ROAD SAFETY BY DETECTING DROWSINESS AND ACCIDENT USING MACHINE LEARNING

[1]Kashyap K. Punyawan, [2]Krushnakumar H. Patle, [3]Shivam R. Kale, [4]Vikas K. Nagpure, [5]Supriya Sawwashere

J D College of Engineering and Management, Nagpur
Dr. Babasaheb Ambedkar Technological University, Lonere, India

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Abstract:

The rate of road accidents is rising continuously, the majority of an accident are caused due to people's negligence and ignorance. There is a lot of work going on continuously to reduce these numbers. Many solutions are based on IoT-based applications for identifying traffic accidents, but these systems have their drawbacks. Therefore, we aim to develop a system with the objective of helping the existing system to increase accuracy. we are currently focusing on highways to reduce accidents and want to utilize this system in cars in the initial phase. We can gain accuracy by using dash cams of the cars to monitor the road to detect accident by third-party vehicles. We have also added a feature where we will continuously monitor the driver's face and detect the negligent behavior of the driver e.g sleepy and not focused. Considering that the majority of modern automobiles have a camera system will be cost-efficient. We are utilizing machine learning algorithms to make the system more efficient and accurate. If an accident occurs, the nearby automobile will detect and reports it to the emergency services, and we may then act quickly to preserve the life of the person who is injured.

Keywords: Accident detection, Accident of highways, CNN, Drowsiness alertness System, Machine learning,.

1. Introduction:

According to different reports, traffic accidents claim the lives of around 1.3 million people each year. According to The Times Of India, the National Highways had the largest number of fatalities in road accidents in India, accounting for 34.5% (53,615 out of 1,55,622), followed by State Highways (25.1%). (39,040 deaths). In 2021, 62,967 (40.5%) people died in car accidents on other roads. According to a Times of India article, truck drivers get sleepy by driving continually to finish work on time, which is a significant cause of road accidents. Most of the time, when an accident occurs, the wounded individual does not receive sufficient emergency care; this is one of the consequences of rising deaths in road accidents. After considering all of these scenarios and causes we are developing this system which can help to reduce accidents, especially on highways. If the driver appears to be drowsy, the system sounds an alert, and we can propose that he should take a rest. At the same time, the road will be monitored by the system until it sees an accident. If an accident occurs system reports it to the emergency services, and we may act quickly to preserve the injured person's life. By incorporating this system into a car, we can save a priceless life of a person. This effort assists individuals in remaining safe and reaching their destination. This project has the potential to save the lives of thousands of people.

2. Literature Survey:

Vivek Upadhyay et. al. focuses to developing a system that can detect and report an accident. Their system provides methods to prevent an accident because of a speed breaker, blind turns, pits, stop signs, etc. Their Integrated Accident Prevention Detection and Response System (IAPDRS) prototype includes a GPS module to locate the accident sites and report the accident to nearby emergency services. In this proposed model they have used micro-controllers to report a message to the Emergency services like relatives, police, fire brigade, etc., whether an accident happens or not (Ex. If an accident happens then alerting message "ACCIDENT OCCURRED-NEED AMBULANCE" have been sent to the ambulance controller. In the research paper[2] provides an overview of automated traffic-detecting methods for accidents. They combine various deep learning algorithms with smartphone technology, GSM and GPS, vehicle ad-hoc networking, and mobile applications for use while traveling. The techniques promptly let emergency services know about the accident region, working to save lives and lower the number of fatalities related to accidents. These techniques have some drawbacks, including limited accuracy, low reliability, and hardware problems. Therefore, there is a chance to develop effective accident detection techniques. We also investigated how the problem of drowsiness is solved so far [3] they made a system that is completely based on Micro-controller, Sensors, GSM module, GPS module, and Power Source Accident Detection and Response System (ADRs) is an auto-detection system inside a vehicle based on a micro-controller platform that detects the type of accident, performs error checking, and notifies a central control system based on Matlab, informing them via text message of the location of the nearest medical personnel,

