iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VI **Month of publication:** June 2022

DOI: https://doi.org/10.22214/ijraset.2022.45074

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VI June 2022- Available at www.ijraset.com

Driver Distraction Detection Using CNN

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Abstract: ***The ultimate aim of this project is to reduce the road accidents and there are several reasons for occurrence of large number of accidents. One of the main and biggest cause is the driver's distraction while driving, so by detecting the driver's distraction and giving an alert to maintain the driver's focus can ultimately reduce the number of accidents. The technology we worked with in this study follows deep neural networks and image processing to prevent accidents brought on by distracted driving. In order to categorize distracted drivers into distinct groups, a CNN-based approach with vgg16 technique is employed to extract the activities of the driver from the driver picture collection. The dataset of all images, which comprises of 10 activities in 26 distinct subjects including texting, using a phone while driving, looking into the mirror, safe driving, drinking, turning behind etc., is used to create a deep learning model. When a video input is given detection is done frame by frame and as soon as the distraction is detected an alarm is given to the driver. Results from 10 epochs demonstrate that all experiments had accuracy levels more than 75%, with the greatest result being 97%.***
Index Terms*: Convolutional Neural Network (CNN), image processing, vgg16.*

I. INTRODUCTION

A driver is said to be distracted when he/she undergo some activity by which they ultimately lose their concentration on the driving. The driver is the key actor in all aspects of vehicle control, including steering, braking, acceleration, and other actions. All traffic participants, their goods, and these fundamental responsibilities must be completed securely. Nevertheless, drivers frequently spend time and energy on pursuits aside from their essential duties. Secondary tasks are any other activities that drivers engage in while operating a vehicle. They can be broken down into interactions with in-vehicle information systems (IVIS), which include monitoring and managing vehicle state, navigating, providing information and entertainment, etc., and interactions with people, such as passengers and pets, or with items that people have brought into the car, like portable electronic devices.

Driver distraction is described as an action that a driver takes that diverts their focus away from their primary task of controlling the forward and lateral movement of their vehicle, thereby their ability to drive safely. It seems to be caused by some circumstance, action, thing, or person within or outside the car that forces or prompts the driver to divert their focus from their main goal. Driving comfort, entertainment, and navigation have been significantly improved thanks to an upgrade of IVIS. IVIS draws extra drivers' attention at the same time, though. It raises DD, which frequently causes car accidents with fatal outcomes. More than 420000 injuries are caused by distracted driving each year. Additionally, more than 3100 drivers pass away suddenly in car accidents per year in the USA alone as a result of DD.

II. EXISTING SYSTEM

The current research focuses on identifying driver sleepiness to prevent accidents. However, losing control due to sleep is only one of several distraction-related behaviours that contribute to accidents. For the purpose of DD detection, a number of machine learning techniques have also been developed. All of these systems employ the Boolean binary categorization of "distracted" or "not distracted." For true IVIS comparison, these solutions are not appropriate for various HMI systems. A DD level has never been accurately measured, particularly when using performance-based metrics and interfacing with IVIS.

A. Limitations of Existing System

1) The main idea of drowsiness detection is to reduce accidents but the solution in that sticks only to detect drowsiness and fails to detect other accidents causing activities.
2) Not flexible to detect other distractions to avoid accidents.
3) Some existing systems use the Boolean binary classification (distracted/ not distracted).
4) Issue with Low Accuracy. Since the real time usage needs god accuracy.

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III. PROPOSED SYSTEM

Here, we concentrate on identifying manual distractions in which the driver is occupied with activities other than safe driving and also pinpoint the source of the distraction. We provide a Convolutional Neural Network-based approach for this problem. We also work to maintain acceptable accuracy, which is necessary in real-time applications, while reducing computing complexity and memory requirements. The proposed idea attempts to identify driver distractions by using the activities recorded by the camera installed on the side opposite the driver's seat. The bodily movements are divided into ten categories, and it is stated that the driver is distracted if any of the activities or movements fit into one of these categories. Based on the evidence, we may the driver was distracted or not based on the body posture using a CNN-based technique.

