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# **Automatic Traffic Rule Violation Detection and Number Plate Recognition**

The project presents Automatic Number Plate Recognition (ANPR) techniques and other image manipulation techniques for plate localization and character recognition which makes it faster and easier to identify the number plates. After recognizing the vehicle number from number plate the SMS based module is used to notify the vehicle owners about their traffic rule violation. An additional SMS is sent to Regional Transport Office (RTO) for tracking the report status. Three algorithms that are used are: Edge Detection, Hough Transform & K-Nearest Neighbor. For detection of the number plate, edge detection is first of all performed, a Gaussian smoothed step edge is used for the detection. This produces a noisy edged picture of the subject. After that for clearing of noise, Hough Transform is used. Hough Transform also helps in line detection. The k-nearest neighbors formula (k-NN) may be a non-parametric methodology used for classification and regression. It is implemented and executed in OpenCV and performance is

tested on genuine images. The system works quite well. [1]

**Algorithm for detecting violations of traffic rules based on computer vision approaches**

The algorithm uses multi-step proceedings. For car detection, we use faster R-CNN deep

learning tool. The algorithm shows promising results in the detection violations of traffic rules. The algorithm works in two stages. At the first stage, it is necessary to detect three classes of objects in the video sequence. First class crosswalk (zebra), the second class moving vehicles and the third class the pedestrians going on the crosswalk. After all the object classes are found on each frame of the video sequence, the second stage begins. It is necessary to impose video sequence frames with the allocated objects at each other. If on the same frame of the video sequence the pedestrian and the vehicle are at the crosswalk, the vehicle means violates Traffic regulations, having done not pass the pedestrian. The background is received using a segmentation method. It is the previously discussed background difference method. Car detection is performed using Faster R-CNN Deep Learning. Create a Convolutional Neural Network (CNN). A CNN is the basis of the Faster R-CNN object detector. Beginning with the image input layer function, which defines the type and size of the input layer. For classification tasks, the input size is typically, the size of the training images. For detection tasks, the CNN needs to analyze smaller sections of the image, so the input size must be similar in size to the smallest object in the data set. In this data set all the objects are larger than [16 16], so select an input size of [32 32]. This input size is a balance between processing time and the amount of spatial detail the CNN needs to resolve. The middle layers are made up of repeated blocks of convolutional, ReLU (rectified linear units), and pooling layers. These layers form the core building blocks of convolutional neural networks. Combine the input, middle, and final layers. The system trains the detector in four steps. The first two steps train the region proposal and detection networks used in Faster R-CNN. The final two steps combine the networks from the first two steps such that a single network is created for detection [2]. Each training step can have different convergence rates, so it is beneficial to specify independent training options for each step. Now that the CNN and training options are defined train the detector using training Faster RCNN Object Detector. During training, image patches are extracted from the training data. The 'PositiveOverlapRange' and 'NegativeOverlapRange' name-value pairs control which image patches are used for training. Pedestrians are detected using Motion-Based Multiple Object Tracking of a method. Detection of moving objects uses the algorithm of

subtraction of a background based on a Gaussian mixture of the model. The movement of each

traced object is estimated using Kalman's filter.[2]

# **Traffic Violation Detector using Object Detection**

Traffic Violation Detector using Object Detection helps to detect the vehicle number plate that is violating traffic rules and by that number the admin finds the details of the car owner and penalty is sent to the violator. This system realizes tensorflow, which makes it easy to construct, train, and deploy object detection models. Generative Adversarial Network (GAN), which is a deep learning algorithm, is used to model or generate data that is very similar to the training data. It consists of a discriminator to identify if the data is real or fake. GAN is based on Deep Learning Techniques. COCO (Common Object in Context) is dataset containing 200,000 images and more than 500,000 object annotations in 80 different categories. This dataset is used in the system. The process sequence is: Image Classification, Image Tagging, Object Detection, Optical Character Recognition and Image Segmentation. The Nanonet API is used for Optical Character Recognition (OCR). [3]