ambulance, hospital, police, and vehicle owner contact. The biggest disadvantage of the system is any component fails to detect location due to technical issues that are one of the projects.[4] So in further study, The goal of this work was to provide an analysis of accelerated weights and the adjustment coefficient parameter to increase the accuracy of classification of the MRBM training algorithm. they followed over-fitting and under-fitting issues, and modified RBM was used instead of conventional RBM. Multiple types of accidents have been identified in a variety of vehicles.[5] The author has used technology like Python, JUPYTER Lab, Image Processing, and Machine Learning. In this project, the eye counter is set to „20. The eye is detected as the eye is not blinking or not in a set countered number then shows a driver is drowsy in his vehicle dashboard. Mohsen Poursadeghigan, et. al. [6] driving simulator built on a virtual reality lab at the Khaje-Nasir Toosi University of Technology was used to analyse five suburban drivers. The Villa-Jones algorithm was used to identify the facial expressions and eye locations. Eye tracking criteria for detecting drivers' levels of drowsiness included eye blink duration and frequency as well as PERCLOS, which was used to validate the findings. Levels of tiredness in drivers are directly correlated with blink frequency and length. Data entered into the network for testing and data entered into the network for training had mean squared errors of 0.0623 and 0.0700, respectively. In the meantime, the detection system's accuracy rate was 93 percent. We observed that currently, many systems are using IoT devices which consist of RADAR and LIDAR systems, in this system the distance between vehicles is a problem, if the distance between vehicles increases, the system fails to do its work. In a few papers where an IoT system uses vibration to detect an accident if the machine breaks during an accident, a normal vehicle crash can result in an accident occurred response. The system is not able to determine whether an accident has occurred or not with high accuracy. We propose the solution by adding a feature where neighbour cars will detect the accident to maintain accuracy. When an accident occurs on the road, the neighbour's car or the passer-by car captures it and sends the coordinates to the emergency system using machine learning. Machine learning drastically increases the accuracy compared to existing methods. The system detects the sleepiness of the drivers and if the module detects that the driver is not alert, it wakes the driver up and asks him to take a break to maintain a healthy driving state. In smart cars, there are cameras placed on the car body to monitor the road which gives ease to the fundamental requirements of the proposed system.

3. Objective:

The objective behind the project is as follows:

3.1 Enhance safety on highways by reducing the number of accidents caused by inattentive or drowsy drivers. This objective can be achieved by using advanced technological solutions that can detect and alert drivers who exhibit signs of drowsiness or inattention while driving.

3.2 Reducing deaths in accidents on highways by informing emergency services for quick delivery of care to the person caught in an accident.

4. Problem Statement:

4.1 How to reduce accidents caused by drowsiness and alert the driver?

4.2 Give immediate medical assistance as soon as an accident is verified with high accuracy?

Despite various efforts to reduce accidents on highways, inattentive or sleepy drivers continue to pose a significant risk to road safety. These drivers often fail to react to potential hazards, leading to collisions and accidents. The problem is compounded by the fact that emergency services may not be immediately aware of these accidents, leading to delays in care delivery. Therefore, there is a need for an effective solution that can alert inattentive or sleepy drivers to potential hazards and inform emergency services for quick delivery of care, thereby reducing the number of accidents on highways.

