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ACCIDENT DETECTION USING BiLSTM

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Abstract - *Accidents have consistently ranked as the major cause of death in India. More than eighty percent of the fatalities that occur as a result of accidents are not directly attributable to the accident itself; rather, they are the result of victims not receiving prompt assistance. It is possible for an accident victim to be left unattended for a significant amount of time on routes that have very light and quick traffic. The objective is to design a system that is able to determine whether or not an accident has occurred based on the video input received by the system. It is the intention to run each frame of a video through a convolutional neural network and BILSTM models that have been trained to identify video frames as either accident or non-accident frames. The Convolutional Neural Network and the BiLSTM models have been shown to be a method that is both quick and accurate when it comes to identifying photographs. CNN-based image classifiers have attained an accuracy of greater than 95% with fewer datasets, and they require less preprocessing than other image classification techniques.*

Key Words: Convolutional neural network and BILSTM

1.INTRODUCTION

The main goal is to implement a system that can recognize an accident from provided video material. The system is meant to be a tool to assist an accident by promptly identifying an accident and afterward reporting the authorities about it, you can help those in need. The goal is to use cutting edge Deep Learning Algorithms that use BILSTM and Convolutional Neural Networks (CNNs or ConvNet) to analyze frames captured from the video input given to the system in order to identify an accident within seconds of it occurring. We concentrated on installing this technology on highways where there is less congestion and prompt assistance for accident victims is uncommon. Transportation is a legitimate means of taking or carrying items from one location to another. As time goes on, transportation suffers a number of problems, including a high accident rate, traffic jams, air pollution from carbon emissions, and more.

The transportation industry occasionally struggled with reducing the severity of crash-related injuries in accidents. Since transportation is so complex, researchers have combined virtual technologies with it to create the Intelligent Transport System. In the sphere of transportation, the concept of integrating virtual technologies is innovative, and it is essential for resolving problems in a worldwide context. The traditional method for creating next-generation technology is known as ITS. From ITS implementations, a variety of reimbursements are available. ITS can significantly lower hazards, accident rates, traffic jams, carbon emissions, and air pollution and meanwhile, improving all modes of transportation's traffic flow, transit speeds, and levels of passenger satisfaction. One of ITS's key uses is traffic control. Controlling traffic is becoming a major challenge as the overcrowding issue gets worse. The Video traffic surveillance system is one of the key technologies being used to implement solutions for this problem.

2. RELATED WORK

[1] As analytical tools in this particular study project, CNN, RNN, and LSTM were employed. Four layers make up the study's architecture: two convolutional layers that help with feature extraction, two layers of long short-term memory (LSTM) units, and a top layer. LSTM is in charge of controlling each video's time dependence (Long Short-Term Memory). Over 80% accuracy in validation is achieved, with the sheer amount of data being one of the main challenges.

[2] Transfer Learning and Mask R-CNN, which uses a mask R-CNN to detect cars, are the main techniques that we employ in this study. The intersection over union (IoU) algorithm is used in order to discover collisions. If used in conjunction with a strong Response system, this model could reduce wait times, speed up procedures, and improve detection accuracy.

[3] The cornerstone of the accident detection system is provided by the CVIS and machine vision. We designed the YOLO-CA deep neural network model to discover accidents. Deep learning techniques and CAD-CVIS were used to create this model. We use a loss function with dynamic weights and Multi-Scale Feature Fusion (MSFF) to enhance the recognition accuracy of very small objects. When it comes to choosing proposal regions, Fast R-CNN uses the time-consuming selective research approach. When dealing with very large objects, rapid R-detection CNNs give incorrect positive findings.

[4] The results of this study suggest that the best approach to the issue is to apply video analytics techniques. The structure is composed of two distinct components. The first

one uses a modified version of the architecture from Inception V4 to extract a vector of visual attributes. Then, we'll discuss the following two steps: temporal video segmentation and autonomous traffic accident recognition. The feature vector produced by utilizing a modified version of the InceptionV4 architecture is accepted as input by the authors' proposed neural network architecture, which is constructed on a ConvLSTM layer. Due to the lack of easily accessible cases involving pedestrians, cyclists, and motorcyclists, the technique can only be used in crashes involving motor vehicles with higher performance in the recognition of traffic crashes captured by video.

[5] The capabilities of a GPS receiver will be used within the parameters of this inquiry. The phrase GPRMC will be detected once every second by a GPS device. To compare the new and old velocities, the MCU was employed. If the computer is outfitted with a GSM/GPRS modem, it is feasible for the computer to read the data and text messages that are transmitted by GPRS. used a GSM modem, which is quite readily available and well-liked. Sends the car's most recent recorded speed, which can be used to determine how bad the collision was and if it was programmed to, start an audio call.

[6] This project requires the use of a Raspberry Pi 3 Model B+, a GSM Module SIM800L, and a Pi Camera. The recommended car accident detection system has the capacity to track accidents as they occur in real-time and immediately text relevant medical facilities and law enforcement agencies to inform them of the incident. The suggested alternative is also more cost-effective than the current methods, which are more expensive and less reliable since they rely on expensive sensors and unnecessary technology.

