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NUMBER PLATE DETECTION WITHOUT HELMET

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ABSTRACT: Classification and clustering are used to identify helmets. Detecting the presence of a helmet is an important yet difficult visual job. When it comes to applications such as traffic surveillance, this is an essential component. Pre-processing, Feature Extraction, and Classification are the steps we propose to do. We use traffic surveillance photographs to explain our ideas. When all is said and done, our algorithm will determine whether or not the subject is donning a helmet. Our method is superior to existing algorithms in terms of both resilience and effectiveness. A CNN model was created for the purpose of detecting HELMETS and license plates in various photos as part of this research. For the purpose of picture recognition, this form of the system makes use of previously acquired photographs. Number plate extraction, character splitting, and template matching are the first steps in the recognition process. The program must be able to handle number plates fast and effectively in a variety of environmental situations utilizing the CNN model.

CNN and the detection of license plates are two of the most commonly used keywords.

INTRODUCTION

The two-wheeler is a common means of transportation in practically every country. However, due to the lack of safeguards, there is a significant danger associated. The wearing of a helmet by bike riders can significantly lessen the risks they face on the road. Because of the importance of wearing a helmet, governments have made it a crime to ride a bike without one, and they've implemented enforcement measures including random checks and other manual methods to detect those who do. In contrast, the current image-based surveillance technologies are passive and require a lot of human intervention. Due to the fact that these systems rely on humans, their efficiency degrades over time. With automation, the monitoring of these violations will be more reliable and resilient, as well as lower the quantity of human resources required. In addition, a growing number of countries have implemented systems that use cameras to monitor people in public locations. As a result, existing infrastructure may be used to detect offenders at a low cost. However, there are a number of hurdles to overcome before such automated solutions may be implemented:

Implementation in real time It's difficult to deal with a large volume of information in a short amount of time. In order to accomplish real-time implementation, operations like segmentation, feature extraction, classification, and tracking necessitate rapid processing of large amounts of data.

The dynamic objects generally obstruct each other in real life circumstances, thus the object of interest is only partially visible.

When things are only partially visible, it becomes more difficult to classify and segment them.

Three-dimensional objects, by their very nature, appear to move in different directions when viewed from various perspectives. The accuracy of classifiers is generally known to depend on the features utilized, which in turn depends on the angle. Consider the front and side views of a bike rider as an illustration.

Environmental circumstances, such as illumination, shadows, and so on, undergo numerous variations over time. Background modeling, for example, can become more difficult as a result of small or large shifts in the environment.

5) Image Feed Quality: CCTV cameras often collect images with a low quality. This is made much more difficult by factors such as poor lighting and adverse weather conditions.

Stricter rules make activities like segmentation, classification and tracking harder. A good surveillance framework should be able to perform in real time, be finely tuned, be resilient to rapid changes, and be able to forecast what will happen next. These constraints and desired qualities prompted us to develop a system for detecting bike riders without helmets using existing security camera footage in real time.

2. LITERATURE REVIEW

2.1 Robust real-time unusual event detection using multiple fixed-location monitors :

Here, we demonstrate how to identify specific sorts of anomalous events using an innovative approach. Low-level statistics are collected by a network of local monitors. If a local monitor detects an abnormality in its present readings, the data is used to make a final determination about the occurrence of an unusual event. Using our approach, a large-scale surveillance system can meet a set of important requirements. In instance, it simply necessitates a quick initial set-up and then runs on autopilot. It is more reliable than tracking-based algorithms because it doesn't rely on the movement of objects. Once sufficient low-level observations indicating routine activity have been collected, the algorithm is effective, which normally occurs after a few minutes, the algorithm is effective. In the actual world, our algorithm is always working. Real-world busy settings were used to test it. The detection and false-alarm rates for these situations were measured using a ground truth.

employing a single camera for real-time car and motorcycle recognition on the road

Real-time monocular vision for rear car and motorbike identification and tracking is presented for lane change assistants in this paper. " (LCA). This work uses several cues to recognize and track multiple automobiles and motorbikes on the road in order to achieve resilience and accuracy. All algorithms have been built on a parallel IMAP (integrated memory array processor) vision board to achieve real-time multi-resolution technology. The accuracy, sturdiness, and responsiveness of this system were demonstrated in a variety of traffic scenarios.