5. Research Methodology:

6. This whole project is split into two modules:

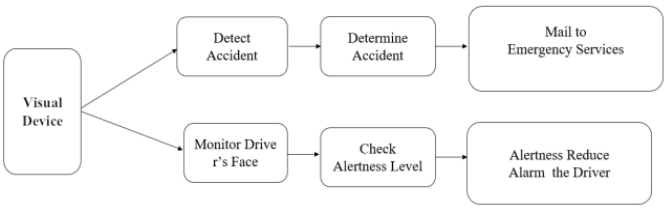


Fig: Basic process and working of module

6.1 Module-01

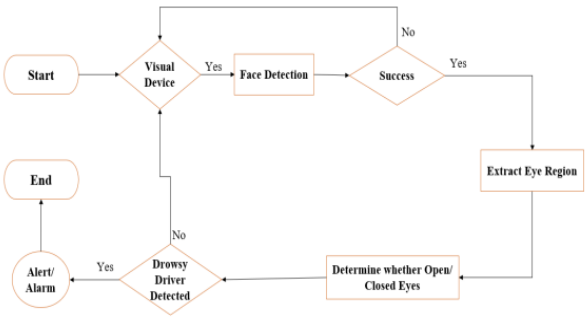
Maintain the driver's focus on driving. There are various reasons for why a driver is distracted like picking up the phone, being drunk, being lost in thought, etc. Out of studies, we are determining the behavior of a person from the face cam to prevent the driver from drowsiness or any other negligence.

5.2 Module-02

Accident detection system. This module continuously monitors the road and tries to identify the accident which was occurred or is occurring live. If it catches any of these scenarios, it will immediately send a message to the emergency services with the location. It will help to provide medical support as soon as possible.

7. Working:

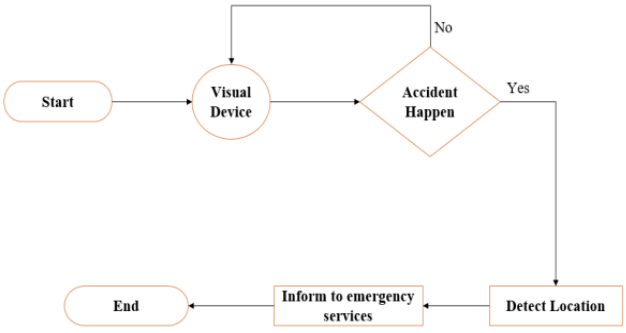
6.1. Driver's Drowsiness System:



In this project, the input video is captured by using a camera and then it will be extracted. The face and eye detection are done by using OpenCV with the help of 68-face landmarks. By using the Euclidean eye aspect ratio, we can get the eye blinking ratio, which helps to detect whether the eyes are open or closed. If the eyes and mouth ratio is less than 0.21 and greater than 0.35 respectively, it will detect that the driver feels sleepy. If the eyes are closed more than a given time interval it will warn the driver by playing the alarm or if eyes are open it will display the message "eyes open" and then it will go to taking the video of the driver and the process will go on

6.2. Accident Detection System:

The project uses a data set of dash-cam videos that include both accident and non-accident footage. The data set was collected from various sources and includes a range of lighting conditions, weather conditions, and types of accidents. The data set was split into training and testing sets, with 70% of the data used for training and 30% used for testing. The model processes the video frames and extracts features from each frame using convolutional layers. The feature maps are then passed through fully connected layers to produce a binary classification output:



Accident or non-accident. The CNN model used in this project consists of three convolutional layers followed by two fully connected layers. The convolutional layers use a 3x3 kernel and a stride of 1. The first convolutional layer has 32 filters, the second has 64 filters, and the third has 128 filters. Each convolutional layer is followed by a max-pooling layer with a 2x2 kernel and a stride of 2. The output of the third convolutional layer is flattened and passed to the fully connected layers. The first fully connected layer has 512 neurons, and the second has two neurons, representing the binary classification output: accident or non-accident. If the model detects an accident, it sends an alert to emergency services, either by triggering an automatic alert system or notifying the driver to call for help.

7. Result:

7.1Driver's Drowsiness System:

The accident detection system using the camera has successfully run: image (9) showing the active driver's status and image(10) displays the drowsy driver's status. These images can be used to identify and monitor drivers who may be at risk of causing accidents due to drowsiness, allowing for early intervention to prevent accidents and promote road safety.

