG methods are being used for distraction detection purposes.

***Key Words* - Distracted-Driver, Dlib, Deep-learning; OpenCV, Computer Vision, Activity Classification**

I. INTRODUCTION

From the public transport system to foreign-born luxury cars, automobiles have developed exponentially in the last two decades. Automobiles are one of the greatest inventions of humankind which is used in every nook and corner of our everyday life. After independence, India has witnessed extraordinary advancement in the automotive sector. Cars became widely available since the early 20th century. Luxurious automobiles are now dominating the widely used ambassadors. A bunch of structural and technological changes has been made since then. Apart from being a boon for modernization, these automobiles have proved to be a bane as well. According to a WHO bulletin, casualties and property destruction in an accident are the chief pressures the transport quarter is meeting.

A World Health Organization (WHO) release affirms that per year nearby 1.35 million people lose their lives in road accidents while the data for wounded encompassing 50 million [1]. It asserts that nearby 3700 deaths and 1,37,000 get injured daily. The same source also corresponds to the fact that road accident contributes mainly to the death of people aged between 5 to 30. Young Males are more likely to be involved in road accidents than women, with mobile phone usage being the most common distraction.

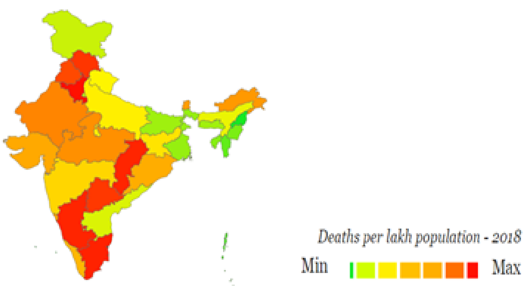

Fig 1. Deaths in India in 2018 [3]

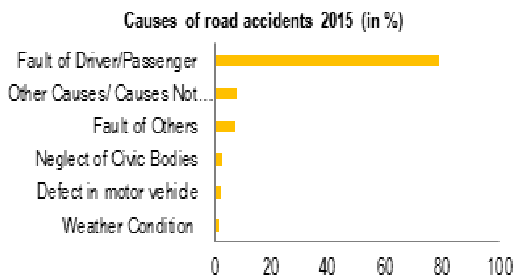

Fig 2. Causes of road accidents [3]

Indian roads stretch over an area of around 58,976,71 kilometers. Along with the increase in the population, a parallel rise in the number of vehicles on roads ultimately increases accident probability. Since 2000, road length has increased by 39%, and the number of transportations has risen by 158% [4]. A total of around 4,67,000 road accidents have been reported by States and Union Territories (UTs) in the year 2018 in India, taking about 1,51,400 lives and 4,69,418 persons were injured. As compared to 2017, accidents increased by 2.4% percent. Road accidents' severity has a 0.6 percentage increase in 2018 over the previous year [5]. In 2019, a total of 4,37,396 road accident cases were reported. The fatalities in road accidents have increased by 1.3%. In 2018, nearly 69.6 percent of young adults aged between 18 – 45 years were the victims of road accidents. The working-age group is contributing mainly to the share in death in road accidents [5]. Drivers are held responsible for 78% of accidents; 3% of accidents are caused by neglect of civic bodies [4].

Different reasons for road accidents include driver's fault, defect in the motor vehicle, neglect of civic bodies, and others. The mistake of driver or passenger contribute majorly to this, and this can be due to various reasons like over speeding, weather condition, condition of roads, drunk driving, drowsiness, distraction due to use of mobile phones, radio system, eating. Drunk driving is one of the principal reasons for accidents and is also a criminal offense. An increase in speed exponentially increases the risk of accident and the severity of injury during an accident. The severity in case of accidents caused by faster vehicles will be more as compared to slower ones. Weather conditions also play a pivotal role in accidents, essentially during winters due to fog and smog. The visibility is lesser and due to those risks of accidents are higher during the early morning. Accidents caused due to distraction can prove to be a very/ fatal one though the type of distraction associated with it can be minor. Distraction can be from either inside as well as outside the vehicles. Whereas inner distraction plays a significant role as talking on the telephone, texting, etc. Talking over the phone occupies a notable portion of the brain, and the inferior part handles the driving skills. This division of the brain hampers the reaction time and the ability to judge and is one of the reasons for crashes.