2.3 Occlusion segmentation for motorcycle recognition and tracking:

Motorcycles can be tracked and detected using a vision-based motorbike monitoring system proposed in this research. There is a segmentation approach for detecting occlusions in an image. The occlusion classes of the motorcycles are detected and the motorcycles from each occlusive class are segmented using the visual length, visual width, and Pixel Ratio of the approach. In order to make sure that the motorcycle and the rider are safe, the helmet detection or search method is used. The method's resilience, accuracy, and temporal responsiveness have been demonstrated in experiments utilizing realistic road scenarios.

In this section, we do a survey of visual surveillance of object movement and behavior:

One of the most active areas of computer vision research right now is visual surveillance in dynamic situations, particularly for people and automobiles. Applications range from entry control in restricted areas to human identification at a distance, population flow statistics and congestion analysis, aberrant behavior detection, interactive monitoring employing several cameras, and more. For visual surveillance in dynamic scenarios, the processing framework contains the following stages: environment modeling, motion detection, classifying objects in motion, tracking and behavior analysis, human identification and data fusion from several cameras. Each stage of the process is examined in detail, as are current advances and the underlying methods. As a final step, we look at potential research directions, including, but not limited to: occlusion handling, two- and three-dimensional tracking, a motion analysis/biometric combination, anomaly detection/behavior prediction, content-based image retrieval, behavior understanding/natural language description, and remote surveillance.

Using motorbike detection and tracking, we can classify the presence of a helmet on a rider's head.

Although helmets are vital for motorcycle riders' safety, enforcement of helmet use is a labor-intensive task. A method for automatically classifying and tracking motorcycle riders with and without helmets has been described and tested. Static pictures and individual image frames from image data are used to train support vector machines on histograms produced from head region image data of motorbike riders. Motorcycle riders are automatically segregated from picture data using background subtraction trained on the classifier. The trained classifier is used to classify the heads of the riders. Each motorbike rider creates a distinct set of time-stamped zones known as tracks. The individual classifier outputs are then averaged to classify the tracks as a whole. Classifiers can accurately identify whether riders are wearing helmets or not based on static photos,

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according to the results of tests. The tracking system's tests show that the classification approach is accurate and useful.

Fig.2: Photographs of helmets taken at midday (left) and at dusk (right).

2.6 Vehicle detection, tracking and classification in urban traffic

In this paper, a system for detecting, tracking, and classifying vehicles using roadside CCTV is presented. Cars, vans, buses, and motorcycles are all counted and categorized by the system (including bicycles). The abrupt variations in illumination and camera shake were addressed with a new background Gaussian Mixture Model (GMM) and shadow removal method. Using a Kalman filter and a level set approach, the foreground blob can be classified by a majority vote over a series of frames. In order to assess the system's performance, numerous experiments have been carried out using real-world data. Training an SVM (Support Vector Machine) with a vehicle silhouette and intensity-based pyramid HOG features extracted after background subtraction, identifying foreground blobs with majority vote, yields the best results.

3. IMPLEMENTATION

Thresholding, a segmentation technique, is used to isolate an object from its surrounding environment. The pixel intensity of each pixel is compared to a predetermined threshold in this process. After thresholding, adjacent pixels are joined to form a ternary pattern. A wide range of ternary values can be found in a histogram, therefore the ternary pattern is divided into two binary ones. In order to construct a descriptor twice as large as LBP, histograms are joined together. The technology used to discover and identify items in an image or image sequence is called object recognition. The color and character elements of a license plate are used to extract it, followed by texture-based segmentation.