IV. SYSTEM ARCHITECTURE

The architecture determines whether diagram given below gives the clear idea about how the model is trained from the images present in the training dataset. Here in this CNN model we use the vgg16 architecture, which is considered as the most stable structure in CNN. Initially the training dataset is divided into number of batches where each batch contains 32 images contains different activities. There are 30 batches formed in total. For training the model we have trained it in 10 epochs where in each epoch all the batches are trained one after the other considering the learning rate, accuracy and loss.

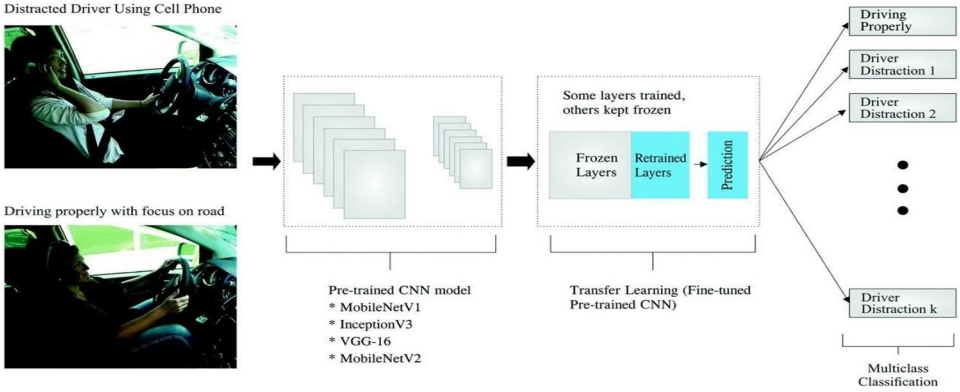

Fig.1 System Architecture

There are 10 classes in which a image can be classifies where 9 are considered as not safe/distracted activities and 1 among them is safe driving. When the classifier detects the image as not safe then an alert alarm is given to the driver so that driver can maintain his concentration.

Technical Architecture

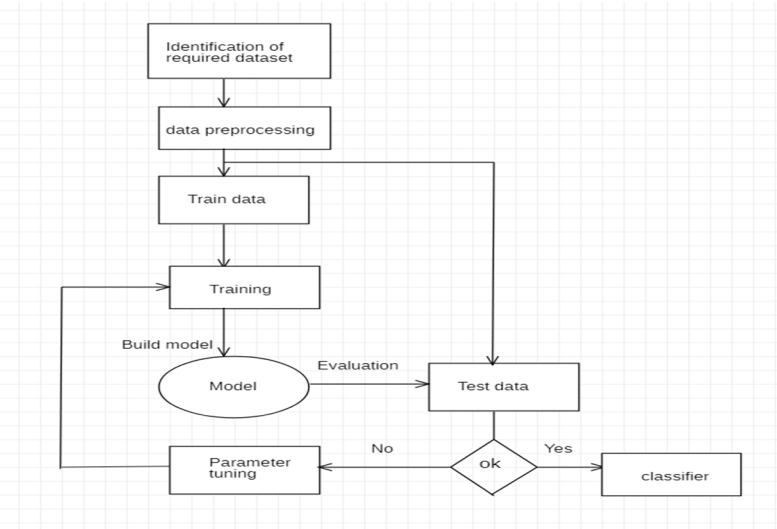

Fig. 1 Architecture for bulding the classifier

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Firstly the suitable dataset is taken and undergo all the preprocessing steps which includes data labeling, data annotation. After the data is splitted for training and testing where training dataset is used for trainig the model. Training dataset contains labeled data through which the classifier is built with good accuracy. After building the classisfier it is tesed with testing dataset which is unlabeled and shuffeled randomly.

