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Accident Detection and Nearby Patrol Alert System Using AI &ML

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Abstract: ***Intelligent communities are utilizing different creative ideas to improve the quality of human life. Due to fast growing sizes of our cities, need of travelling is constantly increasing, which in turn has increased count of vehicles on the roads. Increasing number of vehicles on the roads has brought about numerous difficulties for Street Traffic Management Authorities. Amongst different traffic related issues, road accidents are something worth giving attention to and have to be on the priority list. This project describes various automatic road accident detection techniques, which automatically detect accidents using surveillance videos in real-time and intimates the event scenario to control room and the main uniqueness of the system is it automatically estimates the crash value of the incident and intimates to the user. The proposed method assumes that traffic accident events are described by visual features occurring through a temporal way. Therefore, a visual features extraction phase, followed by a temporary pattern identification, compose the model architecture. The visual and temporal features are learned in the training phase through convolution and recurrent layers using built-from-scratch and public datasets. An accuracy of 98% is achieved in the detection of accidents in public traffic accident datasets, showing a high capacity in detection independent of the road structure.***

Keywords: Road accident detection, Intelligent transportation systems, Vehicle collision detection, Automated accident detection, Sensor networks, Machine learning, Computer vision Data fusion, Wireless communication, Real-time monitoring, Traffic surveillance, Incident detection,Emergency response, Geographic Information Systems (GIS), Traffic safety.

I. INTRODUCTION

According to the data provided by World Health Organization (WHO) in 2018, out of total road accidents in the world, 6% accidents take place in India where the number vehicles present on roads is only 1% of the world's total vehicles. In 2018, nearly 73% of the deaths in South Asia region due to road accidents occurred in India. Also, according to World Health Organization (WHO)'s report in 2017, road accident is one of the most probable reason out of twelve reasons of death. It is also the ninth most common reason of early death, and the tenth most common cause for permanent disability. This shows that the road accidents are something worth giving attention to and have to be on the priority list of the researcher's agenda to provide timely help at the place of accident and save lives, especially in the densely populated areas.There are different factors that cause traffic accidents. Among the most common factors that increase the probability of their occurrence are the geometry of the road , the climate of the area, drunk drivers, and speeding . These accidents can cause harm to the people involved and, although most of these present only material damage, each one affects people's quality of life in terms of both traffic mobility and personal safety. Thanks to technological advances, video cameras have become a resource for controlling and regulating traffic in urban areas. They make it possible to analyze and monitor the traffic flowing within the city. However, the number of cameras needed to perform these tasks has been increasing significantly over time, which makes control difficult if automation mechanisms are not implemented because the number of professionals needed to comply with all the points also increases. Several approaches have been proposed to automate tasks within the control and follow-up process. An example of this is a system based on video camera surveillance in traffic. Through these, it is possible to estimate the speeds and trajectories of the objects of interest, with the objective of predicting and controlling the occurrence of traffic accidents in the area. The scientific community has presented different approaches to detect traffic accidents . These include statistics-based methods, social network data analysis , sensor data , machine learning, and deep learning . These latest techniques have presented improvements in various fields of science, including video based problem solving (video processing).

II. OBJECTIVE AND SCOPE

The objective of the Accident Detection and Nearby Patrol Alert System using AI & ML is to develop an intelligent and proactive system capable of detecting road accidents in real¬ time and promptly alerting nearby emergency services or patrol units.