# **Vehicle Detection and Tracking from Video Frame Sequence**

In the pre-processing phase of this paper, the noises are denoised with the help of filtering techniques. After it, the segmentation is done using regionprops function of MATLAB. The =n background detection is done, after which feature extraction is performed, which extracts features such as image edges, corners, and other structures. After that, the background difference algorithm is applied. The vehicle gets detection. Now, for motion estimation, Optical flow method is applied. The Optical Flow block using the Horn – Schunck algorithm (1981) estimates the direction and speed of object motion from one video frame to another and returns a matrix of velocity components. Various image processing techniques such as thresholding, median filtering are then sequentially applied to obtain labeled regions for statistical analysis. Vehicles are also tracked using the method. [4]

# **Over speed detection using Artificial Intelligence**

In this project, by the use of computer vision and artificial intelligence, over speeding is tried to be detected and reported to the violation to the law enforcement officer. It was observed that when predictions are done using YoloV3, the best results were obtained. Artificial intelligence can be defined as a science or engineering of making machines smart and intelligent. Deep Learning is a part of artificial intelligence which primarily deals with the neural networks. Neural networks try to learn from the training data without being programmed explicitly. Different functions are used for calculation of losses. The back-propagation algorithm is carried so as to update the weights. A traffic signs classifier is implemented using pandas, NumPy, SkImage, SkLearn, h5py, glob, Keras, Matplot lib, OpenCV and python. It took a little more than 9 hours to train the model. Over the whole course of training, it was observed that loss was decreasing with increase in the epochs. Initially, loss was very high and was decreasing non-linearly. After 30 epochs there was a negligible change in the loss and therefore training the model for 30 epochs would be the most efficient. The best accuracy the system was able to achieve was 96% on the validation set. the systemt takes ~2 seconds for inference of single image using the trained model on the same machine. For testing, the system had clicked manually 25 images and these images were cropped so just as to get the traffic sign. When testing was done over these images, 21 images predicted the correct categories whereas 4 images predicted the invalid categories. Tools used to achieve image data augmentation consists of MATLAB, python, SkiImage, NumPy and OpenCV (Computer Vision library). These algorithms work for a constrained environment and fail if the images have variations. They may be able to detect a single large-sized soccer ball in the image very accurately but won’t work if we wish to detect many small size soccer balls of different variations present in the image. Under this kind of situations, Yolo comes to rescue. Yolo is an object detection system and is able to detect a wide variety of the objects present in the real time. Because of its unified architecture, it is extremely fast in detection. Existing deep learning classifier models like Regions with Convolutional Neural Network (R-CNN) are capable of performing object detection. For object detection, these systems use sliding window i.e they consider a classifier for every object to be detected and slide it over all possible window locations on the image. Once the classification is done, post-processing is carried out and bounding boxes are redefined. Post processing is also done to remove duplicated detections. This increases the complexity, computation and time it takes for the detection. The basic motivation for using Yolo is the speed and complexity of the system. Instead of sliding over an image many times, Yolo only looks once and detects all the objects present in the image. Yolo defines the detection problem as a regression problem and uses features from an entire image at the time of training. Unlike RCNN, it looks at the entire image during the time of 27 training and testing That means Yolo predicts all the different object categories present on an image simultaneously. Yolo uses non-maximal suppression [N13]. Neural network of Yolo is very similar to. GoogLeNet has 22 convolutional layers whereas Yolo has 24 convolutional layers. Convolution layer in Yolo is followed by the two fully connected layers. Size of the kernel used in convolution layers is 3\*3 or 5\*5. This causes the weights of convolution layer to be less dependent on the location of the objects in the image and weights do not have spatial information. Fully connected layer takes into consideration spatial far-away features. The system was finally able to achieve accuracy of around 90% for the images in day time but accuracy reduces if it is night time. [5]

# **Automated High-Speed Traffic Monitoring and Violation Detection Using RFID Technology**

# References

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