[7] In this article, a system for identifying instances of vehicle collisions in egocentric films using unsupervised deep learning is proposed. The methodologies used by this system are trajectory prediction, which uses LSTM for pedestrian trajectories and their interactions, and video anomaly detection, which primarily targets video surveillance scenarios and typically uses an unsupervised learning method for the reconstruction of regular training data. On the reconstruction of typical training data, these two strategies are referred to as unsupervised learning methods. It produces predictions about the routes taken by traffic participants and their future positions, and it leverages the consistency and accuracy of those predictions as proof that an unforeseen event might have occurred. The accuracy and consistency of this strategy, which predicts the trajectories of persons taking part in the traffic as well as their future locations, are employed as indicators that an aberration may have happened.

[8] In this particular article, Automatic Smart Accident Detection (ASAD) technology is used. Accident Detection and Alerting Device (ASAD) is a service that may be installed in automobiles and is activated in the case of an accident. Mamdani fuzzy logic can be used to detect accidents. axis accelerometer and gyro breakout for the MPU-6050. This element is used to gauge the vehicle's rotation and acceleration. The architecture also has four Force Sensitive Resistors (FSR) that measure the force of an accident's impact and are connected to the vehicle's four ends.This system provides a service that automatically alerts local authorities to any events that have occurred in their cities. The outcome is that the authorities can respond to the problem right away. As much as you can, prevent harm from coming to the populace and the economy.

[9] Using VANET (Vehicular Ad-hoc Network), vibration sensors, and piezoelectric sensors, traditional accident detection techniques are used in this system. b) Machine learning and artificial intelligence-based accident detection methods, such as support vector machine accident prediction and fuzzy logic accident detection. c)Hybrid methods using limit switches, mobile phone weariness and intoxication detection, and accelerometer speed and acceleration measurement. For the goal of accident detection, the system in question made use of numerous sensors, such as accelerometer sensors, shock sensors, pressure sensors, etc., as well as numerous machine learning techniques, such as neural networks, support vector machines, representation learning, etc.

[10] In this case, the prototype was built and then put into a remote-controlled toy car. This system uses GSM and GPS technologies, as well as vehicle ad hoc networks and mobile application sensors. It also has a heart rate monitor. As soon as an accident is detected, the heart rate sensor finds out the driver's heart rate and the GPS module finds out where the driver is. An SMS is then sent to the driver's emergency contacts. When the vehicle is in an accident that tips it over or tilts it more than 30 degrees and the reset button is not pressed within the time limit, the system will send the message to the emergency numbers that have already been saved.

[11] The suggested approach uses machine learning algorithms installed in each car to work together with other vehicles that are outfitted with V2V communication devices to predict the likelihood of accidents. The underlying workings of three different machine learning techniques—artificial neural networks (ANNs), support vector machines (SVMs), and random forests—are examined in this article (RFs). SUMO (Simulation of Urban Mobility), a collision-free traffic controller, is currently being used on roads in an effort to lower accidents.

[12] Using the MATLAB and SIMULINK software packages, this model is developed that has been presented is constructed and tested. The following are the primary components are Detection system using DWDC(Dynamic Webester Dynamic Cycle) to reduce the amount of time spent waiting and to improve the flow of traffic accident

detection The planned hybrid transportation system offered an answer to the problem of traffic congestion. This model cut down on the amount of time spent waiting at traffic signals, which resulted in time savings for drivers. As the subsystems collaborate and share data with one another, there is a possibility that some of the flows will contain redundant or unnecessary data.

[13] The specified apparatus makes use of a complementary set of HCSR04 ultrasonic sensor modules. Within this automobile, there are sensor modules located in both the front and the rear windscreens. Both of these units are mounted in the side windows of the automobile. After then, a calculation is made to determine the distance between the sensor units and the bumpers. The "first threshold distance" and the "second threshold distance," respectively, are the terms that are used to refer to these distances.

When moving away from the car, everything is always at a greater distance than the thresholds that the car has set. This occurs whenever something is moving away from the path that the car is travelling on. If something strikes the vehicle hard enough, it will travel further than the predetermined threshold distance, which will activate the processing system. The technology quickly calculates the location of the car using GPS and then transmits that information to the relevant authorities through GSM. The system that has been proposed will operate in this manner. However, the procedure that has been described is sufficient for determining whether or not there has been a collision on the road. However, there are a number of problems with the remedy that has been offered. The HCSR04 sound sensor has a maximum detection distance of four meters in any given direction. Therefore, vehicles with a threshold distance that is larger than four meters are unable to utilize the proposed technique. Since the ultrasonic sensor module can only detect reflected sound waves within a range of fifteen degrees, the location of the sensor module plays an important role in determining the quality of the discoveries that are produced by the module. It's possible that an incorrectly positioned sensor is to fault for the false alarm in this instance.