Low-level image processing techniques such as noise removal may be used first, followed by the extraction of features such as lines, regions, and maybe even areas with specific textures.

It then uses a method known as a feature descriptor to produce feature descriptors/feature vectors from a picture. The convolutional neural network (CNN) is then employed, which includes one or more convolutional layers and is mostly used for image processing, classification, segmentation, and other auto-correlated data processing. ' Using optical character recognition and thresholding/template matching, a license plate recognition system may then be implemented.

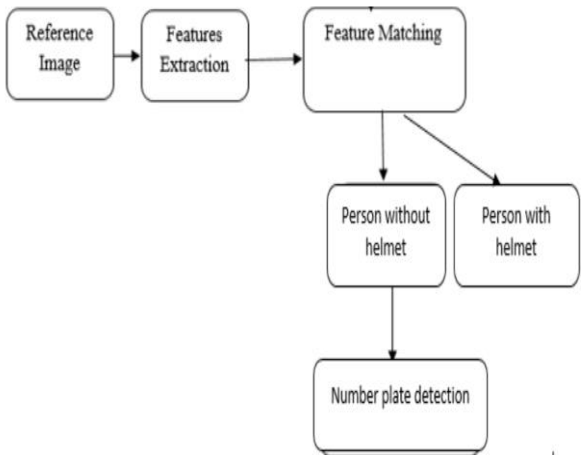

Fig.3: System architecture

This is a system for detecting whether or not someone is wearing a helmet and reading their license plate based on photos obtained from a traffic monitoring system and fed into convolutional neural networks. If the person is not wearing a helmet, convolutional neural networks will be used to recognize the number plate characters of the bike rider and create an accurate and effective output in the next step.

The modules involved in this project are

1. Upload image

2. Detect motor bike & person

3. Detect helmet

Using either an ipcam or a webcam, the bike can be identified in the image. In order to categorize whether or not a person is wearing a helmet, this technique first detects the picture of a motorcycle and the driver. In this study, we used CNN models to tackle the challenge of identifying bikers and their helmets from surveillance images. When we'd finished collecting the photos that would make up our training dataset, we divided them into two piles: one for training data, and the other for testing data. The results of this experiment are based on the use of CNN models to classify images. To ensure the accuracy of the detection of the biker with and without a helmet in the image, all photographs will be examined and analyzed. Convolutional neural networks, such as CNNs, include several layers (and some other layers). The convolutional process is carried out by a number of filters in a convolutional layer. After comparing the results of earlier phases, we arrive at our final decision. Image categorization and image detection performance will be evaluated based on experiment accuracy. Performing operations on images at the lowest level of abstraction is referred to as "image pre-processing." If entropy is used as a measure of information content, these procedures actually decrease it. An image's quality can be improved by preprocessing by removing unwanted artifacts or improving certain aspects of the image that are important for subsequent processing and analysis. The license plate number is found using morphological procedures on a segmented image. The license plate area will be improved (smoothed) using the dilation and erosion method by deleting any extra pixels from the plate's outer region. We will be able to differentiate the foreground and background after morphological processing. This number plate has been snatched away.

4. ALGORITHM

CNN:

The reader is expected to be familiar with neural networks. Artificial Neural Networks are excellent in Machine Learning. Image, audio, and word

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classification are all examples of tasks where artificial neural networks are applied. LSTM and Convolution Neural Networks are both used for picture classification, whereas Recurrent Neural Networks and Convolution Neural Networks are used to predict word sequences. Let's go over the basics of a neural network again before getting into the Convolution Neural Network. Normal Neural Networks have three layers: the input, the output, and a hidden layer.

Layers of data to be entered: Essentially, this is the layer where we feed our model with data. There are exactly as many neurons in this layer as there are in our data (number of pixels in the case of an image).

