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DETECTION OF PEDESTRIAN AND VEHICLES FOR ROAD SAFETY

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***Abstract*— Traffic accidents make car safety receive most attention in recent years. With the progress of image processing technology, the automotive safety equipment helps to conduct image processing with the videos captured by the cameras, which provides pedestrian safety. In the image-based active driving safety equipment, the pedestrian detection technology is important. We used development tool for implementation of cars and pedestrian detection in a video segment. This application will be developed in Python using OpenCV. Object detection exists in many countries around the world after recent growing interest for autonomous vehicles in the last decade. This project aims on a vision based approach focusing on vehicles and pedestrians detection in real-time as a perception. Hence, we can manage and control the traffic easily.**

***Keywords*— R-CNN, Vehicle Detection, Pedestrian Detection.**

I. INTRODUCTION

There has been a lot of advancement in the field of Computer Vision. Object tracking is the most commonly used procedure for detecting moving objects beyond time. The main aim of object tracking is to relate the target objects as well as the shape or features, location of the objects in successive video. Furthermore, several other issues appear ascribed to occlusion of the object to scene, object to object, complex object motion, real-time processing requirements as well as the improper or distorted shape of the object. However, this type of tracking is being used in many places now-a-days, few of them are traffic monitoring, robot vision, surveillance and security and video communication, public areas like underground stations, airports, mass events and animation. Thus, the application needs an optimal trade-off among computing, communication, and accuracy over the network. The revenue related to computing and communication relies on the amount and type of cooperation executed among cameras for data collection, dispensing and processing to confirm decisions and to reduce the estimation errors and ambivalence. Subsequently, this tracking can be explained as the procedure of determining the orientation of object across the time as the object moves throughout a scene. A substantial number of such applications require much reliable and efficient tracking methods which meet to the real-time restrictions and are challenging and complex with respect to changes of object movement, scale and appearance, illumination of scene and occlusion. The current approach for analysing and detecting the suspicious object usually needs exceptional marker connected to the suspicious object that prevents the extensive technology application. In this project, we try to implement cars and pedestrian detection and try to provide efficiency by adding time library.

In this paper, the work is based on image processing techniques and OpenCV and the Haar like feature. We have been using it for vehicle detection and classification. It will use the features that are extracted and then the learning the algorithms for getting the instances of an object class. There are many applications based on this like image security, recovery, surveillance that use object detection method. Object detection uses various models such as features that are mainly based on object detection, and image segmentation. There are so many categorization algorithms that are being used basically for the main aim of the car detection. The methods used are quantity, non-quantity, or square distance-based object detection method. It helps to give information to the controller of the particular location.

The rest of the paper is organized as follows: Section II exhaustive Literature Survey is explained. System Design and Implementation is explained in section III. Section IV gives the results and snapshots.

II. LITERATURE SURVEY

"Theory and application of vehicular networks": [1] by Anand Paul, Seungmin Rho in 2017. This paper describes results of experiments with camera setup, calibration and image processing algorithms for automatic detection and tracking of pedestrians and vehicles. The aim of the Mobis project was to develop a method of assessing safety of unsignalised pedestrian crossings. Correct detection and tracking proved to be more difficult in the case of pedestrians than vehicles due to variability in people's appearance, movement in groups and poor visibility in bad weather. Application of cameras with built-in pedestrian tracking programs was successful only in very good visibility conditions, so a computationally efficient PC algorithm providing a high pedestrian detection rate was

used instead. The paper presents comparison of results obtained using different image processing methods as well as selected problems of pedestrian tracking. Statistical analysis of pedestrian behaviour with and without vehicles present is also shown. The proposed approach seems to be accurate enough for the purpose of assessing pedestrian safety.

