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HELMET DETECTION ON TWO-WHEELER RIDERS USING MACHINE LEARNING

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ABSTRACT

Now-a-days 2 wheelers is that the best most popular method of transport. it's extraordinarily fascinating for bike riders to use helmet, however sporting helmets is commonly neglected by riders worldwide vital to accidents and deaths. to deal with this issue, most countries have laws that obligation the employment of helmets for two-wheeler riders. Additionally to the law, there's a vital proportion of the force that daunts this behaviour by supplying a traffic violation price ticket. As of now, this technique is manual and tedious. The projected system is to clarify this problematic by automating the tactic of sleuthing the riders World Health Organization area unit riding while not helmets. moreover, the system additionally extracts the license plate, in abstraction of license plate formula has 5 parts: image finding, initial process, fringe detection and segmentation, feature extraction and recognition of character range plates exploitation correct machine learning algorithms therefore that it may be used to issue traffic destruction tickets. The system implements machine learning antecedent image process ways to spot riders, riding two-wheelers, World Health Organization don't seem to be sporting helmets. The system takings a video of traffic on public roads because the input and identifies moving objects within the scene. A machine learning classifier remainders applied to the moving objective to acknowledge if the moving object may be a two-wheeler. The registration code is providing by method of the output in circumstance the rider isn't sporting a helmet.

KEYWORDS: Helmet Detection; Machine- Learning; OpenCV, python.

1. INTRODUCTION

In each country round the world, two-wheelers, bikes area unit best used for transport. A bourgeoisie family or tiny family by few members uses a motorbike as their main transportation. this is often because of the low worth and really few maintenance charges. however the tough raised by the two-wheelers is fewer security, unproductive, besides high risk is entangled by bikes. it's suggested to continuously wear a helmet whereas riding two-wheelers. within the previous amount, it absolutely was discovered a continuing growth fashionable the amount of motorcycle accidents besides loss of life. With respects to official information provided through the road transport department around twenty to thirty bike riders face accidents on a daily basis that may result in death or severe injuries besides additionally resulting in permanent bed ridden injuries on Indian streets in 2018 due to the neglect of not taking precautions whereas riding a motorbike like carrying head protectors, Associate in Nursing guards toward arms which can avoid slightly braking of bones whereas fell when a motorbike or met complete an accident. Additionally to the current out of twenty bike riders, 10 bike riders died because of not employing a protecting helmet. to scale back the concerned risk of life, it's extremely prompt and inspired for bicycle riders towards wear a protecting cap or helmet.

Two-wheeler could be a quite common mode of transportation in virtually each country. distinctive the effectiveness of helmet, Governments have ready it a punishable offense toward drive a bike while not helmet then take adopted manual approaches toward catch the violators. However, the remaining video observation primarily based ways area unit passive and demand important human support. In general, such systems area unit impossible because of involvement of humans, whose potency decreases completed long period.

2. RELATED WORK

In recent years, many studies were accomplished to gauge comprising the detection, classification and as well as of vehicles besides helmet detection.

R. Rodrigues Veloso e sylva, K.Teixeira Aires, and R. Delaware Melo Souza Veras[1] "Helmet detection on motorcyclists victimization image descriptors and classifiers". This paper Author presents a theme that repeatedly identifies motorbike riders and decides that they area unit carrying security helmets or not. The system abstracts moving objects and classifies them as a motorbike or alternative moving objects established on options extracted from their region properties victimization K-Nearest Neighbour / (KNN) classifier. The heads

of the riders on the recognized motorbike area unit once counted and segmental based mostly on projection identification. The system classifies the os as carrying a helmet or not victimization KNN supported on options derived from four sections of the segmental head region. Experimentation outcomes show a mean correct detection rate for close lane, faraway lane, and each lanes as eighty four, 68%, and 74%, separately.

C.-C. Chiu, M.-Y. Ku, and H.-T. subgenus Chen[3] "Motorcycle detection and pursuit system with occlusion segmentation," This paper Author mentioned close Image process has developed a typical technique for creating pictures a lot of apprehensible to the human eye. pictures no inheritable ar establish to be corrupted through noise in several cases. There are numerous strategies bestowed to get rid of compulsion noise in grey scale and color pictures. however terribly slight has been in dire straits the removal of preservative noise in color pictures of the numerous filters bestowed, most of them ar just for grey scale pictures. The filtering techniques established for grey scale pictures will be extended to color pictures by relating it to the totally different color elements singly however it's additionally obvious that they will incompletely destroy image details. The existing systems contains ancient Smoothing, linear filters, non-linear filters like median filter and unsure filter, adaptive filter, moving ridge primarily based filter etc. These techniques have a variety of blessings and additionally disadvantages.