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The system aims to leverage artificial intelligence (AI) and machine learning (ML) algorithms to analyze various data sources such as vehicle sensors, surveillance cameras, and communication networks to accurately detect accidents and assess their severity. By employing advanced AI & ML techniques, the system seeks to improve response times, enhance traffic safety, and ultimately reduce the number of fatalities and injuries resulting from road accidents. Real-time Accident Detection: The system will continuously monitor data from various sources including vehicle sensors, traffic cameras, and communication networks to detect road accidents as they occur. Accident Severity Assessment: Utilizing machine learning algorithms, the system will analyze relevant data to assess the severity of detected accidents, distinguishing between minor incidents and more critical situations requiring immediate attention. Nearby Patrol Alert: Upon detecting an accident, the system will automatically generate alerts and notify nearby patrol units or emergency services, providing them with precise location information and details about the incident. Integration with Traffic Management Systems: The system will be designed to integrate seamlessly with existing traffic management systems, enabling coordinated responses and traffic rerouting if necessary to minimize congestion and facilitate emergency vehicle access. AI-driven Decision Support: Advanced AI techniques will be employed to provide decision support capabilities, assisting emergency responders in prioritizing and optimizing their actions based on real-time traffic conditions, accident severity, and available resources. Data Privacy and Security: The system will prioritize the privacy and security of collected data, adhering to relevant regulations and employing encryption and access controls to safeguard sensitive information. Scalability and Adaptability: The system will be scalable to accommodate varying traffic volumes and adaptable to different geographical locations and road conditions, ensuring its effectiveness across diverse environments. Performance Evaluation and Optimization: Continuous monitoring and evaluation will be conducted to assess the system's performance, identify areas for improvement, and refine AI & ML models to enhance accuracy and reliability. User Interface and Accessibility: An intuitive user interface will be developed to enable easy access and interaction for both emergency responders and system administrators, facilitating efficient operation and maintenance of the system. Research and Development: The project will involve ongoing research and development efforts to explore emerging technologies and methodologies in AI & ML, with the aim of further enhancing the capabilities and effectiveness of the Accident Detection and Nearby Patrol Alert System.

III. METHODOLOGY

In the proposed system would be focusing on creating the positive or negative bags of video instances for the training purpose, gathered from the dataset. Then extract features of that video and then give ranks to the bags to classify them as Accident or normal incident which are trained on normal videos are used to extract deep representations. An CNN is an Convolution neural network that learns to compress data from the input layer into a short code i.e. deep representation, and then uncompressed that code into something that closely matches the original data. The accident is being detected by reconstructing error and likelihood of deep representation. The false alarm rate is being reduced by the intersection point of vehicles trajectories. And finally the accident image is sent to control room and the estimation is calculated. PREPROCESSING: Images come in different shapes and sizes. They also come through different sources. Taking all these variations into consideration, we need to perform some pre-processing on any image data. RGB is the most popular encoding format, and most “natural images” . Also, among the first step of data pre-processing is to make the images of the same size. Here we have used auto resizing for training to make all the images in the dataset to convert in to same resolution. FEATURE EXTRACTION: The process of feature extraction is useful when you need to reduce the number of resources needed for processing without losing important or relevant information. Feature extraction can also reduce the amount of redundant data for a given analysis. Also, the reduction of the data and the machine’s efforts in building variable combinations (features) facilitate the speed of learning and generalization steps in the machine learning process. IMAGE LABELING AND DATASET DISTRIBUTIONS: All subjects were independently labelled twice as “normal” or “ACCIDENT” by two set of images. Labelling was first evaluated with the original images on a picture archiving communication system (PACS) and secondly with the resized images that were used for the actual learning data. Datasets were defined as the internal dataset and temporal dataset, with the temporal dataset used to evaluate the test. The internal dataset was randomly split into training (70%), validation (15%), and test (15%) subsets. The distribution of internal the test dataset consisted of 50% Accident images, and 50% Normal

