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Automated Surveillance on Roads for Helmet Detection and Number plate Detection

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ABSTRACT

The major cause of deaths and disabilities among motorbike users are head that is traumatic caused as a result of neglect in wearing helmets. The way that is only check the increase in this statistics is by maintaining strict surveillance on business and roads. Current surveillance styles involve the use of large force with business police sitting behind defenses showing CCTV footages of roads. Since this system is exhausting and tedious, proposals have been made to make road surveillance automated and effective. With advancements in the field of object findings and machine knowledge, several styles have been accepted to make this a reality.

Keywords: Image Detection, YOLO, Automated Surveillance

I. INTRODUCTION

India is one of the multitudinous countries with the world's most unsafe roads. According to statistics taken in 2015, over 400 people failed in road- related accidents, each day. Two- wheeler accidents took the lives of 36,800 victims and left around 93,400 injured. The United Nations suggests that about 15,000 lives across the world could be saved each time if motorcyclists start wearing helmets that are applicable. According to them, motorcyclists are more likely to face accidents than bus drivers, still wearing a helmet would reduce their chance significantly of survival by 42. A unlooked-for deceleration takes place, which causes the rider to be thrown off the vehicle during a two- wheeler accident. The skull stops its stir still, the brain continues to be in stir till it hits the inner part of the skull in this situation, if the head strikes a hard face. This type of head injury could be fatal. Helmets have been designed to help the deceleration of the skull. Cushion inside the helmet absorbs the impact of the collision and spreads the impact to a larger area, thus securing the relative head from severe injuries. Despite the Government's business regulation- making wearing of helmets obligatory for both the riders, people are still neglectful in using a helmet. The living system of manual surveillance of business using CCTV is a tedious task since surveillance requires repeated obediences to achieve the ideal and it also demands a lot of mortal resources. Largely vibrant cosmopolises with large amounts of vehicles can't go this manual that is shy of helmet discovery. With the prolusion of object discovery in the field of artificial machine and intelligence knowledge, advancements have been made in automated surveillance of helmetless motorbike riders. An average model of such an surveillance that is automated involves two modules- helmet discovery and number plate discovery. The use of open and free technologies like Tensorflow, OpenCV and Tesseract make the software fairly less precious. In this paper, several different espoused ways have been compared and mooted.

