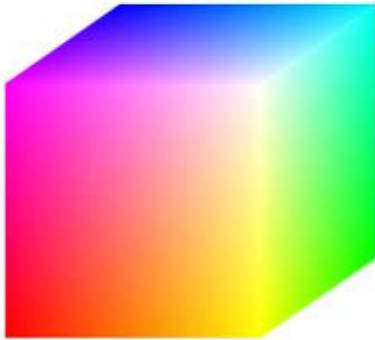# Deteccction and recognition of traffic signs

Alfaro Vendrell, Mónica

Barroso Laguna, Áxel

Gilabert Rodríguez, Ibai

Gómez bruballa, Raúl

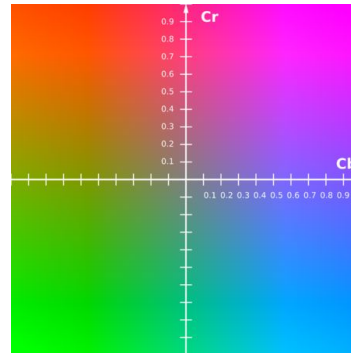B1/B2

1. Evaluating color space

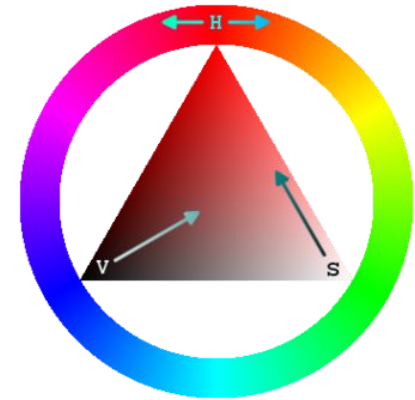### RGB

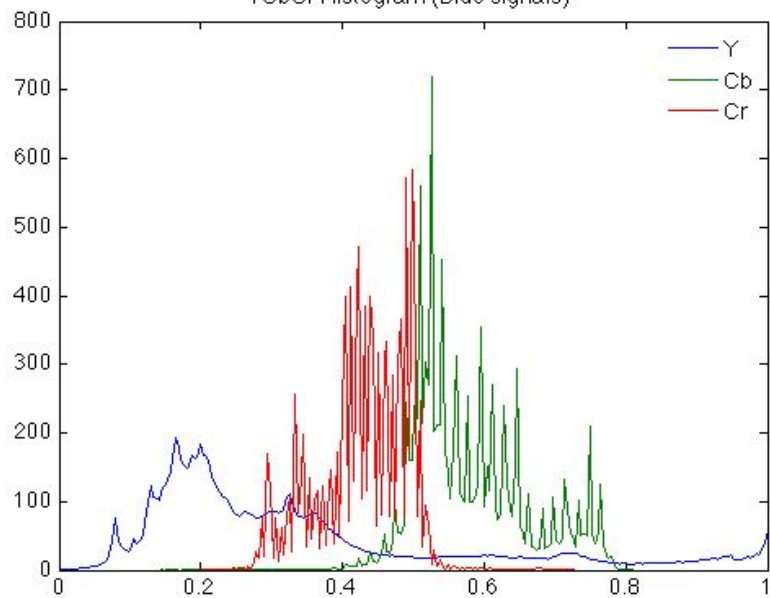- Hue information in three components [0,255]

YCbCr

-Separates luminance
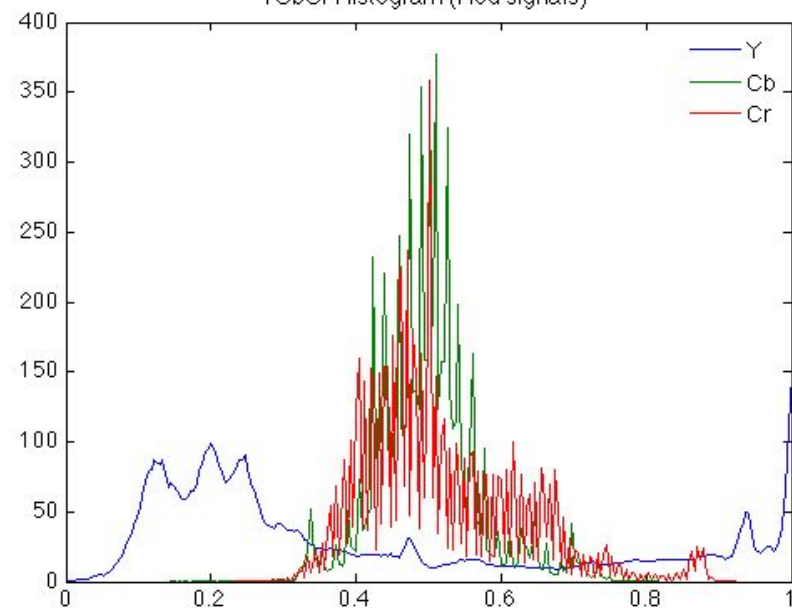
-Hue information in 2 components [-127,127]