C. Stauffer and W. Grimson.[4], In this paper Author presents a quick outline of digital image process techniques like Feature Extraction, Image Renovation and Image sweetening. a quick history of OCR and numerous methodologies to character recognition is equally mentioned during this paper. written character recognition is continually a frontline space of investigation within the field of pattern recognition. Here may be a Brobdingnagian demand on behalf of OCR accessible written documents currently Image process. Even the', necessary studies have performed in foreign scripts like Arabic, Chinese and Japanese, solely a awfully very little work will be found for written character recognition principally for the south Indian scripts. OCR system improvement for Indian script has several application areas like preservative manuscripts and ancient literatures written in dissimilar Indian scripts and creating digital libraries for the documents. Feature extraction and classification area unit essential steps of character recognition procedure touching the full accuracy of the popularity system.

Z. Zivkovic,[2] during this paper, Author has deliberated safety and security of the rockers beside road accident. good helmet takes superior plan that makes bike driving safety than beforehand, this is often consummated exploitation GSM and GPs technology. different benefits of this project is to live the alcohol equal of the inebriated those that is riding the bike. once the alcohol level crosses the predefined worth, the alarm starts and obtain warning regarding the inebriated driver. The author take conjointly deliberated regarding the accident detector and therefore the detector can active the GPS and notice the place and more SMS can send to auto or relations.

3. Proposed System

1. Moving object detection

The first task in helmet identification is to detect a moving vehicle. It is the first step before performing more sophisticated functions such as tracking or categorization of vehicles. Rather than immediately processing the entire video, the example starts by obtaining an initial video frame in which the moving objects are segmented from the background. Processing only the initial few frames helps to take the steps required to process the video. The foreground detector needs a certain number of video frames to initialize the Gaussian mixture model. The foreground segmentation process is not perfect and often includes undesirable noise. Next, we will find bounding boxes of each connected component corresponding to a moving vehicle. Generally, more than one blob is detected apart from moving vehicles such as pedestrians, trees, dogs and other small noises. All the blobs that consist of less than n number of pixels are discarded (in our case n is 150 pixels). This way, we only remain with the moving vehicle. But there are a lot of gaps in the blob, that is, it is not one coherent blob. We use the morphological opening to remove the noise and to fill gaps in the detected objects which makes the blob more coherent. Once the blob is found, the raw image is extracted that is hidden behind the blob.

3. Vehicle classification

The next step is to classify the moving vehicle extracted in the last part. To classify vehicle, we are going to use the number of machine learning algorithms, from classical machine learning algorithms to modern deep neural networks, to see which approach works best in vehicle classification with limited data. A vehicle can be classified into two categories two-wheelers or four-wheelers. We are only interested in two-wheelers Figure 1 since we want to detect the presence of a helmet. The system proceeds further only if a two-wheeler is

detected. Else, it discards this vehicle and looks for other vehicles and the cycle continues. We will collect the training data required for the classification of a vehicle on our own. We will capture the images of various vehicles in various positions. Almost same number of images, 1000, were gathered for both the classes two- wheelers or four-wheelers. If there are equal number of training images from both classes then it eliminates the problem of class imbalance and leads to better performance of the classifier. The training images contain a vehicle surrounded by other objects of interest such as trees, footpath, how a vehicle is normally seen on roads. Although this dataset is not the most representative of the real world moving objects, it is still enough to train and test the effectiveness of various machine learning algorithms to check the feasibility of the approach. The images will be converted to grayscale. Raw pixel values were fed to the classifier.

4. Helmet detection

Using the same approach as applied to identify the type of vehicle, we detect whether the rider is wearing a helmet. The images that will be used to train a helmet detector will be cropped version of the two- wheeler images focusing on the head region of the rider. Using this technique, we will be able to maintain the class balance, that is, there will be same number of images where the rider was wearing a helmet and where the rider was not wearing a helmet. We used numerous machine learning classifiers in order to select the best one for this task.

5. License plate extraction

After the previous steps, in case if the rider of a two-wheeler is not wearing a helmet, our next step is to extract the license plate of the vehicle. We extract the region of interest from our cropped image by giving the appropriate coordinates.