"Pedestrian Detection and Image Processing" proposed by Jiye Duan, William Mac Docwell, 2017[2]. Pedestrian detection is an important application of target detection. It is an important foundation in many fields, such as unmanned vehicle driving, intelligent monitoring system, pedestrian analysis and robot development. Despite a lot of research, pedestrian detection methods still have many problems to be solved urgently. In order to sort out the existing pedestrian detection algorithms, this paper will summarize and analyze the advantages and disadvantages of these algorithms. The two methods of traditional algorithms and deep learning algorithms are used to discuss pedestrian detection, analyze and compare the results of the two types of algorithms, and finally target pedestrians. The detection algorithm is expected. HOG are feature descriptors used in computer vision and image processing for the purpose of object detection. The technique counts occurrences of gradient orientation in localized portions of an image. The HOG features and deformation cost functions can be learned by using latent SVM from the training data set. The detained learning algorithm can be found. In order to fix each filter size, the HOG pyramid H consists of a multi-scale resized image, which has λ layers, and the image is resized by a ratio of 21/λ. Normally, the HOG features have to be calculated in each layer. However, in the proposed system, the size information of the object hypotheses can limit the HOG pyramid levels. "Automatic Vehicle Accident Detection and Messaging System Using GPS and GSM Module"[3] proposed by Jayati Routh, Arshiya das,2019. This system can detect road accident and identify the location through GPS. After that, through GSM interface this will be notified to the nearest emergency care unit so that the victim can get immediate medical attention. Here first, a driver takes a driver seat. The system checks if the driver has worn the seat belt or not. If not, it displays a message, "Wear seat belt". If the driver wears the seat belt, the engine starts and gives message "Happy Journey". While moving if it detects a vehicle or any other objects it will decreases the vehicle speed, even though the accident occurred then vibration sensor will activate the GPS to locate accident area. If there is no affect to anyone then the person involved in accident has to press the safety switch. In this case no SMS will send to emergency care centre. If no one is pressed the safety switch within 40s then GSM will send the location and persons heart beat status to the emergency care centre and optional mobile number stating that ACCIDENT OCCURRED. In addition to that it will send a message to emergency care centre when the vehicle is flipped or detects the fire.

"Automatic Detection and Classification of Road, Car, and Pedestrian"[4]: By Guang Li,14 May 2020. A considerate U-V view method is proposed to obtain the final V view and the initial contour of the road, which avoids the incorrect estimation of the road contour caused by the traditional straight-line fitting method for the V view of uphill and downhill sections. We propose a considerate U-V view method, including obstacle removal on the initial U and V views, inverse view transformation, approximate classification, minimum distance calculation, and noise removal, which constructs the final V view, obtains the initial contour of the road and the horizon position, and provides a basis for the detection of specific traffic objects. A new method for detecting and classifying vehicles and pedestrians on the road is proposed. A peripheral envelope algorithm is used to obtain the source points of vehicles and pedestrians on the road. Multi-feature fusion and threshold segmentation methods are used in combination with the minimum energy and similarity algorithm to achieve classification detection. "Detection of Pedestrian using different types of vehicle."[5] paper by H.Deshpande, P.Shetty 29 Feb 2020 is based on a machine learning approach where a cascade function is collected and verified from a lot of positive and negative images. Then it is mainly used for detecting the objects in another picture. In this method we will work with vehicles and the pedestrians, and another few more objects can be detected. Firstly, the algorithm needs many more positive images (for example images of a car) and negative images (for example images without a car) to make understand the classifier and train it; then the features are extracting from it. By subtracting some of the pixels each feature obtained under the white rectangle from the sum total of the pixels under the black rectangle is a single value. "Cars and Pedestrian Detection"[8] paper by International Journal of Engineering Research & Technology (IJERT) in 1 Jan 2021. Object tracking is imposing its importance in the area of computer vision because of the expansion of high- powered computers and the growing need for automated surveillance systems and such. It is now-a-days mainly used in the sector of automated surveillance, robotics monitoring, human-machine interface, motion-based recognition, vehicle navigation, traffic monitoring and video indexing

III. PROPOSED ALGORITHM

A. **Image Processing –**

Digital image processing consists of the manipulation of images using digital computers. Its use has been increasing exponentially in the last decades. Its applications range from medicine to entertainment, passing by geological processing and remote sensing. Multimedia system, one of the pillars of the modern information society, relies heavily on digital image processing. Digital image processing consists of the manipulation of those finite precision numbers.

The processing of digital images can be divided into several classes: image enhancement, image restoration, image

analysis, and image compression. In image enhancement, an image is manipulated, mostly by heuristic techniques, so that a human viewer can extract useful information from it. Image restoration techniques aim at processing corrupted images from which there is a statistical or mathematical description of the degradation so that it can be reverted. Image analysis techniques permit that an image be processed so that information can be automatically extracted from it.

B. Image Segmentation and Detection–

Image segmentation plays a crucial role in many imaging applications, by automating or facilitating the delineation of anatomical structures and other regions of interest. It present critical appraisal of the current status of automated and for the segmentation of the images. Terminology and important issues in image segmentation are first presented Detection is a critical task in the field of computer vision, and it has made considerable progress with the help of Convnets. However, a persistent crucial problem is that small-scales are notoriously difficult to detect because of the introduction of weak contrast and blurred boundaries in real-world scenarios. So for the proper detection of objects like pedestrian and vehicles are necessary for road safety.

