IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

LANE AND SPEED BREAKER WARNING SYSTEM FOR VEHICLES

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Abstract: In our rapidly urbanizing world, ensuring road safety is a pressing concern. The development of advanced driver assistance systems has become imperative to reduce accidents and enhance driver awareness. Maintaining full attention on the road is essential to prevent accidents. Distracted or inattentive driving is a leading cause of traffic accidents. When drivers are not fully engaged, their reaction times are slower, and they may fail to respond to sudden or unexpected events on the road. This study presents a comprehensive Lane and Speed Breaker Warning System designed to improve the safety of vehicles on the road. Fueled by cutting-edge machine learning techniques and trained on data containing videos of lanes and speed breakers, a system can be created that proficiently identifies lanes and speed breakers, offering timely alerts to drivers. This paper meticulously delves into the broader implications of our work in striving to prevent accidents on the road. As urbanization and vehicular traffic increase, road safety has never been more crucial. The Lane and Speed Breaker Warning system is a proactive step towards mitigating risks. By harnessing the power of machine learning, we empower the system to perceive and respond to its surroundings. This not only enhances driver awareness but also minimizes the potential for accidents and discomfort while driving. The Lane and Speed Breaker Warning System exemplifies a versatile solution for monitoring road conditions.

Keywords: Lane and Speed Breaker Warning System, Road Safety, Machine Learning, Accident Prevention

1.INTRODUCTION

In an era of unprecedented urbanization and surging vehicular traffic, the imperative of ensuring road safety stands as a towering concern. Machine Learning algorithms can precisely detect lane markings and speed breakers in complex road conditions, enhancing the reliability of warning systems. Machine Learning allows for real-time analysis of data, enabling immediate alerts to drivers when they approach speed breakers. This rapid response is crucial for accident prevention. The Lane and Speed Braker warning system actively contribute to driver awareness, helping to prevent accidents caused by slow reaction times. The Lane and Speed Breaker Warning System, using machine learning, leverages machine learning algorithms to analyze data and detect lanes and speed breakers, providing alerts. Numerous machine learning methods can be employed for the Lane and Speed Breaker System, such as Convolutional Neural Networks.

2. LITERATURE REVIEW

The system proposed by Heltin Genitha C, Rajaji P, Rahul S [1] gives the accuracy of detection of lane and speed breaker 78%-65% in different conditions and they used FCN and YOLOv5 model and real time data. They used Roboflow dataset for speed breaker detection and Udacity dataset for lane tracking. The predicted accuracy for Normal, shadowed and multiple speed breakers are 78%, 65% and 75% respectively in different environment condition.

Shoubiao li et al. [2] has developed a lane detection network based on kernel convolution and location, which can achieve a lane detection in complex scenes. They used the location boundary of lanes. To improve accuracy they used center sampling strategy and designing B-CoordConv,the method achieves a 79.50% F1 score on CULane and a 97.17% F1 score.

Rahul Ramakrishnan et al. [3] proposed a system for detection of speed breaker and alerting a driver for oncoming speed breaker on the same route, they used a GPS coordinates .The hardware i.e. Sensors detects a speed breaker based on the proximity of the vehicle with the road level and then sends the Coordinates of the speed breaker to an online database ,then driver get notified.

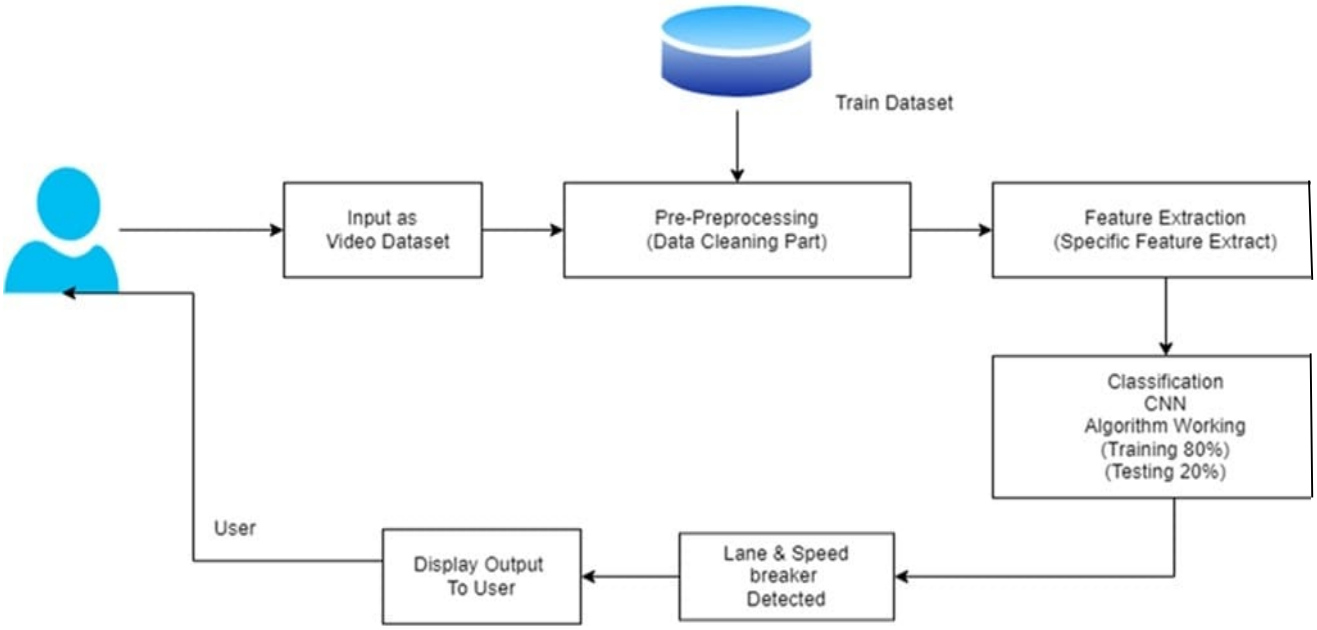
Samia Sultana , Boshir Ahmed, Manoranjan Paul, Muhammad Rafiqul Islam , And Shamim Ahmad[4] addressed a system vision based for multi lane detection in challenging condition using the angle and length based constraints followed by Hough Transform. Propose a novel lane tracking technique, to predict the lane position of the next Frame by defining a range of horizontal lane position (RHLP) along the x axis which will be updated with Respect to the lane position of previous frame. gives average detection rate is 97.55%.