The input from the input layer is fed into the hidden layer. Depending on our model and data size, there may be several hidden layers. As the number of characteristics increases, so does the number of neurons in each buried layer. A nonlinear network's output is generated by multiplying the previous layer's output by the layer's learnable weights and biases, then applying an activation function to the resulting matrix.

A logistic function such as sigmoid or softmax is used to translate the output of each class into a probability score for each class in the output layer.

Using the model's output, we can next calculate the error using an error function, such as cross-entropy or square loss error, among others. This phase is referred to as "feedforward." After that, we use the derivatives to retrace our steps back to the model. Backpropagation is a technique used to reduce the amount of data that is lost.

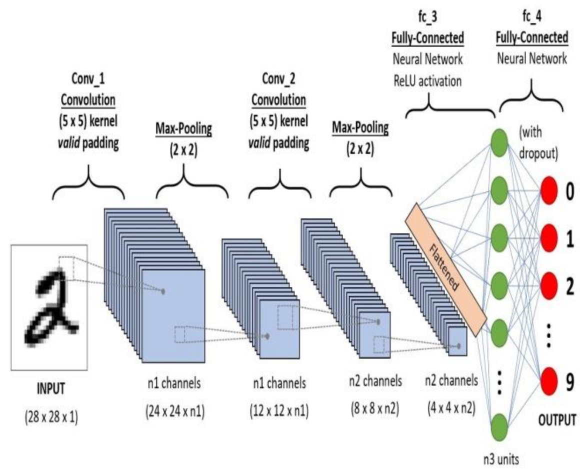

Fig.4: CNN architecture

Step by Step Procedure:

Step 1: Choose a Dataset. ...

Step 2: Prepare Dataset for Training. ...

Step 3: Create Training Data. ...

Step 4: Shuffle the Dataset. ...

Step 5: Assigning Labels and Features. ...

Step 6: Normalizing X and converting labels to categorical data. ...

Step 7: Split X and Y for use in CNN.

5. EXPERIMENTAL RESULTS

If a helmet is not present in an image, the application will identify the number plate; if a helmet is present, the application will not identify the number plate. This is because we don't have enough images to train the CNN model, so our application can detect the presence of a helmet from 25 different images.

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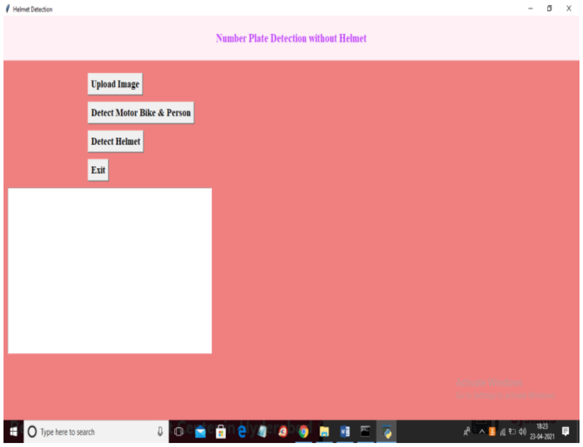

Fig.5: Home screen.

In above screen click on ‘Upload Image’ button to upload image

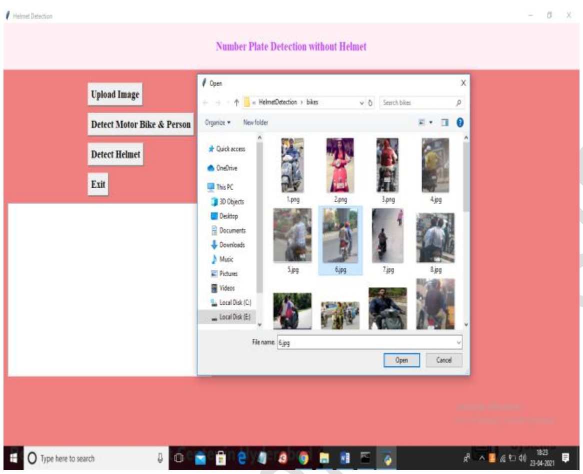

Fig.6: Upload image

For example, pick and then upload the file "6.jpg," then click on "Open," and then click on "Detect Motor Bike & Person" to determine whether or not there is an image of a someone riding a motorcycle in it.