C. Pedestrian detection

Pedestrian detection consists of two parts, namely, identification and positioning. This is one of the important computer vision problems in automotive safety and driver assistance domain. It is a major component of the advanced driver assistance system (ADAS) which help the driver to drive safely. There are number of research activities addressing object detection/tracking in general and pedestrian detection in particular. The solutions proposed by different researchers vary in detection methods, detection scenario, feature descriptors, classification schemes, detection performance, as well as computational complexity.

However, the average detection accuracy is not much promising even after many years of research. The fail-safe and real-time human detection from real life road scenes, even in standard resolution, is far from reality. Safety critical systems in the automotive industry have to follow well established stringent safety standards like ISO26262. Since the pedestrian detection system deals with human safety, it also has to follow these standards before integrating to the vehicle electronics. This project is a study of different techniques used in pedestrian detection specific to the automotive application, along with a description of generic pedestrian detection solution architecture.

D. Vehicle detection-

Vehicle detection also consists of 2 parts, namely, identification and positioning. For solving the problem of multi-task pedestrian protection system (PPS) including not only pedestrian classification, detection and tracking, but also pedestrian action-unit classification and prediction, and finally pedestrian risk estimation. The goal of the work is to develop an intelligent pedestrian protection component based only on single stereo vision system using an optimal cross-modality in order to classify the current pedestrian action, predict their next actions and finally to estimate the pedestrian risk by the time to cross for each pedestrian.

First investigate the classification component where analysed how learning representations from one modality would enable recognition for other modalities within various systems which one terms as cross-modality learning. Second, it helps to know how the cross modality learning improve an end-to-end the pedestrian action detection. Third, it helps to analyse the pedestrian action prediction and the estimation of time to cross.

Autonomous driving technologies

These are mainly divided into three parts: perceptual positioning, planning decision making and executive control. As for perceptual positioning, there are challenging tasks including driver environment understanding, road sign detection, pedestrian detection, behaviour analysis and prediction, depth estimation, Vehicle-to-everything (V2X) and intelligent human-computer interaction technology among these its applications and tasks, feature extraction plays a significant role.

Basis of such considerations, the algorithm uses a different color image multiplied by the weighting coefficients of different ways to solve the visual distortion, and by embedding the watermark, wavelet coefficients of many ways, enhance the robustness of the watermark.

The details of the proposed methodology for detecting pedestrian and vehicles for road safety is given below. The proposed scheme is based on OpenCV models. The architecture of the proposed system as well as the detecting techniques that will be applied in the various steps involved are explained here.

A. **System Architecture-**

Create the video files of the various objects (target object) to be detected i.e, one video file of each vehicle and pedestrians at a particular location. The steps involved in detecting the objects from files is shown below.

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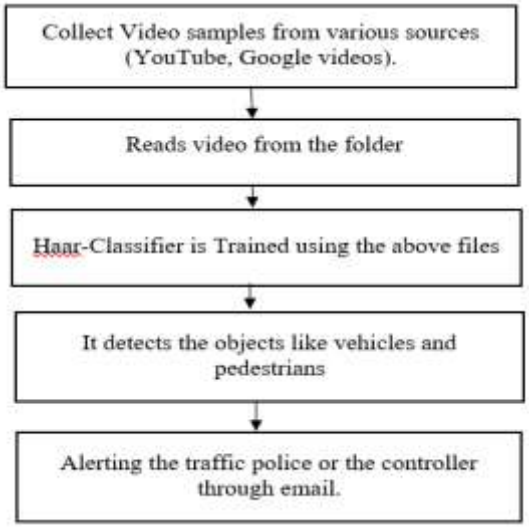