II. METHODS

A. Detection using various Methods

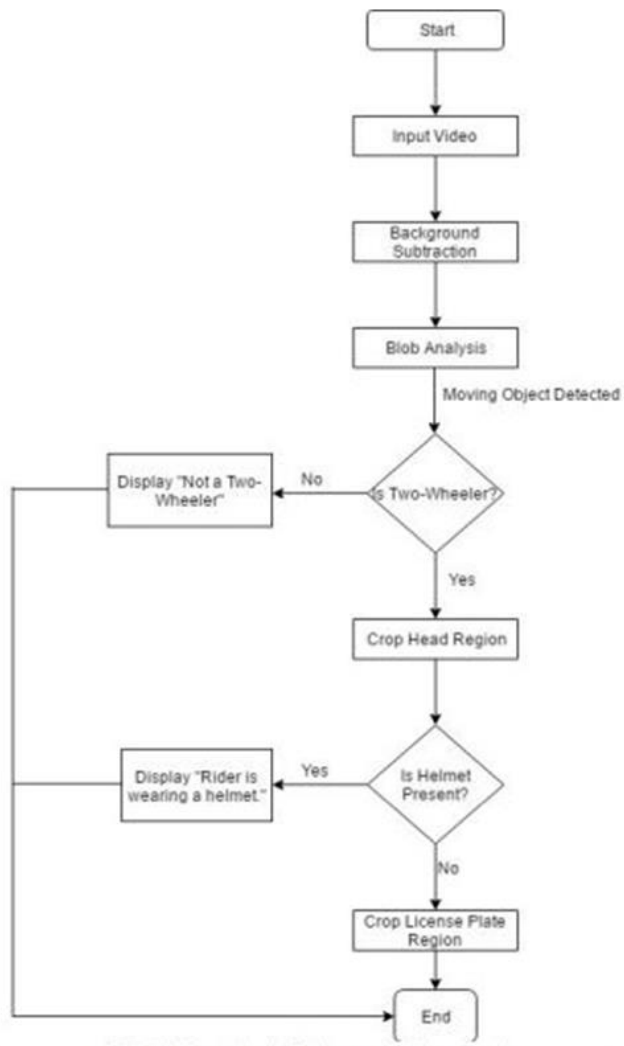

Fig. 1. Flowchart of the proposed method

The authors of (1) compared different methodologies to

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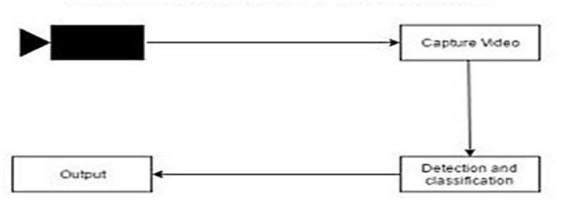
determine the ideal generality for helmet discovery. The first task in helmet identification is to descry a moving vehicle. rather of directly recovering the video that is entire an original video frame of the moving object is segmented from the background. The focus detector needs a certain number of video frames to initialize the Gaussian amalgamation model. still, the segmentation that is focus is not perfect and includes noise. After this bounding boxes of each element that is connected to a moving vehicle are attained. Objects that correspond of lower than 150 pixels are discarded. This removes gratuitous objects and obtains only the moving vehicle. The morphological opening is done to remove noise and to fill gaps in the detected objects which makes the area covered by the bounding box more coherent. The image that is raw also pulled. To classify vehicles, multitudinous knowledge algorithms were used, to determine which approach works best in classifying between two- wheelers or four- wheelers. For training the different models, 1000 images of two- wheelers and four- wheelers from different possible angles were chosen. The images were converted to grayscale. A system that is similar accepted for helmet discovery as well. A total of four different human knowledge classifiers were put through their paces in order to determine which one is superior in terms of how well it performs in this script. The Random Forest Algorithm relies on decision trees to function properly. A large number of trees are developed in resemblant, each of which is given access to a limited portion of the available data points and features. The use of sub- setting guarantees that there is a diverse collection of trees. Following completion of training, each tree casts a vote for a class, with the class with the highest total number of votes becoming the final class. Still, trees are generated successively one after the other as part of the Grade Boosted Trees method. This is similar to how the arbitrary timber algorithm is based on decision trees. Each tree helps to reduce the loss by correcting the mistakes that were produced by the tree that was used as training before it. The Support Vector Machine generates a hyperplane, which is an airplane that operates within n-constrained boundaries. This hyperplane separates all of the classes in the training data from one another in a manner that is both realistic and ensures that the gap between the two classes is as wide as possible. When compared to the other types of approaches, this technique requires a significant amount of computing resources in order to finish the training. Deep neural networks are used are a more advanced form of neural networks than its more traditional counterparts. They have a great number of castes, each of which is distinguished by a multitude of protrusions. Utilizing in-depth expertise, researchers in the fields of computer vision and natural language processing are working to attain state-of-the-art achievements in their respective fields. When compared to machines that use traditional methods, deep neural networks require far more data for training in order to outperform them.



B. Detection using two YOLOv2 models and OpenALPR

The authors of(3) proposed an automated surveillance system that utilizes two YOLOv2 models successively. The first model that's YOLOv2 trained with the COCO dataset which detects several classes in an image. Of all the detected classes, person class is considered, while every other class is discarded. generally box that's bounding of motorcycle is considered before moving on to person discovery. It was set up that motorbike discovery isn't relatively accurate especially when the camera is frontal- facing or back- facing, and indeed it's generally with a veritably lower confidence score if it does. The head covers the helmet and the bottom covers the license plate region in this system, with person discovery, if a person is sitting on a motorcycle. This increases the discovery score of the helmet in any test case.

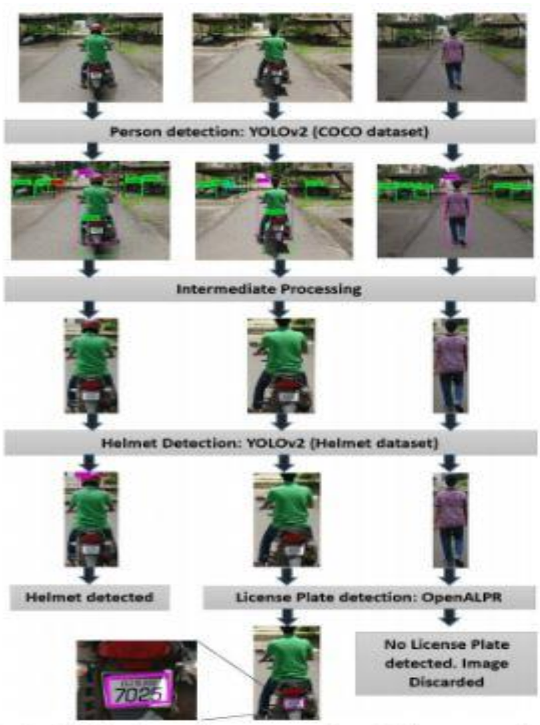


Fig. 1: Block schematic representation of the proposed approach.

