TRAFFIC SIGN RECOGNITION

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CS512 - Fall 2018

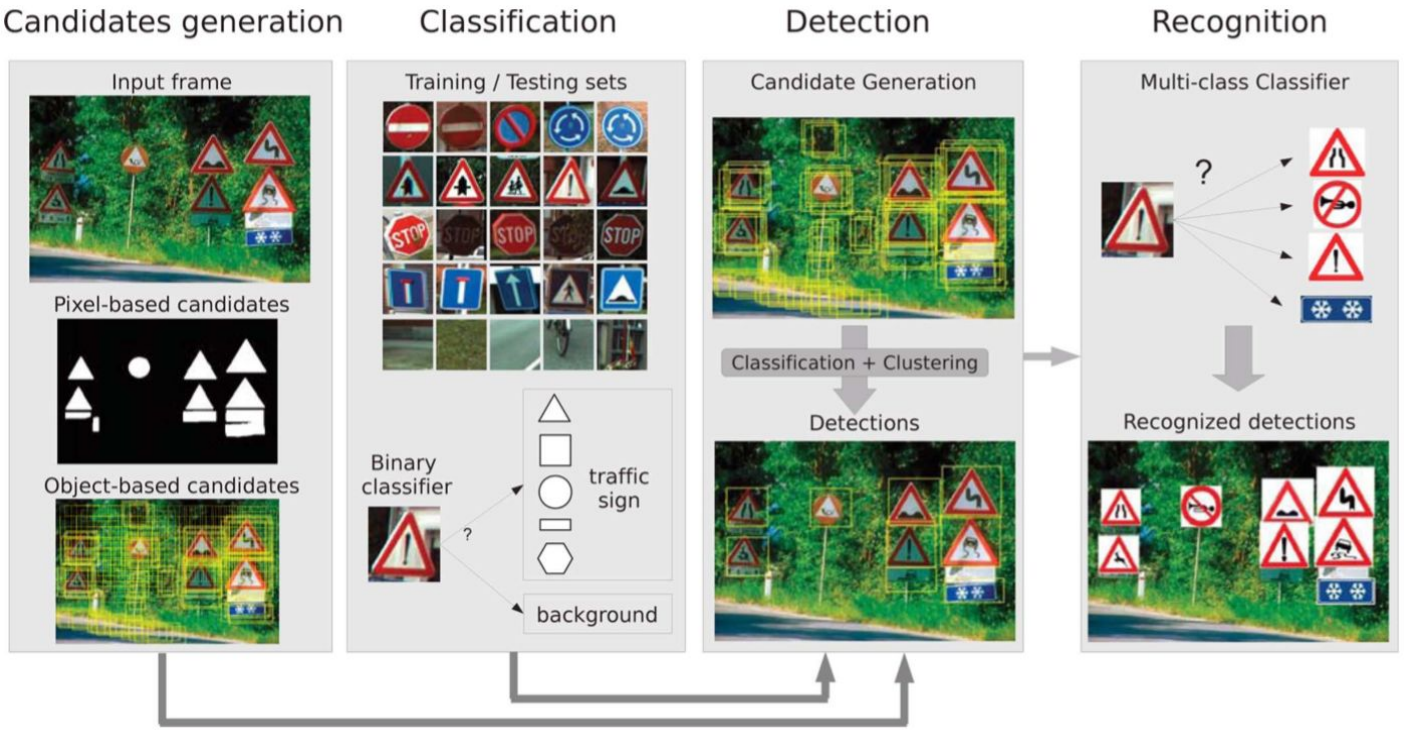
INTRODUCTION

Introduction

- Motivation
- Reference → Traffic Sign Recognition for Computer Vision Project-Based Learning
- Dataset → KUL Belgium traffic signs and classification benchmark datasets

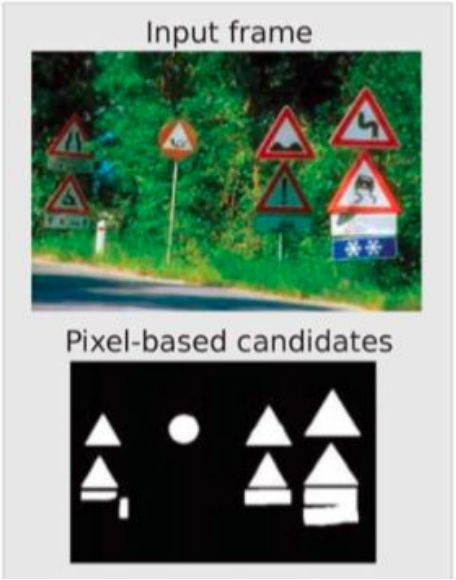
APPROACH

Approach (I)