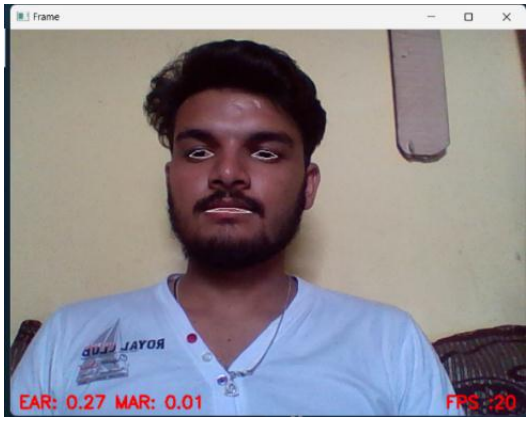


Fig. 9 Sleepy face

Fig. 10 Active face

7.2 Accident Detection System:

The accident detection system using a dash cam has produced this result. In this three images, The first image(11) shows a status of "no accident", indicating that the system has detected no unusual events or danger on the road. The second image(12) shows that an accident has been detected, allowing for prompt response to the situation. The third image(13) displays an SMS alert that has been sent, providing necessary information about the accident to the relevant authorities and emergency services. The system's accurate detection and timely alerts can help to minimize the severity of accidents and prevent loss of life or property damage on the road.

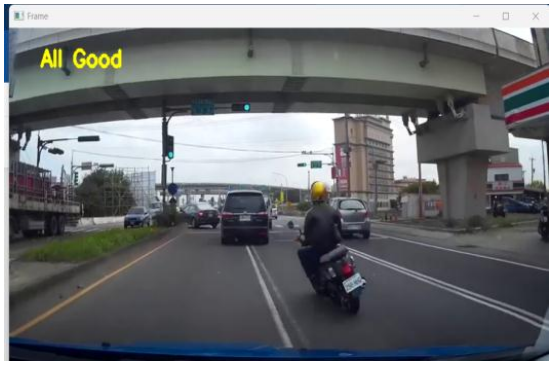


Fig. 11 No Accident

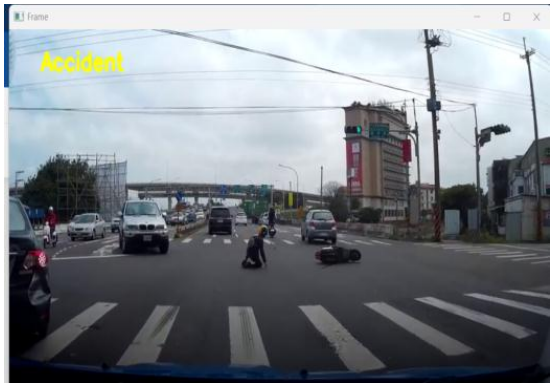


Fig. 12: Accident

Fig 13: sms alert sent

8. Advantages:

1. Reduce the Rate of Road Accidents by helping existing systems.
2. This system is more cost efficient and can be used in smart auto-driving cars
3. It improves self-driving capability.
4. It would help to reduce fatalities due to vehicle accidents by decreasing the response time of emergency services.

9. Disadvantages:

1. Accuracy might be reduced due to heavy rain.
2. lack of Internet Coverage might affect the system in sending the exact location of the accident spot
3. Require a special unit to analyze the accident images in case it sees a scrap of a car it will detect the accident.

10. Future Scope:

1. The Possible Future Implementation is if a driver gets drowsy more than one time then the Engine of the car will turn Off Automatically with an alarm
2. If he tries to restart the car without taking a break, then the system will share his car details with the police for further action on it.
3. This system can be implemented in heavy motor vehicles(Trucks, Buses, etc.)

11. Conclusion:

This project will provide effective and optimized software that can alert the driver if he is sleepy or distracted. The model will detect the accident using a dash cam more accurately to deliver immediate help. The project will reduce accidents on highways which will drastically reduce the death rate due to accidents.

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