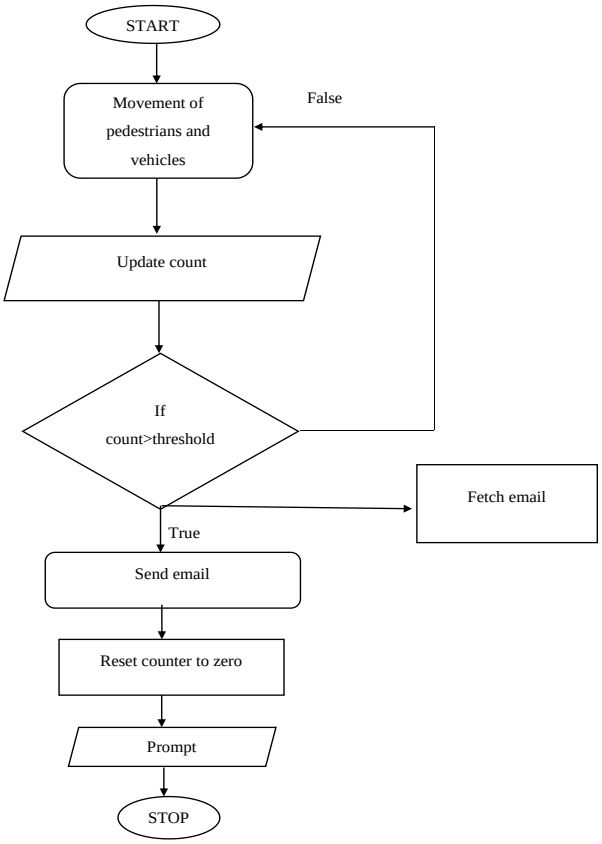
Collection of video segment, some of the images were manually cropped out of the video and rest of them were downloaded from the internet. It reads the video file from the particular folder. It will detects the object to avoid the collision between the objects. The objects are identified and detected objects are shown in the rectangular box. Then the dialogue box will appears indicating the accident zone. Then the message will sent to the traffic police or controller.

The traditional tracking systems are often prone to problems which can be deduced either from the subject, camera or background movements which includes major changes in posture, appearance, clothing and lighting of the background. The work introduced here proposes a system for extracting and tracking objects from a video sequence by initializing the process of feature extraction of the selected area of the human. The need for cascade extraction by using Haar-like features, is to basically decrease the use of crude or raw pixel values and then make classification easier. The major issue here is the problem in extracting the required finite set of input for identifying the characteristics necessary for domain encoding rule. In the proposed work the major aim is to address the tracking procedure.

B. **Boundary Box-**

Object detection is a fundamental yet challenging task which requires the algorithm to predict abounding box with a category label for each instance of interest in an image. All current mainstream detectors such as Faster R-CNN, and YOLOv2, v3 relyon a set of pre-defined boxes and it has long been believed that the use of such boxes is the key to detectors' success. In detection performance is sensitive to the sizes, aspect ratios and number of anchor boxes. For example, in Retina Net varying these hyper-parameters affects the performance up to 4%.

It works by predicting a vector (l, t, r, b) encoding the location of a bounding box at each foreground pixel (supervised by ground-truth bounding box information during training). The right plot shows that when a location residing in multiple bounding boxes, it can be ambiguous in terms of which bounding boxes the location should regress. The hyper-parameters need to be carefully tuned in detectors. Even with careful design, because the scales and aspect ratios of boxes are kept fixed, detectors encounter difficulties to deal with object candidates with large shape variations, particularly for small objects. The pre-defined boundary boxes also hamper the generalization ability of detectors, as they need to be re-designed on new detection tasks with different object.



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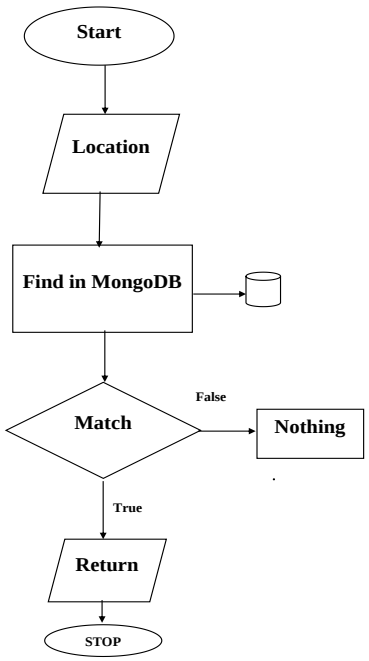

Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certain class in digital images and videos. Well-researched domains of object detection include face detection and pedestrian detection. Object detection has applications in many areas of computer vision, including image retrieval and video surveillance.

IV. EXPERIMENT AND RESULT

The fig 5.1 shows about the detection of cars and pedestrians of location 1 and it gives message of danger ahead.

Fig 5.1 Location 1 Detection

The fig 5.2 shows about the detection of cars and pedestrians of location 2 and it gives message of danger ahead.

Fig 5.2 Location 2 Detection

The fig 5.3 shows about the detection of cars and pedestrians of location 3 and it gives message of danger ahead.