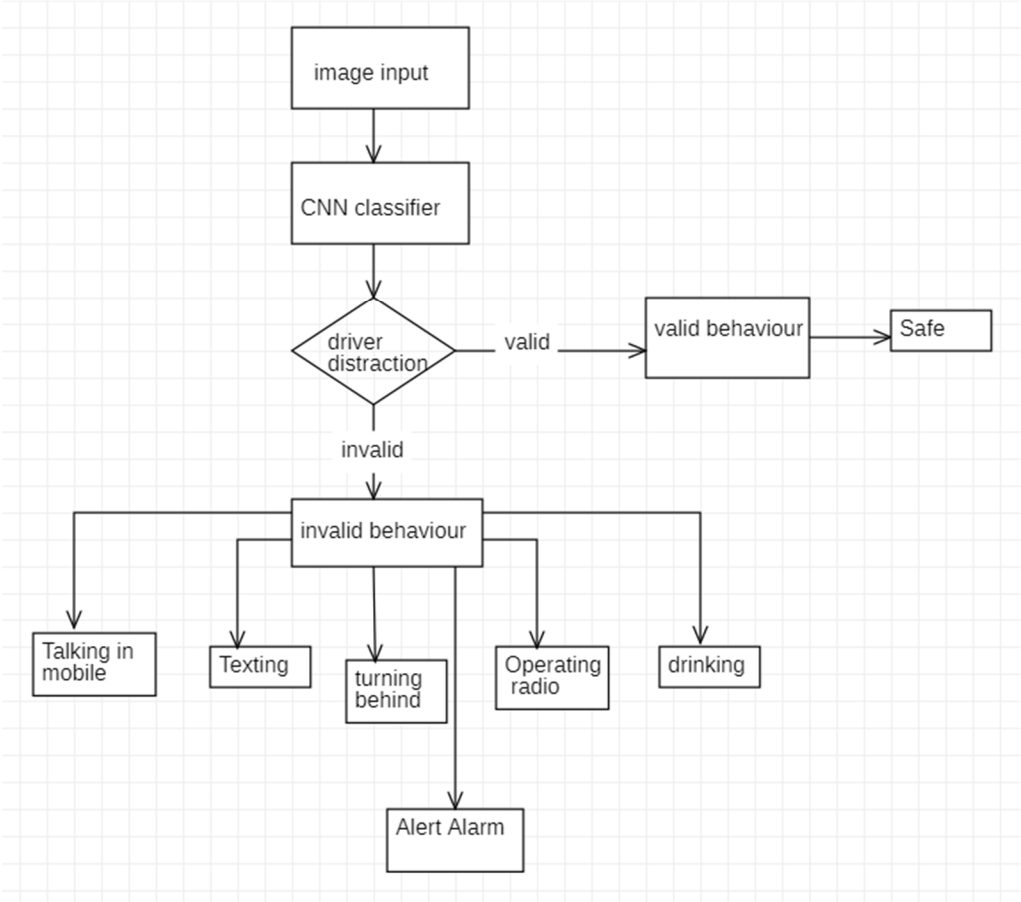

Fig.3 Working of the CNN classifier

When an image is given as input to the classifier it classifies it into any of those 10 classes depending on the driver's body posture. When the detection is safe the alarm does not blow but if the input image is unsafe as soon as the unsafe detection is made an alert alarm is given to the driver. Which eventually can reduce the number of road accidents occurring.

V. RESULTS

Fig.4 Driver detected while operating radio

Fig.4 Driver detected while turning behind

Fig.6 Driver detected while texting on phone

Fig.7 Driver detected safe driving

Here in the above examples fig4, fig5, fig6 are considered as distracted driving/unsafe driving whereas fig7 is considered as safe driving.

VI. CONCLUSION AND FUTURE SCOPE

The ultimate aim of this project is to reduce the road accidents which are caused due to the driver distraction. This model can detect 10 different types of activities carried by drivers which are done more frequently in the real world like texting, calling, turning behind etc. As soon as the distraction is detected an alert alarm sound is given to alert the driver. The classification model built has 97% accuracy which can be further improved by training it with large dataset.

Sometimes there may be mispredictions if there is no proper lighting available. Driver can do multiple things at same time and system fails to detect all of them. These are some of the limitations which can be resolved by training with large and flexible dataset in the future.