II. Vehicle classification

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MACHINE LEARNING APPROACHES

A total of five machine learning classifiers will be used to test which one performs better in our scenario.

The classifiers are Random Forest

This algorithm is based on decision trees. Here, instead of building one tree, a lot of trees are grown in parallel. All these trees are fed only a subset of data points and a subset of features. The sub setting ensures diversity among the trees. After training, each tree votes for a class and a final class is chosen based on the highest number of votes.

Gradient Boosted Trees

This algorithm is also based on decision trees like the random forest. However, instead of constructing a lot of trees in parallel, trees are constructed sequentially one after the other. Each tree improves the loss by rectifying the error made by the previous tree while training.

Support Vector Machine

An SVM creates a hyper plane (a plane in n-dimensions) which divides all the classes in the training data from one another in such a way that the difference between the two classes is maximum. This algorithm takes a lot of computing resources to complete the training as compared to the aforementioned classification techniques.

Deep Neural Networks

Deep neural networks are an improvement over conventional neural networks. These are neural networks with a large number of layers where each layer has a plethora of nodes. Deep learning is being used to achieve state-of-the-art results in the field of computer vision and natural language processing. Deep neural networks require a lot of training data as compared to conventional machine learning algorithms to outperform them. And that's why we were interested to see how well would this technique work in case of a small training data. If we had a large training data (hundreds of thousands of images for each class), the choice obviously would have been a deep neural network. However, the small number of images becomes a bottleneck for such networks. We used a 10-layer network with 50 nodes in each layer.

Tensor Flow

The deep learning library in the world is Google's TensorFlow. Google product uses machine learning in all of its products to improve the search engine, translation, image captioning or recommendations. example, Google users can experience a faster and more refined the search with AI. If the user types a keyword the search bar, Google provides a recommendation about what could be the next word.

Google wants to use machine learning to take advantage of their massive datasets to give users the best experience. Three different groups use machine learning:

- Researchers
- Data scientists
- Programmers.

They can all use the same toolset to collaborate with each other and improve their efficiency. Google does not just have any data; they have the world's most massive computer, so Tensor Flow was built to scale. TensorFlow is a library developed by the Google Brain Team to accelerate machine learning and deep neural network research.

It was built to run on multiple CPUs or GPUs and even mobile operating systems, and it has several wrappers in several languages like Python, C++ or Java.

TensorFlow architecture works in three parts:

- Preprocessing the data
- Build the model
- Train and estimate the model

It is called TensorFlow because it takes input as a multi-dimensional array, also known as tensors. You can construct a sort of flowchart of operations (called a Graph) that you want to perform on that input. The input goes in at one end, and then it flows through this system of multiple operations and comes out the other end as output.

OpenCV

OpenCV is the leading open source library for computer vision, image processing and machine learning, and now features GPU acceleration for real-time operation.

OpenCV is released under a BSD license and hence it's free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. Written in optimized C/C++, the library can take advantage of multi-core processing. Adopted all around the world, OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 6 million. Usage ranges from interactive art, to mines inspection, stitching maps on the web or through advanced robotics.

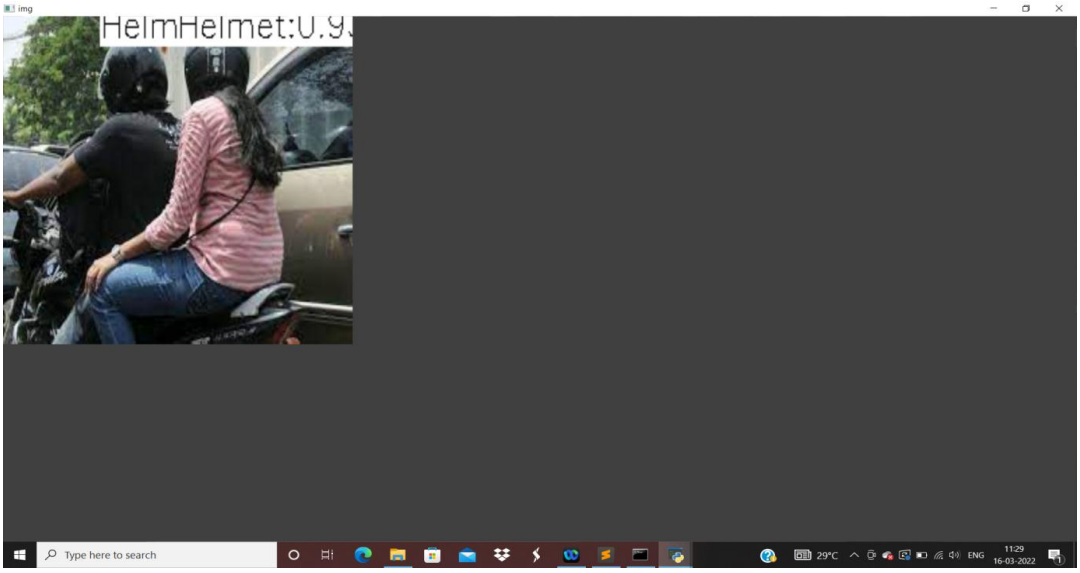
OpenCV is being used for a very wide range of applications which include.