II. LITERATURE REVIEW

In Detection of Distracted Driver using Convolutional Neural Network, Bhakti Baheti et al. [6] have described a robust method for identifying and alerting the distracted driver. For classification purposes, they have used CNN as it has shown impressive progress in various tasks like image classification, object detection, action recognition, natural language processing, etc. They have used a dataset created by Abouelnaga et al. Safe driving, texting on mobile phones with right or left hand, talking on mobile phones with right or left hand, adjusting the radio, eating or drinking, hair and cosmetics, reaching behind, and chatting to a passenger are among the 10 groups in the dataset. The VGG-16 is used to detect distracted drivers, and it has a training set accuracy of 100 percent and a test set accuracy of 94.44 percent. The addition of dropout, L2 weight regularization, and batch normalization considerably enhanced the system's performance, resulting in 96.31 percent accuracy on the test set.

D.Feng, et al. [7] focused on activity identification of the distracted driver using photos and several machine learning methods in Machine Learning Techniques for Distracted Driver Detection. Their main goal was to develop a model with high accuracy for distinguishing between drivers who are driving safely and those who are engaging in a certain type of distracting activity. They employed five different classification methods on the State farm dataset: Linear SVM, Naive Bayes, SoftMax, Decision, and two-layer Neural Network. The two-layer Neural Network model performed considerably better on the dataset, with the highest accuracy of all the techniques at 92.24 %.

In Real-Time Detection of Driver Cognitive Distraction Using Support Vector Machines, John D. Lee et al. [9] collected data in a simulator experiment in which ten individuals engaged with an in-vehicle information system (IVIS) while driving. Following that, the data was used to train and evaluate both logistic regression and SVM models. How distraction was defined, which data were input to the model, and how the input data was summarized were all investigated as model characteristics. When distraction was determined using experimental settings and the input data were eye movement and driving metrics, the best performance was 96.1 % accuracy. These results demonstrated that eye movements and driving performance can be used to detect driver distraction in real-time.

In 2018, Real-time Detection of Distracted Driving based on Deep Learning et al. [10] proposed a camera-based driver distraction detection system that uses several deep learning architectures such as VGG-16, GoogLeNet, AlexNet, and ResNet to identify driver distraction. They employed a side camera to record a video of the driver's hand and body movement, which lasted 5 minutes each. Experiments on an assisted-driving testbed based on a commercial driving simulator were used to validate the CNN models. The detection was done in real-time on the Jetson TX1 embedded computer board, with an accuracy of 86-92 %.

Shruti Mohanty et al. presented their work at the IEEE international conference 2019 Design of Real-time Drowsiness Detection System using Dlib [11]. They used OpenCV and Python to develop the drowsiness detector system. The pre-trained facial landmark detector in the Dlib module is used to detect and recognize facial landmarks. Instead of using OpenCV's haar cascade, the histogram of oriented gradients (HOG) detector is employed because it has a low false-negative rate. The average real-time test accuracies for eyes and yawns achieved using Dlib were 82.02 % and 85.44 % pre-recorded footage, respectively.

In particular, the single-task CNN-LSTM model leads to a maximum performance of 88% AUC with 82% average recall for the drowsiness detection task [12]. [13] presents a Spatio-temporal approach which is applied to classify drivers' distraction level and movement decisions using convolutional neural networks (CNNs) based on the selection of 4 frames. Their approach has outperformed the previous one claiming the accuracy to be 99.10 %.

