

German Traffic Sign Benchmark

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German Traffic Sign Benchmark

- ▶ German Traffic Sign Benchmark
- ▶ <http://benchmark.ini.rub.de/>
- ▶ 43 classes
- ▶ 26640 images for training
- ▶ 12569 images for testing

Image classes



Hard images from the dataset



Color decomposition

- ▶ For every pixel, calculate similarity of color to each of predefined colors:
 - ▶ red
 - ▶ green
 - ▶ blue
 - ▶ yellow ($r+g$)
 - ▶ cyan ($g+b$)
 - ▶ magenta ($r+b$)
 - ▶ white ($r+g+b$)
 - ▶ black
- ▶ Calculate color indexes - index of color that is most similar
- ▶ Calculate values - measure of similarity of most similar value

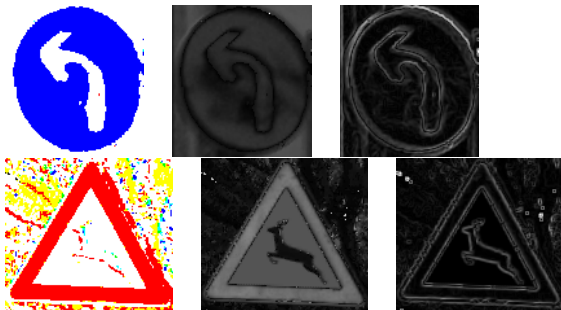
Color decomposition

- ▶ Slice image into 9 parts with partial overlap
 - ▶ rectangle size is 40% of image size
- ▶ Compute histogram of color indexes for every part
 - ▶ for every part 8 values between 0 and 1



Edge detection

- ▶ Perform edge detection:
- ▶ on original image (slightly cropped)
- ▶ on image consisting of similarity values



Moments

- ▶ For both edge-detection results, calculate 8 image moments
- ▶ Use central moments (invariant to translation)
- ▶ mi_{00} , mi_{11} , mi_{20} , mi_{02} , mi_{21} , mi_{12} , mi_{30} , mi_{03}

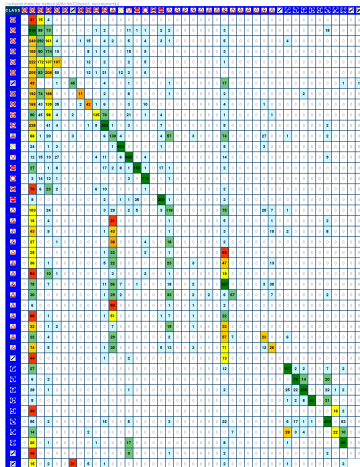
Coefficients

- ▶ 8×9 : histogram of color indexes
- ▶ 8 moments from edge detection
- ▶ 8 moments from edge detection of similarity values
- ▶ 88 coefficients total
- ▶ All coefficients normalized between -1 and 1 across entire dataset

Neural network

- ▶ Back-propagation neural network
- ▶ 88 input neurons
- ▶ 48 neurons in hidden layer
- ▶ 43 output neurons
- ▶ 700 iterations of learning
- ▶ Part of learning data used for testing and validation

Results



42.91% accuracy

Questions

Questions?