- Street view image stitching
- Automated inspection and surveillance
- Robot and driver-less car navigation and control
- Medical image analysis
- Video/image search and retrieval
- Movies - 3D structure from motion
- Interactive art installations

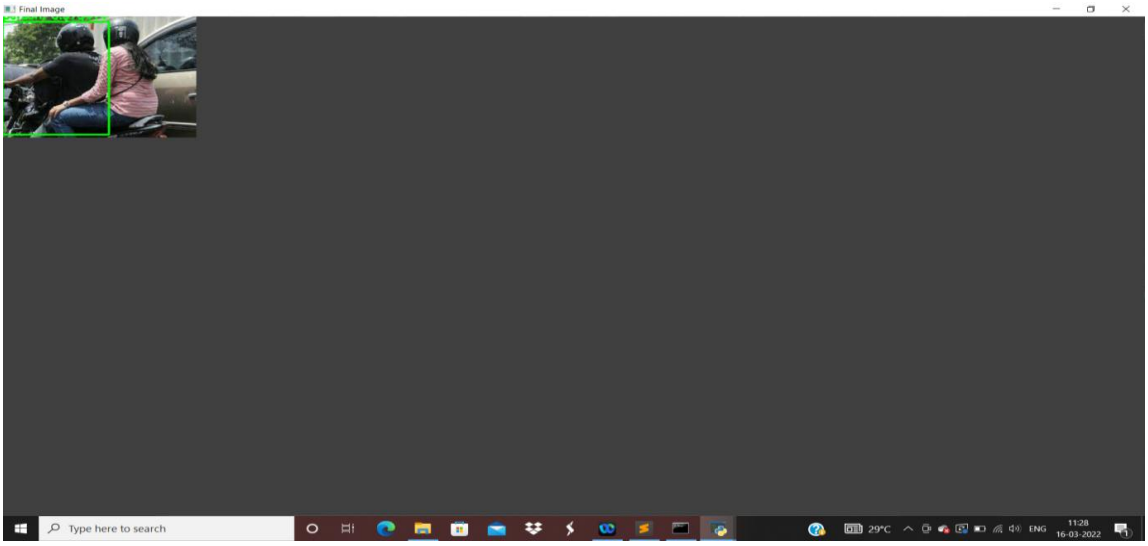
4. IMPLEMENTATION

- The system takes a video of traffic on public roads as the input and detects moving objects in the scene.
- A machine learning using KNN classifier is applied to the moving object to identify if the moving object is a two-wheeler.
- By using OPenCV the system detect that the rider is wearing helmet or not. If rider wear a helmet then it show “with helmet”. If not then it show no helmet.

5. OUTPUT



- The system takes a photo/video of traffic on public roads as the input.



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5. DISCUSSION

Machine learning is that the field of AI within which a trained model works on its own intense the inputs given throughout coaching amount. Hence, by coaching through a particular dataset, a Helmet detection model are often dead. Mistreatment this helmet detection ideal helmet fewer riders are often positively detected.

6. CONCLUSIONS

This system is extremely effective for the protection purpose of the user. User needs to wear helmet to ride a motorcycle and therefore traffic rules are monitored by the rider. this method is below pocket management that's riding the 2 wheeler vehicle having safety in hand and in affordable. this method consumes simple functionalities. It provides an improved security to the biker.

All the libraries and software system employed in our project ar open supply and henceforward is extremely versatile and budget good. The project was primarily engineered

to unravel the matter of non-efficient traffic organization. henceforward at the tip of it we will say that if organized by any traffic management departments, it'd create their job easier and additional economical.

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