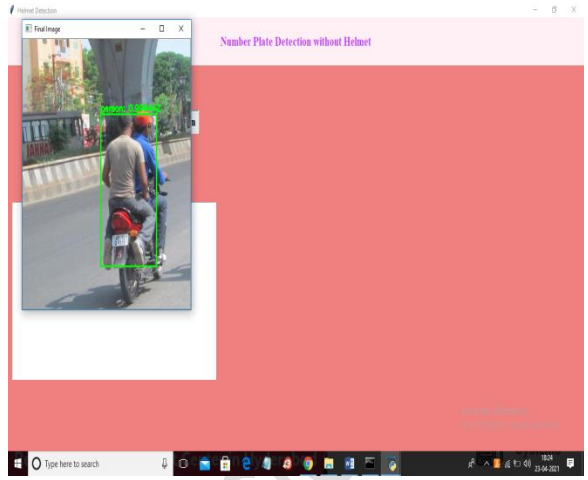

Fig.7: Detect motor bike & person

In the above screen, if a person on a bike is spotted, the 'Detect Helmet' button is pressed to get the following output.

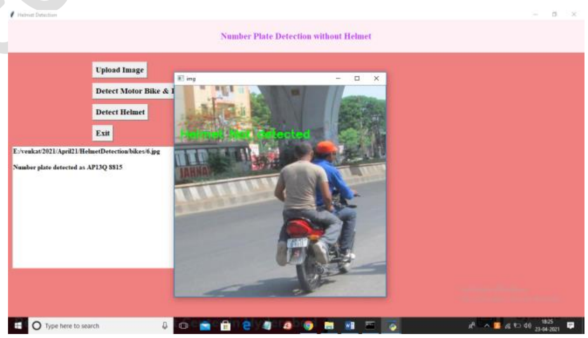

Fig.8: Detect helmet

We can see that the helmet is not identified in the screen shot above, and the application then identifies the license plate number and displays it as 'AP13Q 8815' in the text box.

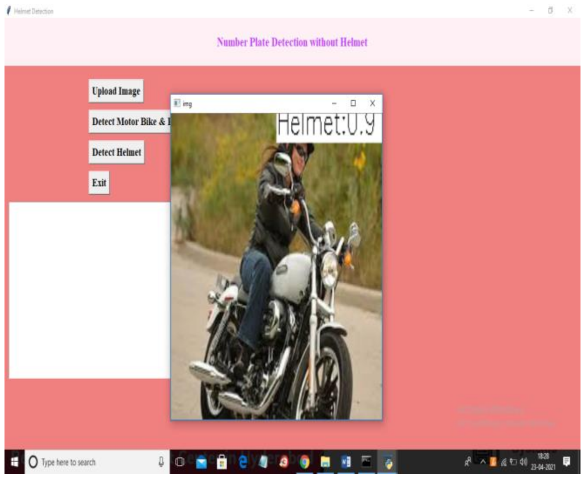

Fig.9: Another detection screen

App discovered a helmet with a matching score of 0.90 percent on the above screen.

6. CONCLUSION

Our goal is to develop a method for identifying cyclists without helmets who are breaking traffic laws. The traffic police would also benefit from the proposed framework, which will help them identify such violators in unusual weather situations, such as the blazing sun. Both the recognition of bike riders and the detection of violators were shown to be accurate in the experiment results With a little tweaking, the proposed architecture can adapt to any new situation.

7. FUTURE SCOPE

Video frames will be used in the future to extend this notion. We can even recognize the number plate without the helmet quite effectively through films.

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