Zahid Hasan, Samsoon Nahar Shampa et al. [5] used CNN and R-CNN for detection of potholes, deep ridges and speed breaker by using the Smartphone camera. They used custom built Bumy dataset which gives the accuracy upto 87%. The paper discusses the use of smartphone cameras and Convolutional Neural Networks (CNNs) for detecting potholes and speed breakers on roads. This could involve using image processing techniques and machine learning to identify and alert drivers about road hazards.

The authors Meng 1,2, Jing Yuan 3, And Shubin Li et al. [6] Proposed a system that detect the lanes track them in multilane condition, they focused on improving the lane change rate. In traffic conditions the lane change parameter and slope have important effects on the stability of traffic system. They distances and equations to select the efficient lane during complex condition.

Fuquan Pan Lixia et al. [7] and other authors proposed a Lane-Changing Risk Analysis in Undersea Tunnels Based on Fuzzy Inference. The authors analyzed lane-changing behaviors in an undersea tunnel, focusing on three types: free, compulsory, and collaborative lane-changing. They employed fuzzy inference models to assess the associated risks. The study strongly recommends prohibiting compulsory lane-changing in downhill sections due to its extremely high risk, potentially leading to traffic accidents.
The fuzzy inference models and risk assessment provide valuable insights for traffic safety management in undersea tunnels and offer suggestions for drivers to ensure safe navigation in these environments.

3. SYSTEM ARCHITECTURE



A system architecture for a lane and speed breaker warning system for vehicles using video input typically involves several components and stages:

1.Input Dataset: This is the initial source of data. in this case, it's video feeds from the vehicle's cameras. these videos are continuously captured as the vehicle moves.
2.Video Preprocessing: Before feeding the videos into the system, preprocessing may include tasks such as frame extraction and stabilization to ensure a consistent and clean input for analysis.
3.Feature Extraction: Feature extraction involves analyzing the video frames to identify relevant information. for lane and speed breaker detection, some of the features might include edge detection, color analysis, and object tracking. features are essentially the characteristics of the video frames that can be used for classification.
4.Classification CNN Algorithm: Convolutional neural networks (CNN) are commonly used for image and video analysis. in this stage, a CNN model is used to classify the features extracted from the video frames. for lane detection, it might identify lane markings, and for speed breaker detection, it might identify road irregularities.
5.Lane And Speed Breaker Detection: Once the CNN has processed the features, it can classify whether the video frame contains relevant information regarding lanes or speed breakers. this classification can trigger alerts when lanes are deviated from or when a speed breaker is approaching.
6.Warning System: Based on the results of the classification, the warning system activates. for lane deviations, it might provide warnings such as lane departure warnings, and for speed breakers, it could trigger alerts to slow down or provide notifications to the driver.
7.Output And Feedback: The warnings and alerts generated by the system are presented to the driver. this feedback could be in the form of visual, auditory, or haptic alerts, ensuring the driver is aware of the road conditions.
8.Data Logging And Storage: It's essential to log data for future analysis and system improvement. this can include storing video footage, feature data, and the results of the CNN classification for later analysis and system refinement.
9.Real-Time Processing: The system must perform these tasks in real-time, as it needs to continuously process the video feed and provide immediate warnings to the driver.
The system architecture combines computer vision (feature extraction and CNN) with real-time processing and feedback mechanisms to enhance driver safety by detecting lanes and speed breakers.

4. CONCLUSION

Lane and Speed Breaker Detection systems have already made significant contributions to road safety and transportation efficiency. These technologies have evolved over the years, and their future holds even more promise. As the world of transportation continues to change and adapt to new challenges, these systems will play an integral role.

In conclusion, these systems offer immense potential to enhance road safety, traffic management, and overall transportation infrastructure. The incorporation of artificial intelligence, machine learning, and real-time data analysis will continue to improve the accuracy and effectiveness of these systems. As they become more widespread and integrated into various aspects of transportation, the future of Lane and Speed Breaker Detection systems looks promising, ensuring safer and more efficient roadways for all.

5. FUTURE SCOPE

1. Advanced Automation: Lane and Speed Breaker Detection can be integrated into advanced driver-assistance systems (ADAS) and autonomous vehicles. This technology can help improve safety and navigation for self-driving cars, paving the way for safer and more efficient transportation.

2. Predictive Maintenance: Lane and Speed Breaker Detection systems, when deployed on a larger scale, can contribute to predictive maintenance of roads and highways. Authorities can identify and address road issues before they become severe, saving resources and preventing accidents.

3.Multi-Modal Transportation: These systems can be adapted for various modes of transportation, including bicycles and pedestrians. This can enhance the safety and experience of non-motorized travelers.

4. Environmental Impact Assessment: Lane and Speed Breaker Detection systems can be used to monitor and assess the environmental impact of road construction and maintenance. This data can be crucial for making infrastructure decisions that align with sustainability goals.

5. Cross-Platform Compatibility: Future systems should aim for cross-platform compatibility, ensuring that different types of vehicles, from conventional cars to electric scooters, can benefit from lane and speed breaker detection.

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