III. COMPARATIVE ANALYSIS

Table 1 Comparison between reviewed methodology

S. No.	PAPER TITLE	PURPOSE	METHODOLOGY	RESULT
1	Detection of Distracted Driver using Convolutional Neural Network	Developing a robust method for detection of distracted driver	CNN is used for image classification for various activities associated with driving.VGG-16 is used for the task of distracted driver detection	VGG gave an accuracy of 100% on the training set and 94.44% accuracy on the test set.
2	Machine Learning Techniques for Distracted Driver Detection	It was focused on activity detection of the distracted driver using images on various machine learning algorithms.	Different types of classification named Linear SVM, Naive Bayes, SoftMax, Decision, and two-layer Neural Network on the State farm dataset were used for classifying whether the driver is distracted or not.	Two-layer neural network model outperformed others giving an accuracy of 92.24%.
3	Real-time Distracted Driver Posture Classification	They have proposed a new dataset and a method for the classification of posture that can operate in a real-time environment.	The weighted ensemble of convolution neural networks was used for training raw images of hand, face, and face +hand both.	Ensemble gave an accuracy of 95.98%.
4	Real-Time Detection of Driver Cognitive Distraction Using Support Vector Machines	Developing a real-time approach for detecting cognitive distraction using drivers' eye movements and driving performance data	The data was gathered in a simulator experiment in which ten people drove while interacting with an IVIS. Both SVM and logistic models were trained and tested using the data models of regression.	When distraction was defined using experimental conditions, the input data were eye movement and driving measures, and the accuracy was 96.1 %.
5	Design of Real-time Drowsiness Detection System using Dlib	They implemented the drowsiness detector system using OpenCV and Python.	The pre-trained facial landmark detector in the Dlib package is used to detect and localize facial landmarks. Instead of using OpenCV's haar cascade, the histogram of oriented gradients (HOG) detector is employed because it has a low false negative rate.	Accuracies obtained using Dlib for eyes and yawn were 82.02% and 85.44% respectively.
6	Distracted and Drowsy Driving Modeling Using Deep Physiological Representations and Multitask Learning	They looked into the ability of numerous physiological signs to detect distracted and drowsy driving.	We compare the performance of three classical classifiers (Random Forests, KNN, and SVM), which have been widely used in the literature, to a deep CNN-LSTM network that learns spatio-temporal physiological representations.	For the sleepiness detection task, the single-task CNN-LSTM model achieves a maximum AUC of 88 percent and an average recall of 82 percent.
7	Real-time Detection of Distracted Driving based on Deep Learning.	focused on offering a camera-based driver attention detection system that is discovered utilizing a variety of deep learning architectures	They employed a side camera to record a video of the driver's hand and body movement, which lasted 5 minutes apiece. Experiments on an assisted-driving test bed based on a commercial driving simulator were used to validate the CNN models.	Jetson TX1 embedded computer board in real-time gave accuracy between 86-92%.
8	Real-Time Driver State Monitoring Using a CNN Based Spatio-Temporal Approach.	A spatio-temporal approach which is applied to classify drivers' distraction level	Convolutional neural networks (CNNs) are used to classify drivers' distraction level and movement decisions using a spatial-temporal method based on the selection of four frames.	Their method outperformed the previous one, with a claimed accuracy of 99.10 percent.

IV. CONCLUSION

Previous studies have proposed several methods for the detection and classification of distracted drivers. The literature survey resulted in understanding various approaches for this purpose. It is found that detection can be done using a camera set up in the car dashboard. Lighting, for example, plays a significant role in effective detection. In comparison, the Dlib module of the C++ library is quite good in detecting drivers based on facial landmarks. To classify the activities of the driver, image classification can detect the posture and movement of the driver. It is the need of the hour for the protection of drivers on the road.

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REFERENCES

[1] World Health Organization, “Road traffic injuries”, https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries

[2] World Health Organization, “Mobile Phone use: A growing problem of driver distraction”, https://www.who.int/violence_injury_prevention/publications/road_traffic/distracted_driving_en.pdf?ua=1

[3] Ministry of Road Transport and Highways’ “summary of accidents and death trend overall”, https://app.powerbi.com/view?r=eyJrIjoiMjIzMTY5MmQtNjZmZC00OTAyLTkzOGMtYWEyOWYwZDE1YjU2IiwidCI6IjViN2ExMDIzLTI1ODgtNGU3Yi05MjZlLTgwYzllY2EwNWQ4OCIsImMiOjEwfQ%3D%3D.

[4] PRS Legislative Research, “Overview of Road Accidents in India”, https://prsindia.org/policy/vital-stats/overview-road-accidents-india.

[5] Consumer Voice, “Road Accidents in India – A Stark Reality for All”, https://consumer-voice.org/global-road-safety-initiative/road-accidents-in-india-2018/

[6] Baheti, Bhakti & Gajre, Suhas & Talbar, Sanjay,” Detection of Distracted Driver using Convolutional Neural Network” (2018)

[7] D.Feng, Y. Yue. “Machine Learning Techniques for Distracted Driver Detection.” (2019).

[8] Abouelnaga, Yehya & Eraqi, Hesham & Moustafa, Mohamed, “Real-time Distracted Driver Posture Classification”, (2018)

[9] Y. Liang, M. L. Reyes and J. D. Lee, "Real-Time Detection of Driver Cognitive Distraction Using Support Vector Machines", IEEE Transactions on Intelligent Transportation Systems (2007)

[10] Sheng, Weihua & Tran, Duy & Do, Ha & Bai, he & Chowdhary, Girish, "Real-time Detection of Distracted Driving based on Deep Learning. (2018).

[11] Shruti M, Shruti V. H., Supriya P., and J. Manikandan, “Design of Real-time Drowsiness Detection System using Dlib,” IEEE International WIE on Electrical and Computer Engineering, 2019

[12] M. Papakostas, K. Das, M. Abouelenien, R. Mihalcea, and M. Burzo, “Distracted and Drowsy Driving Modeling Using Deep Physiological Representations and Multitask Learning,” (.2021)

[13] Kose, Neslihan & Kopuklu, Okan & Unnervik, Alexander & Rigoll, Gerhard. Real-Time Driver State Monitoring Using a CNN Based Spatio-Temporal Approach. (2019)