The alternate YOLOv2 model, which is trained on a dataset consisting only of photographs of helmets, takes as input the cropped versions of the person class images that were generated by the first YOLOv2 model. This

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dataset was constructed using 3054 photos that feature subjects wearing helmets. The weights that are currently being used on ImageNet were trained. A network that has been pre-trained on a massive and complex dataset like as ImageNet can capture features such as angles and edges in their early stages, making it beneficial for solving issues that are ultimate examples of their type. This speeds up the training process as the model has formerly learned the features that are fundamental. For both training and testing the batch size is set to 64 with the knowledge rate of0.001. The decay and instigation are set to0.9 and0.0005, singly. still, it's detected and the process is stopped for that cropped image, If a helmet is present in the cropped image. However, the cropped image is passed to a license plate detector, OpenALPR, If a helmet isn't detected. However, in the event that a license plate has not been found, it is quite likely that the individual is a hitchhiker. OpenALPR is a library that allows for the automatic recognition of license plates and is available under an open source license. It is the most up-to-date and cutting-edge license plate library that may presently be accessed for either research or commercial reasons. The dereliction detector has been trained for the United States and a number of European Union nations, but it is feasible to add new countries by training the detector on a large dataset comprising of license plates from those additional countries. The detector has already been trained for the United States and a number of EU countries. However, the authors of this study decided to take into account the region in which the license plate was first issued rather than developing a new format for the license plate. The birth point of the region works better, and as a result, it provides the geographic location of the actual number plate that is displayed in the image. Downloaded images from ImageNet that had not been used for learning were utilized for testing purposes. The testing dataset included a total of 409 photos of people wearing helmets and 403 photographs of people not wearing helmets. The morals state that one can use 700 helmeted and 100 non-helmeted photos, which equates to around 20 images from the training data for testing. Still, we employ a quantity that is equalalmost 50) of helmeted and non-helmeted data because our model was originally meant to be alive of faces (transfer information). The helmet discovery delicacy utilizing this proposed system is 94.70, which is better when compared to other hitherto existing countries of the creative art ways which were around 91-94. After performing 500 repetitions in the morning of the training session, the average error was extremely large when it first began, but it gradually decreased in an exponential manner. Eventually, however, it became stable, with a truly minute but significant difference. After around 2500 repetitions, the training was terminated since there was no discernible improvement in the rate of error.

C. Detection Using YOLOv2 and OCR Method

The authors of (2) present a methodology for the discovery of entire helmets and the birth of license plates. The methodology makes use of YOLOv2 and YOLOv3 for the discovery of motorcycles and helmets, and OCR for the discovery of the actual number plate. During the initial step of the process, frames are extracted from the video train that is going to be under surveillance at certain intervals. The most recent image or an alternate version of the most recent image is selected for further processing depending on how the subject moved in relation to the camera. The entirety of the task can be broken down into two distinct scenarios: those in which the rider is protecting their head with a helmet and those in which they are not. The selected frame is then sent as input to the object that is the YOLOv2 model, where the classes that are supposed to be detected are "Motorbike" and "Person." The output is an image that contains the required detected class in addition to the degree of certainty in its finding as measured by a bounding box and a probability value. The discovered objects are cropped along their bounding boxes with the assistance of functions provided by the Image AI package. These images are then saved as individual files and given names that include the class name and image number in sequential order. After the person and the motorcycle have been secured together, the photos of the person are fed into the discovery model that is contained within the helmet. Notwithstanding this, there were several findings that were shown to be incorrect. As a result, the image of the individual was cropped so that only the top section, which constitutes one-fourth of the image (Region of Interest), was obtained. This guarantees that any false discoveries are not allowed to be made, and it also helps eliminate situations that could lead to incorrect results, such as when the rider is holding the helmet in their hand or if the helmet is sitting on the motorcycle rather than being worn by the rider. There is no further processing done, however if the rider is not wearing a helmet, the appropriate cropped image of the motorcycle is transferred for license plate discovery if the rider is wearing a helmet. If the rider is wearing a helmet, the image is not transferred. A total of 832 photos were gathered to be used as the dataset for the training process. These photographs contained a variety of motorcycles along with their respective license plates. For the purpose of the model's education, the license plate in each of those photographs was labeled with information using the labeling tool. The information pertaining to the bounding box is saved in a. xml train, and the true name of the file is the same as the image name. In addition, the annotated photos are utilized in the formation of the trained model for license

