Android App for Number Plate Recognition System

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***Abstract*— Vehicle number plate recognition is one of the most interesting and challenging research topic from past few years. It is shown that the number plates are different shape and size and also have different color in different countries. In this project we developed an android application for localization of number plates of the vehicles and segmented the numbers as to identify each number separately. This paper presents an approach based on simple and efficient morphological operation and sobel edge detection method. We also presents a deep learning based approach to segmented all the letters and numbers used in the number plate. After reducing noise from the input image we try to enhance the contrast of the presents a simple approach to segmented all the letters and numbers used in the number plate.**

***Index Terms*— Number plate localization, Morphological operation, Character segmentation, Thresholding, Edge detection, Deep Learning, Stacked Auto Encoder, Android application developement**

I. Introduction

II. Materials and Methods

Exact Sequence of events are (i) Grayscale conversion, (ii) Median Blur (iii) Adaptive threshold - Morphological Closing operation using Ellipse kernel, (iv) Connected Component analysis for finding Contours, (v) letter and number recognition using Stacked Auto Encoder

In order to facilitate the plate extraction, and increase the processing speed, Colour image (RGB) acquired by a digital camera is converted to gray-scale image. Application of a median Blur filter with an aperture size of 5 unit was used.This step is necessary to remove any kind of stray and unnecessary pixels and smoothening of the image.

The scanned images of texts require certain pre-processing steps so that they are in suitable forms for character recognition. Since most OCR algorithms require bi-tonal images, we must first convert color or gray images to black and white images, this is called binarization. We used Adaptive Thresholding Technique from OPENCV library to achieve binarization of the given input image.

Morphological Standardization : Because of the above preprocessing operations there might be discontinuities in the resulting image for filling them we use morphological closing operation with an ellipse kernel.

Character Segmentation : Segmentation is the most important step of the preprocessing procedure. Using Connected component analysis we are performing the operation for finding contours in the resultant image and locating each contour and segmenting it out and saving all the words separately in order. We have used a size threshold of neglecting any contour which is less than 42% in height of the maximum sized contour for best possible results.

Fig. 1. Illustration of the Character segmentation in the android application

Character Recognition : We used Stacked Auto Encoder to train a data set containing various letters and numbers. The SAE was trained using character dataset[1]. The input layer had in total 784 nodes as all the images were scaled to 56x56. The number nodes of the only hidden layer used was set to be 1000. The validation was done using 10 fold cross validation method. Then we initilazied a neural network using the SAE. The output of the neural network classifier had 36 nodes corresponding to 26 letters and 10 numbers.

III. Results and Conclusion

The training error was approximately 7%. After that, the segmented images from the number plate were given as input to the neural network implemented in MATLAB. Then we stored the weight matrices in the android application. And finally the android application was able to show the proper output. As the training was carried out earlier so the recognition system didn't face any computaional time complexity problem in the phone.

IV. References

[1] A New Benchmark Dataset for Handwritten Character Recognition, Laurens van der Maaten, TiCC TR 2009002

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