LICENSE PLATE RECOGNITION SYSTEM

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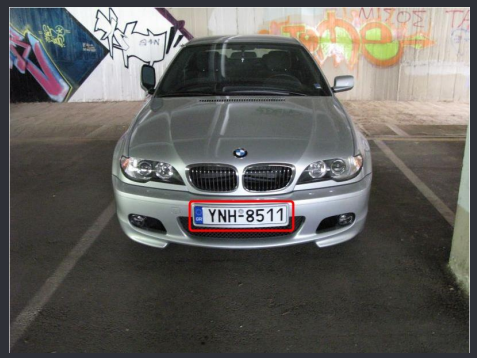
INTRODUCTION

LPR System has three major steps:

1) Localization



2) Segmentation

3) Object Character Recognition

Z Z H 3 5 9 7

SOME COMMON TECHNIQUES

- Morphological Operations
  - Using Dilation and Erosion to remove unwanted edges in image
- Edge Features
  - License Plates show high frequency edge response in Vertical direction
  - Also shows edge response in Horizontal direction
- Scan Line method: “top hat”
  - Detect candidate rows for license plate

SOME COMMON TECHNIQUES

- Connected Components
  - Label regions of pixels in binarized image
  - Reject connected components based on area and geometry
- Colour Features
  - Detect license plates using combination of colors
  - May adhere to a specific type of license plate (country dependent)
  - Textures may also be used

CORE CONTRIBUTION - Localization

- Preprocessing
  - Noise removal
  - Sharpening
- Vertical Edge Detection
  - Used Sobel Mask to find vertical edges
- Normalization of pixel intensities
- Thresholding (Otsu's Method)
- Histogram analysis of edge image
- Choosing candidate rows
- Used compactness factor to find columns of interest

CORE CONTRIBUTION - Localization

- Used Morphological Operators
  - Removed unwanted edges
- Dilated in Horizontal
  - Rectangular structuring element in horizontal
- Dilated in Vertical
  - Rectangular structuring element in vertical
- Found intersection of two images
  - Joint image
- Filling holes
- Erosion
- Find biggest binary region

CORE CONTRIBUTION - Segmentation and Recognition

1. Skew correction
2. Adaptive thresholding
3. Removal of noise such as screws, etc
4. Connected components for characters
5. Non character components rejected through aspect ratio
6. Used MATLAB OCR on every segment of character

DATA SET

We used Data Set from MediaLab: Color images in Day and Night (with flash) ~ 230 images

- Data Set contains License Plates from different parts of the world
  - Hence, they don't adhere to one specific format
- The camera should be horizontal to the ground
  - To recognize vertical edges in number plates
- The distance between the car and the camera should be around ~ 2 meters

EVALUATIONS AND RESULTS

- Localization
  - Successfully able to localize 185 images out of 228 images
  - Implies accuracy of 81.1%

- Recognition
  - Defined ground truth for 25 randomly sampled images
  - Edit Distance used as distance measure between result and ground truth
  - Calculated averaged accuracy for 25 images
  - Accuracy for 25 images ~ 85%