[14] Locating moving cars is the first step in the suggested method. This is done by first extracting the foreground with GMM (Gaussian Mixture Model), and then going on to motion mapping. The intensity of the car's motion as well as the direction in which the car is moving are then used to establish whether or not a collision has taken place. Find each and every vehicle that is parked in the parking lot. The accuracy of the method for identifying accident scenarios has been significantly improved by the utilization of the AND operator for the purpose of merging information from the foreground and the motion map. Greater than 75% of collisions involving automobiles may be correctly identified using this approach.

[15] Vehicle detection, tracking, and parameter extraction are the three distinct tasks that make up the proposed technique, in that order. The three primary systems that work together to detect cars are the Gaussian Mixture Model (GMM), Mean Shift Algorithm, and Accident Detector. The mean shift approach is used to follow the observed cars after they have been identified. This method handles occlusions during accidents reasonably well, but it has a severe problem in that it depends on a small set of parameters, making it difficult to adapt to situations like sudden changes in traffic patterns or inclement weather. This paradigm is based on local parameters such as trajectory intersection, velocity calculation, and the anomalies related to these. The recommended framework is capable of correctly detecting accidents, as evidenced by the 71% Detection Rate and 0.53% False Alarm Rate on accident recordings acquired in varied settings. However, due to faults in vehicle recognition and tracking, this method is not suitable for high-density traffic. Be at ease; these errors will be corrected in subsequent work.

Large objects in the cameras' field of view may also have an impact on how well they follow the vehicles, which may therefore have an impact on how well they detect crashes snow, day, night, and many weather situations.

[16] Long short-term memory (LSTM) and convolutional neural network (CNN) layers are used in this model to label real-time video material. The footage captured by the CCTV cameras is immediately transmitted to a component responsible for pre-processing.

The first stage of processing, which involves extracting high-quality still images from video, is the responsibility of the openCV library. Some changes will be made to the dimensions and shapes of the photos in order for them to be compatible with the ResNet-CNN algorithm. When compared to other systems, this method is far superior in terms of cost, durability, and accuracy. Making changes to a piece of software in time for it to be implemented in a real-world scenario can be a difficult task.

[17] The system proposed is used "to detect using video" and "to detect using audio" are the two models that are produced as a result of this. While SVM and CNN were both utilized throughout the process of testing the classification of the video inputs, only CNN was utilized during the process of evaluating the classification of the audio inputs. Many GRU layers are utilized throughout the process of the training method. CNN filters are applied to each of the three dimensions of the data before it is classified. In this approach, multiple modes of inquiry are combined in order to get information that is more specific. Models that can handle only a single category of data should be avoided in favour of these strategies. The most significant drawback, on the other hand, is that producing CNN content in 3D takes a great deal more time than it used to.

[18] Residual Networks, also referred to as "ResNets" for short, are a common type of neural network that form the basis for numerous computer vision applications. Extraction of key frames, extraction of features, clustering, and classification are the four primary pillars that support the system. And it does it in a timely and accurate manner, identifying where the error occurred. This system is more efficient in terms of cost when compared to other methods.

[19] A motorcycle accident detection and alert system that takes into consideration the vehicle's acceleration, deceleration, tilt, and changes in the pressure that is being applied to the vehicle body. Combining a global positioning system (GPS) with a proximity sensor results in an intelligent distributed system that has the potential to identify accidents and alert the appropriate authorities. In addition to this, it is unable to recognize two-wheeler incidents as effectively as other systems can.

[20] An accelerometer allows a car alarm to detect errant driving behavior so long as the driver is paying attention. It can serve as a crash or rollover detector in the case of an accident and be used in this capacity if necessary. The signal is picked up by an accelerometer, which then calculates how severe the collision was based on its readings.

If there were no injuries and there is no immediate threat, the driver may use a switch to turn off the alarm message if it is no longer necessary. In addition to a user interface that is easier to navigate and a foundation of reliability that is more robust, the level of sensitivity and accuracy that can be achieved has significantly improved.

3. CONCLUSIONS

Accidents are one of the most prevalent sorts of challenges that humanity faces on a daily basis, and they can lead to the loss of life as well as the destruction of material goods. The strategy that has been suggested provides a solution to this problem that is one that is realizable and effective at the same time. The system for the identification of automotive accidents that has been developed is able to monitor the situation from the moment an accident takes place until it is resolved. Comparatively speaking, the proposed system is much more accurate, cost-effective, and reliable than its competitors. This is primarily because a model-based approach is used instead of the expensive sensors and unnecessary hardware used in other systems that are already in use. The proposed system also has a much higher accuracy rate. A higher level of sensitivity and accuracy is indeed feasible utilizing this technology, according to experiments, tests, and validations that have all been carried out with the use of images. In each of these procedures, images have been utilized. As a consequence of this, deploying this system over the bulk of the country's state and national roadways is a possibility that should not be discounted. Throughout the phases of experimentation, testing, and validation, images have been utilized.

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