Candidates generation
Classification
Detection
Recognition
Input frame
Pixel-based candidates
Object-based candidates
Training / Testing sets
Binary classifier
?
traffic sign
background
Candidate Generation
Classification + Clustering
Detections
Multi-class Classifier
?
Recognized detections

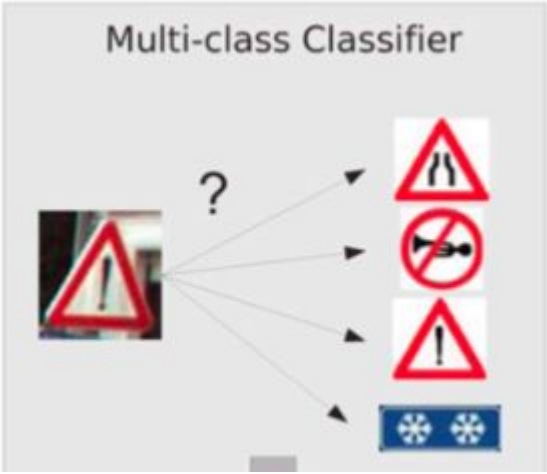
Approach (II)

Image Preprocessing



Detection

Classification



IMPLEMENTATION

Image Data Modeling

Linköpings University traffic sign dataset

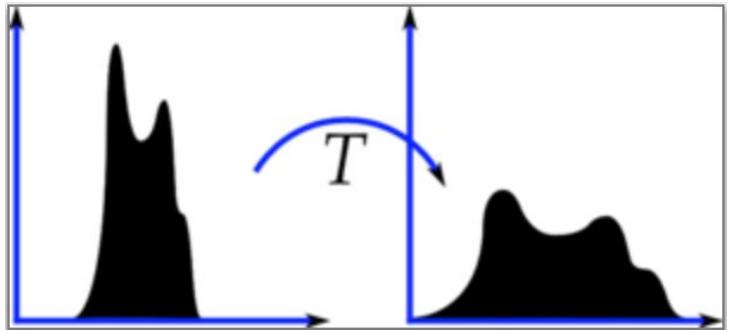
STEPS:

- Definition of 14 classes -> 13 traffic signs and 1 error class
- Cleaning the dataset-> removing bad images with high noise

Image Preprocessing

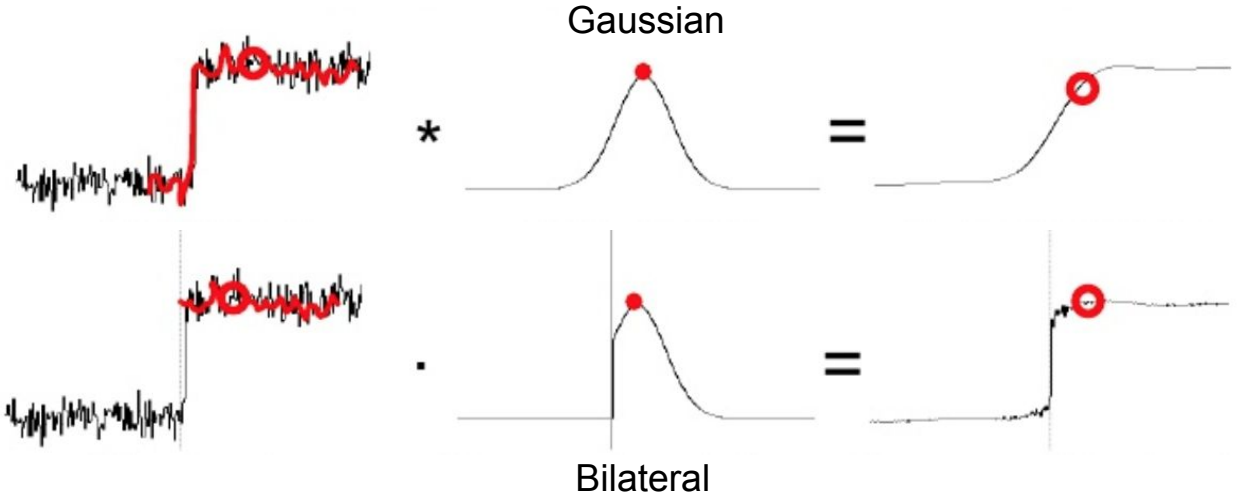
Three main steps:

1. Contrast limit



2. Edge detection

3. Binary



Sign Detection

Steps:

1. Remove small components
2. Find contours
3. Detect sign shapes
4. Select largest contour
5. Crop image

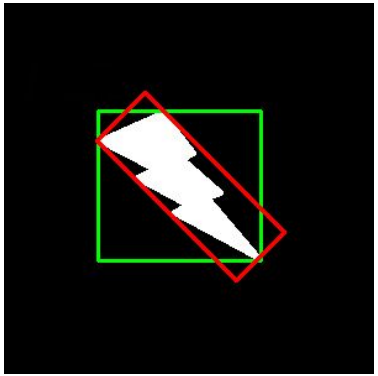


Image Classification

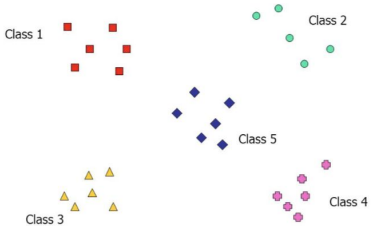
STEPS:

1. Loading Data Images
2. SVM class definition
3. Get HOG descriptors
4. Deskew images
5. Training Process
6. Testing Process

Image Classification II

SVM

Class definition with 4 different functions for initialise the model, train it, save it and predict



ADVANTAGES:

- High accuracy, high flexibility
- Naturally handle large dimensional data
- Sparse representation of the solutions

HOG

Algorithm implementation steps:

1. Gradient Computation
2. Orientation binning
3. Descriptor Blocks
4. Block Normalization
5. Object Recognition

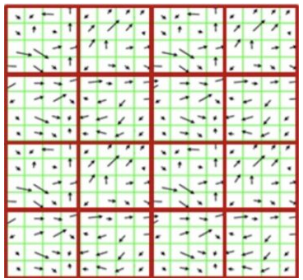


Image Classification

Deskew

Training and Testing

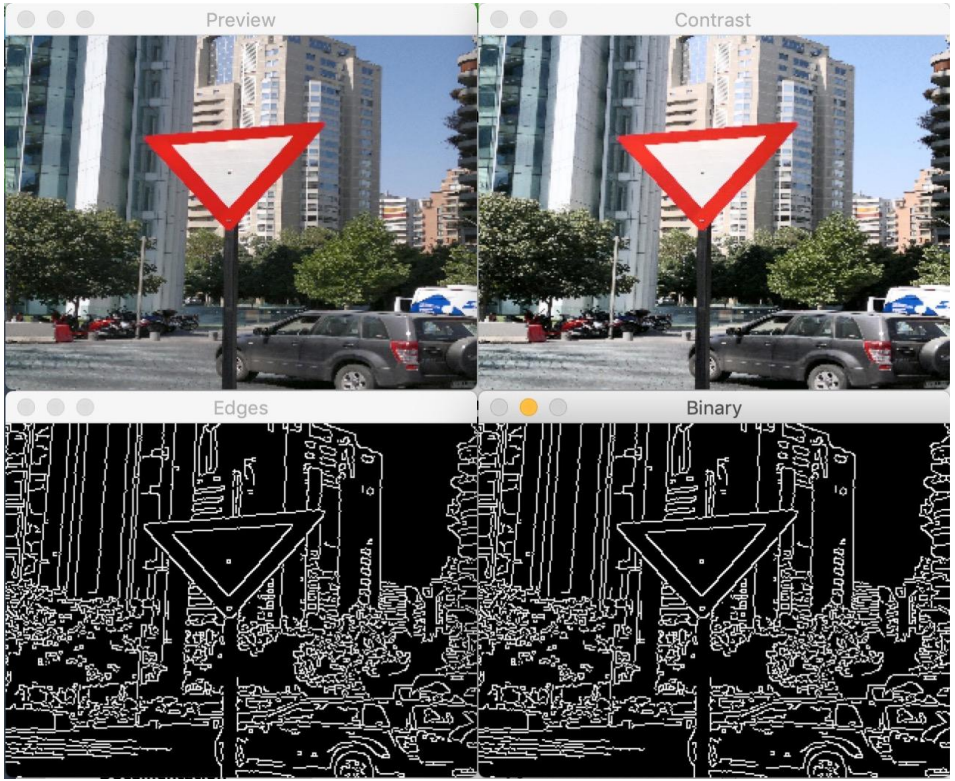
- 90% TRAINING
- 10% TEST

Get Label

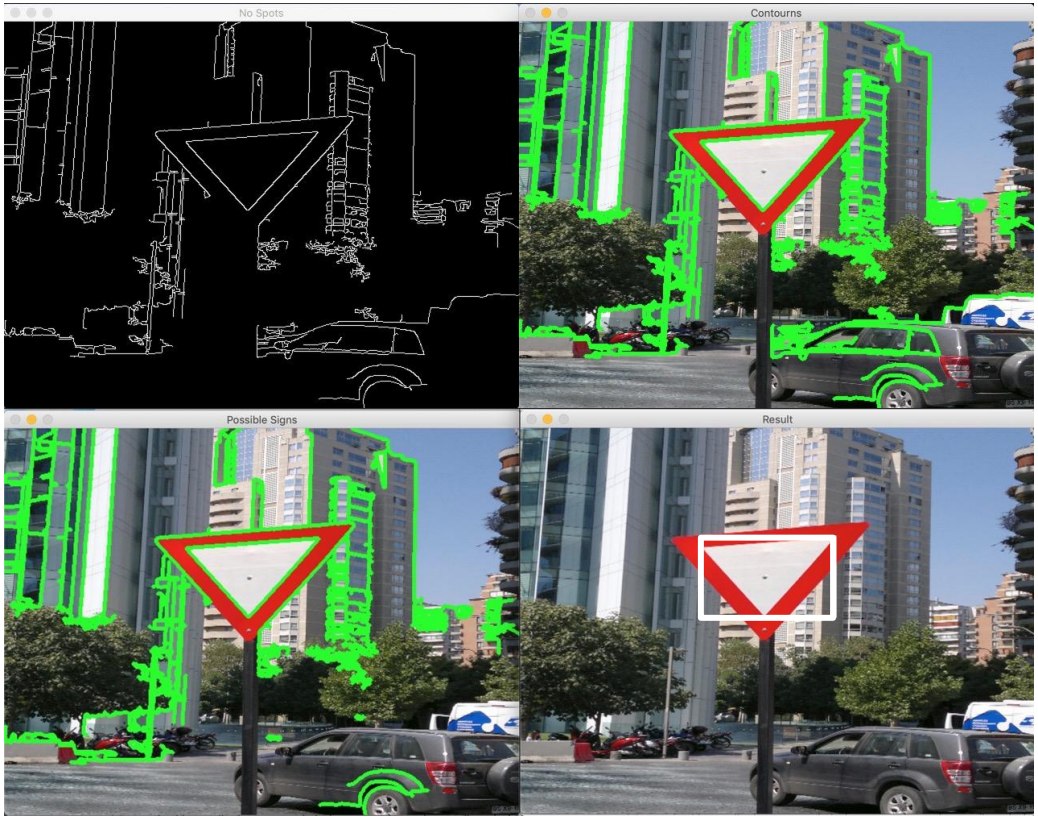
- 14 LABELS
  - 13 TRAFFIC SIGNS
  - 1 ERROR LABEL

RESULTS

Image Preprocessing



Sign Detection (I)



Sign Detection (II)

Image Classification

BAD CLASSIFICATION

GOOD CLASSIFICATION

Image Classification II

Modifying the following parameters:

- MAX-NUMBER of images per traffic sign type equal to 80
- HOG parameters: lower down to 5 bins

Accuracy of 93.52%

CONCLUSION & FUTURE IMPROVEMENTS

Conclusion

- Good learning experience
- Program susceptible to improvements in every phase.

Future improvements

1. Use a CNN as a classifier
2. Sign detection by top-down sliding windows algorithm
3. Video support