VII. AKNOWLEDGEMENT

This research was made possible thanks for the direction, encouragement, and inspiration from our faculty, who we hold in high regard and who have inspired us to pursue our interests in the field of deep learning. We are thankful to Mrs. Sangeeta Jawar, Assistant Professor, Dept of CSE, TKREC.

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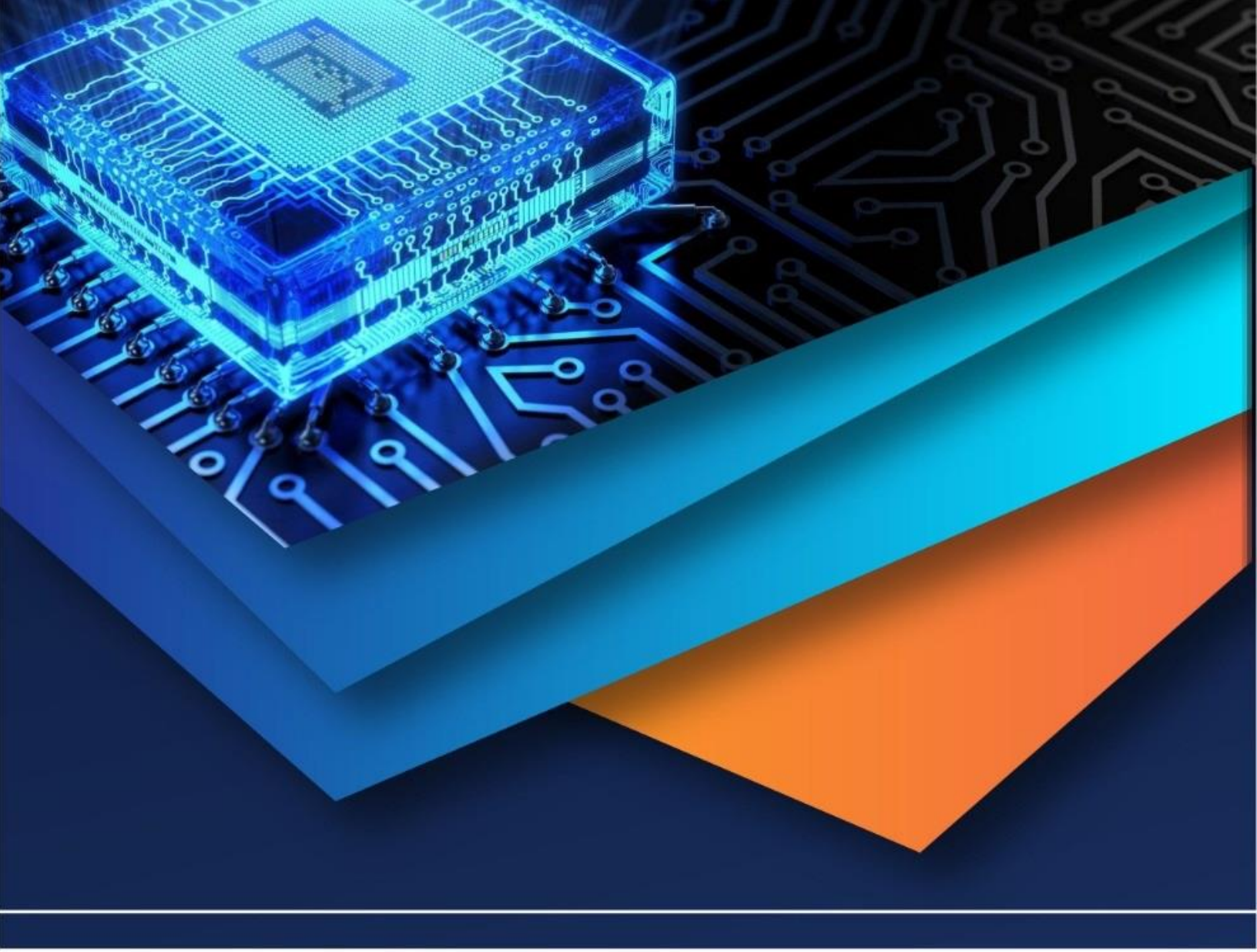

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