

# CV - Homework 3 - Road Signs Recognition

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## 1 Problem

Given a picture consist of multiple non-intersecting rectangular fragments of photos with signs determine:

- if there is a sign in a rectangular region;
- what sign is in the rectangular region

## 2 Algorithm

### 2.1 Learning

For each known sign:

- Load an image with sign
- Use common image preprocessing

### 2.2 Testing

- Load sign composite
- Use inverted threshold with 235 and 255 borders(experimentally found)
- Use Canny to find contour points
- Find bounding rectangles for each contour
- For each rectangle which area is bigger than 2000 square pixels process as "sign candidate"
- For each sign candidate use common image preprocessing
- Rescale each known sign to the size of sign candidate
- Use Chamfer matching (I've modified some OpenCV sources and recompile OpenCV to make it work) with sign candidate for each known sign
- For chamfer matching try to use 10 different scales between 0.9 and 1.1 and all the possible positions
- Classify the sign candidate as sign matched sign with the lowest score

### 2.3 Image preprocessing

- Grayscale image
- Gaussian blur with (5,5) radius
- Find contours using Canny with 60 and 120 borders (experimentally optimal)

### 3 Illustrations

Please, find signs with matched contours illustrated below.

#### 3.1 Source Sign Composites



Figure 1: Signs composite 1

#### 3.2 Matched Signs Examples



Figure 2: Signs composite 2



## 5 Program testing results

### 5.1 Important note

It should be noted, that the algorithm performance depends on constants a lot. I've played a lot with constants and after that obtained good results. In order to achieve good results which will be independent from sign composite you should use signs geometrical properties and this makes algorithm a lot harder. Color-based extraction is not relevant in our case because of quite different lumination and contrast properties.

### 5.2 Measure results

On the samples given the program achieved such results:

precision = 92.5%

recall = 80%

Accuracy = 80%

The recall and accuracy are not 100%, because my algorithm based on corners sometimes cannot identify them correct for the corrupted label. That results into invalid centered test result. This error occurs only for 2 bottle in our sample.