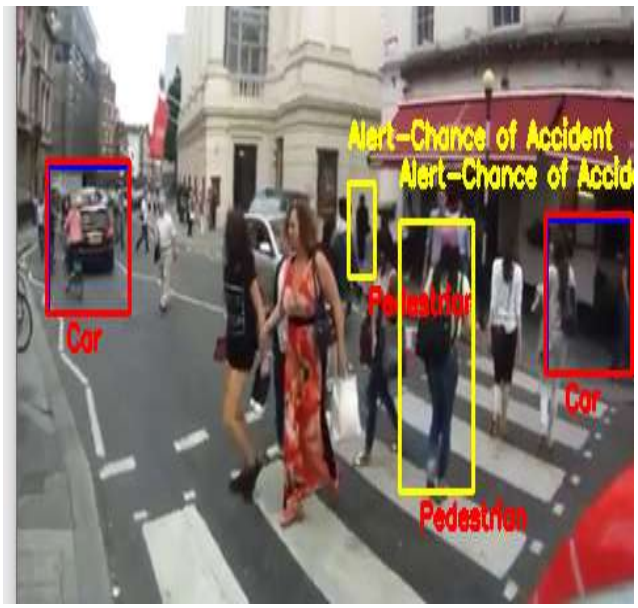

Fig 5.3 Location 3 detection

The figure 5.4 shows after detecting pedestrian and vehicle phase. The dialogue box will pop-up which gives the alert of Accident Zone.

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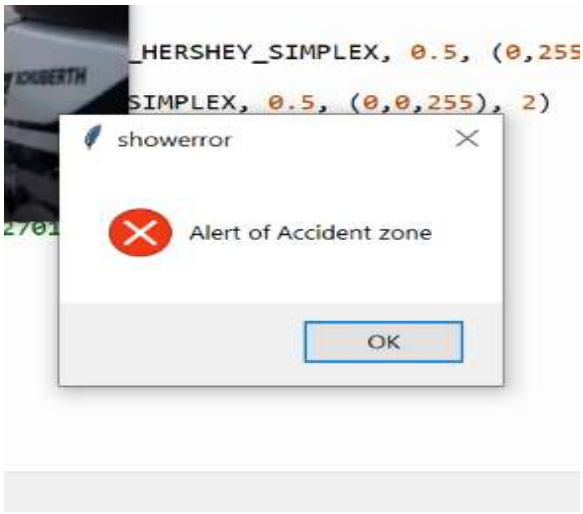

Fig 5.4 Dialogue Box

The below Fig 5.6 and 5.7 shows the image of alerting email sent to the receiver.

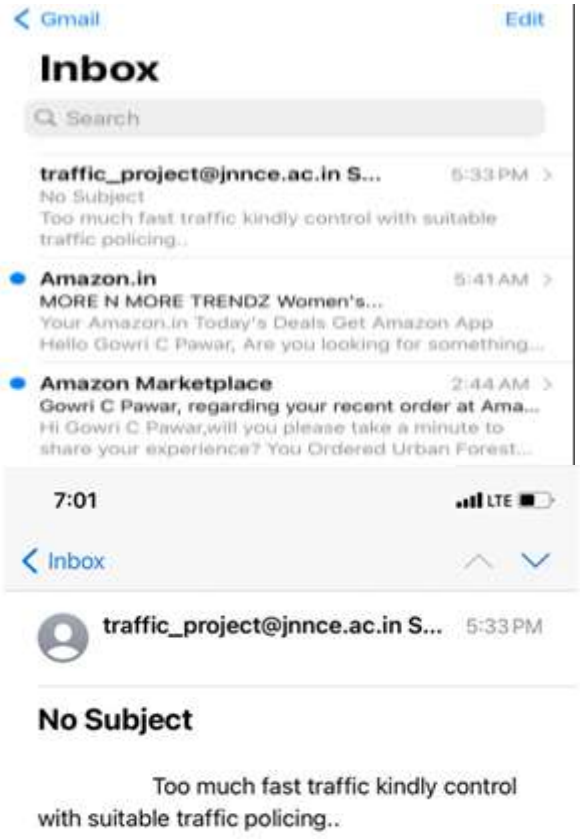

Fig 5.7 Image of alerting email

V.CONCLUSION

Nowadays, the control of the traffic in the urban roads and in the highway has been a big challenge as the number of increase in the auto mobiles. So to overcome this problem we use the detection and tracking the vehicles using the traffic surveillance system. The results of object tracking could be impacted by the disparity of one among the parameters. To tackle the above explained issues and others in object tracking, a large number of approaches have been proposed. In this object tracking application, target will be vehicles and pedestrians. The capability of machines to identify the suspicious object and further identify their activities in a specific environment and gives information which is an important part of permitting a software to interact with controller in effective and easy manner.

V. REFERENCES

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