License Plate Detection In Complex Circumstances

(Indian License Plates)

Project by-
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Abstract:

The importance of detecting License Plates is significant because of its wide range of applications ranging from traffic and parking management to security surveillance and privacy protection.

This is not merely a simple case of object detection but is a complex one because the license plates often come in different shapes, orientations and will be subject to different lighting conditions as well. For example: it's a challenge to capture a fast moving vehicle's license plate with good resolution and also, the farther small sized ones would also be difficult to analyse.

When it comes to an Indian License plate, there are sometimes found different versions of plates which sometimes do not abide by the law and are difficult to recognize. Some people write their names which makes it difficult for a human eye to catch the real plate number. We are proposing a model which can detect all kinds of license plates even in a complex scenario.

Introduction:

License Plate detection is a prominent application of neural networks. Being a case of object detection, it has many real-time applications such as traffic management, privacy detection, theft control, security surveillance,automatic payment of tolls on highways, etc. This task is challenging because the differences among each of the license plates are huge and often, each of them have different color combinations, varying fonts and dimensions. In this project, we as a team would like to use the YOLO(You Only Look Once) network for object detection and Multi Layer Perceptron (MLP) for training purposes, and finetune it to obtain the best results.

Related Work:

This application of Image detection has been implemented on Car Plates by R.Parisi, E.D.Di Claudio, G.Lucarelli and G.Orland at *University of Rome*[1].They have used the Block Recursive LS algorithm(BLRS) which promised the results of high convergence rates and robustness to the solution. The images they acquired of the number plates were normalised using Discrete Fourier Transform (DFT) and then were subsequently classified by the neural network.

First step was Image Processing where the digital image was preprocessed using tone equalization & contrast reduction. Then the plate was located and the location of it was extracted. This was followed by character localization and segmentation; which means the image portion was converted to binary values which could get classified into black and white tone clusters. This was followed by finding the white areas between columns with higher densities of black pixels.

The last step included recognition using FNN; which was trained with english characters and it resulted in high convergence. The final step was plate validation where the number plate was reconstructed from the set of recognized characters.
This work has resulted in a 90% validation rate and only 8% was the rejection rate when tested on fifty real-world images of license plates.

About the Dataset:

We are using an Indian vehicle license plates dataset from kaggle which has around 10000 images. We have decided to first train our neural network on clear images.
The Indian License plate is composed of Alpha-numeric characters, with the first two letters depicting the area or state. Below are some of the examples of the number plates from the dataset, which we focus on accurately detecting through our model.

Dataset Link- https://www.kaggle.com/thamizhsterio/indian-license-plates

Methods:

We would input a set of images to our model which may or maynot comprise of the license plates from the dataset and the output we expect are the images with highlighted License Plates.

We aim to use YOLO-V3 model which will be fine-tuned on our dataset with pictures of License Plates and then perform error analysis.This might throw light on the weakness of our model which will allow us fine-tune it to improve the performance.

Challenges:

- It might get difficult to detect the smaller sized license plates.
- Objects that are similar looking as license plates with the same colors and dimensions might get misclassified as license plates.
- The model that is being built should be sensitive enough to capture the varying resolutions of the different license plates.

Expectation from the project:

We would like to make the detection and recognition more robust and accurate, even in most complicated environments.Overcoming the challenge of multiple sizes, varying fonts, color codings and languages; we want to develop a network model that can detect and recognize from even the most complex background.

References:

https://www.researchgate.net/publication/3756510_Car_plate_recognition_by_neural_networks_and_image_processing

https://missinglink.ai/guides/computer-vision/neural-networks-image-recognition-methods-best-practices-applications/

https://pjreddie.com/media/files/papers/YOLOv3.pdf

https://www.altexsoft.com/blog/image-recognition-neural-networks-use-cases/

https://www.sciencedirect.com/science/article/pii/S1877050910005442