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plate recognition. Processing is done first in order to get a more delicate image ready for optical character recognition, which is then applied immediately to the pulled license plate. In order to improve its legibility, the picture of the license plate will be extracted and rotated. The image will also be rescaled after it has been rotated so that OCR can read the strings with sufficient sensitivity. The size of the rescaled image was established by selecting a scaling rate, which refers to the proportion of the size of the rescaled image to the size of the original image in terms of both its width and its height.

III. RESULTS AND DISCUSSION

Title	Year	Method Used
Helmet Detection on Two-wheeler Riders Using Machine [1]	2018	Random Forest, Gradient Boosted Trees, SVM, Deep Neural Network
An Automatic Detection of Helmeted and Non-helmeted Motorcyclist with License Plate Extraction using Convolutional Neural Network [2]	2017	YOLOv2, OpenALPR
Detection of Non-Helmet Riders and Extraction of License Plate Number using Yolo v2 and OCR Method [3]	2019	YOLOv2, YOLOv3, OCR

In paper (1), each of the four classifiers undergoes training using around 2000 different pictures. Both the frontal and the rear views of the car are shown in the training photographs provided here. R was used to do the analysis of the many different algorithms. Notwithstanding this, the final end-to-end system was carried out in Matlab with the help of the swish classifier. Each individual algorithm was put through its paces in the vehicle helmet and type discovery challenge. Raw pixel values are utilized as a sort of feature for both in-vehicle and helmet discovery. Delicacy was selected as the measure to use because all of the classes are in a state of balance; that is, each class has a number that is very close to being the same for both of the jobs.

Twenty percent of the total amount of information that was collected was left out of the process of training the classifiers. Rather, it was applied to the purpose of validating the classifiers. The algorithm known as random timber is head and shoulders above the competition in almost every respect. The performance of a deep neural network in picture identification does not live up to expectations because to a lack of training data. It was anticipated that the deep neural network would perform better than an arbitrary wood, but it did not. This is due to the fact that deep knowledge algorithms only function well when there is an abundance of training data. When there are not many automobiles present in the scenario, the system is able to function properly. This was purposefully left out because the primary focus of this script was more on analyzing the effectiveness of various machine learning algorithms rather than making the system particularly adept at recognizing helmets. Nevertheless, in order for the system to be useful, it must be able to identify several vehicles and successfully carry out all of the responsibilities that it performs when only dealing with a single vehicle. A second disadvantage is that, rather than producing a picture of the license plate at the end of the process, the system is able to issue a license number by making use of an OCR (optical character recognition), a commodity that was considered in (2). YOLOv2 was employed for the purpose of helmet finding by the authors of (3). The achieved findings demonstrated a higher degree of sophistication than the other methods, scoring 94.70 overall. They reported this outcome while contrasting the thoroughness of the methods advocated by Silva et al.writers in (5) who have a helmet discovery delicacy of 91.37 using a multi-subcaste perceptron model for type, (4) who has a helmet discovery delicacy of 94.23 using SVM classifier, and Waranusat etal.(6) with a degree of difficulty of 74 achieved with the use of a k-NN classifier over the head area of a biker. However, it is important to note that the authors have not tested the methods on raw CCTV video footage; rather, they have used still photos retrieved from ImageNet as their testing subject. The

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conclusion that can be drawn from this is that the result cannot be trusted due to the numerous drawbacks associated with the inapplicability of the method. The writers of(2) have effectively utilized YOLOv2 by adding relevance to video footage and perfecting the delicate consideration of the top quarter of the detected motorcycle picture as the region of interest in their work. OCR was utilized in order to choose numerals from the actual license plate.

IV. CONCLUSION

Several approaches to object discovery have been thought about with regard to the discovery of the number and the helmet plate. The Object Discovery Principle with YOLO Architecture is the Current Common System Considered for Motorcycle, Person, Helmet, and License Plate Discovery Thanks to its State of the Art Architecture, the Object Discovery Principle is the Current Common System Considered for Motorcycle, Person, Helmet, and License Plate Discovery.

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