IV. CONCLUSIONS

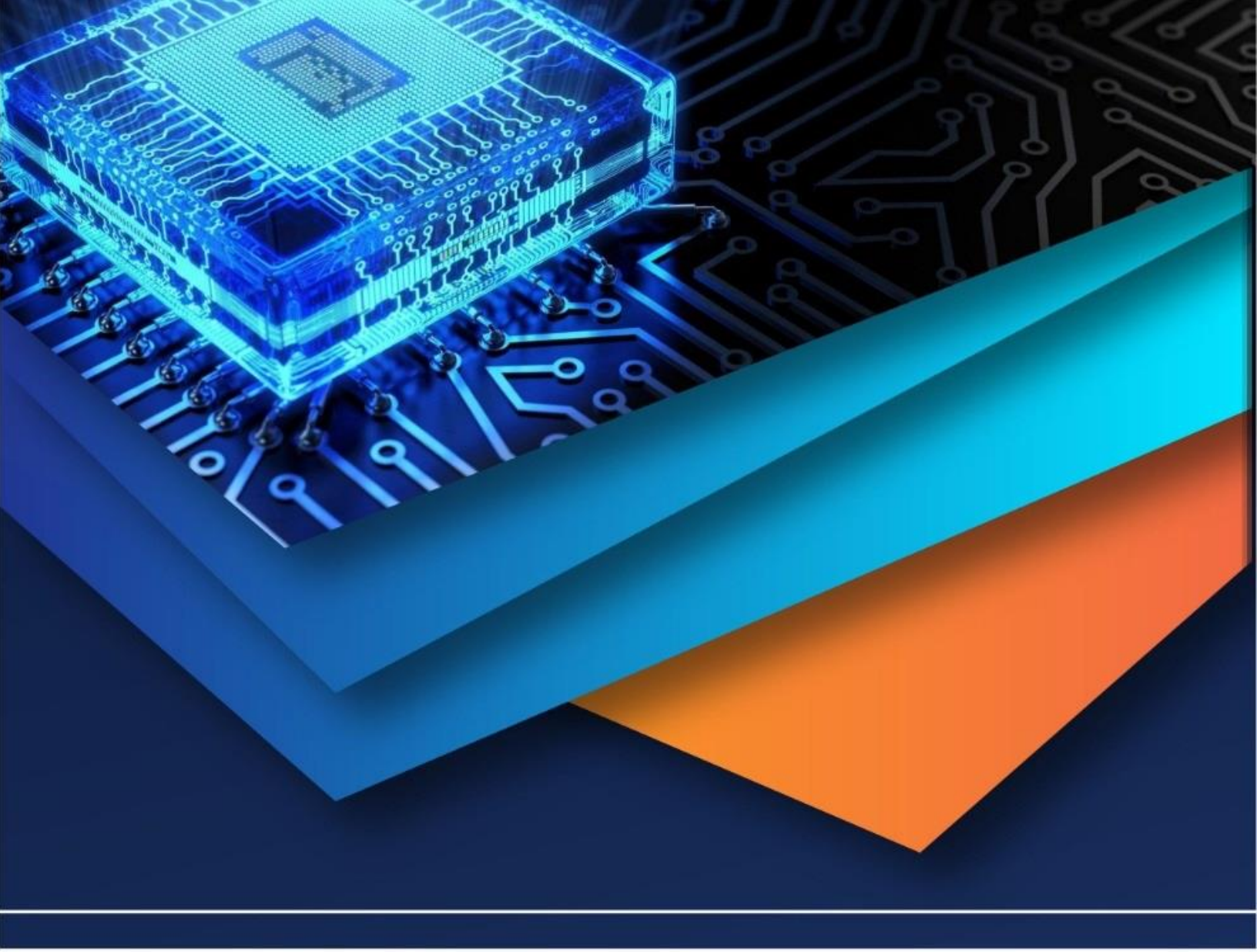
Accident detection operation is not an easy task to handle; it can be an extremely complicated process when it comes to real time applications, which is the main reason why it is not implemented yet on a large scale. the proposed system will help to improve the present scenarios.

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Although an in-vehicle accident detection system provides emergency responders with essential information as fast as possible but unavailability of this system are restricted by their nonprobability and costs. the proposed vehicle accident detection system can track an accident at its moment of occurrence. compared with other deployment systems composed of expensive sensors and unnecessary hardware, the proposed system is more economical, more reliable, and more accurate than similar systems, mainly due to the model-based approach.ai based architecture for automatically detecting an accident with the help of cctv surveillance videos are implemented. in spite of exceptionally advisable task, very less and restricted work is carried out in this field. some methods are developed to work on particular pattern of traffic in restricted environment and those do not consider other affecting factors. all these strategies can said to be reasonable for small sized samples and don't ensure the same performance in different situation. this creates an urge to design a new system for automatically detecting accident addressing lawful as well as lawless traffic patterns in various illumination and different environmental conditions and to compare results on some common data set. acknowledgment

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