HSV

-Separates luminance

-Separates saturation

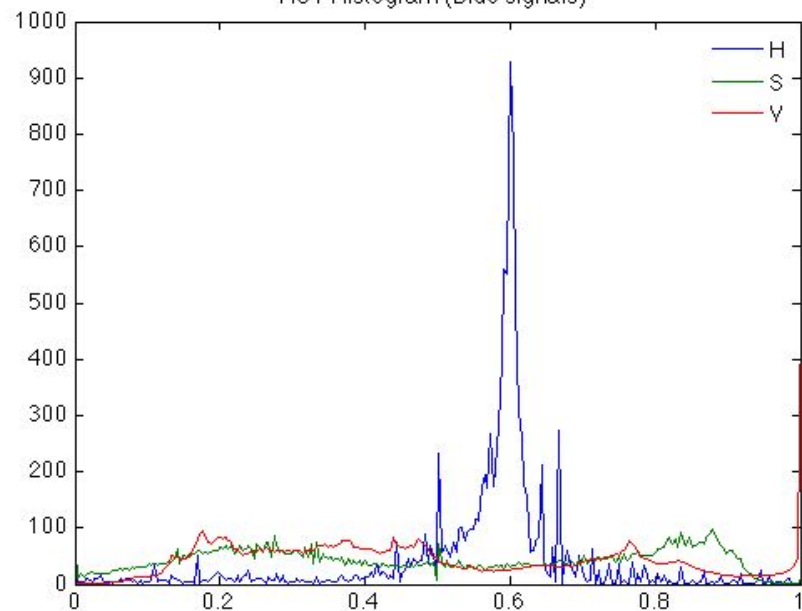-Hue information in one component [0º,360º]
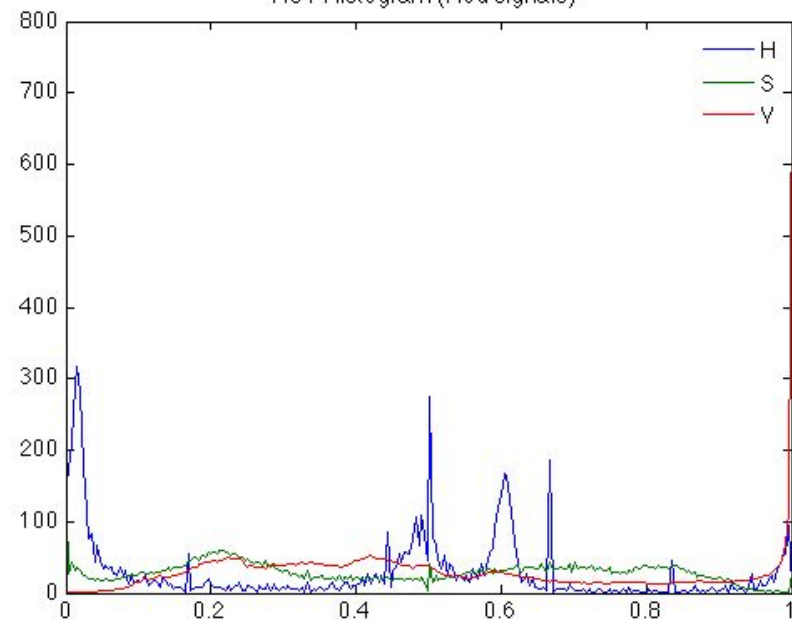
YCbCr Histogram (Blue signals)

YCbCr Histogram (Red signals)
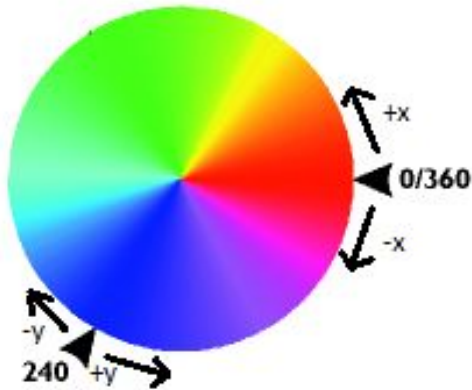
HSV Histogram (Blue signals)

HSV Histogram (Red signals)

1. Evaluating color space

Method 1:

- Select the signal most common hue and put a threshold of accepted hue variance.

- Train the classifier to select the best variance for each signal color (red and blue).

Method 2*:

-Compute the euclidian distance between a reference color and the current pixel color.

-The mean luminance of the image defines a threshold between the two colors.

-Train the classifier to adjust the reference colors, starting from the signal most common hues.
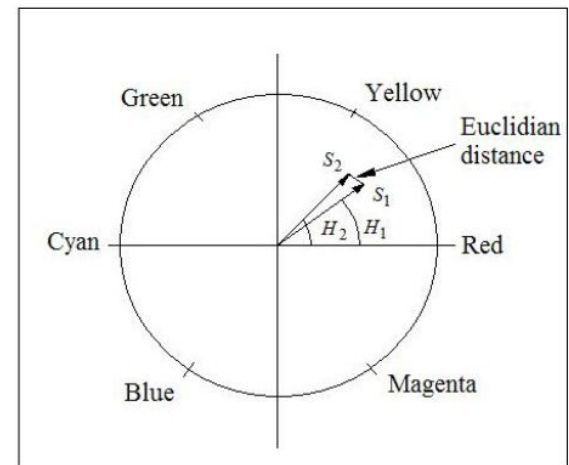
2. EVALUATING MORPHOLOGICAL OPERATORS
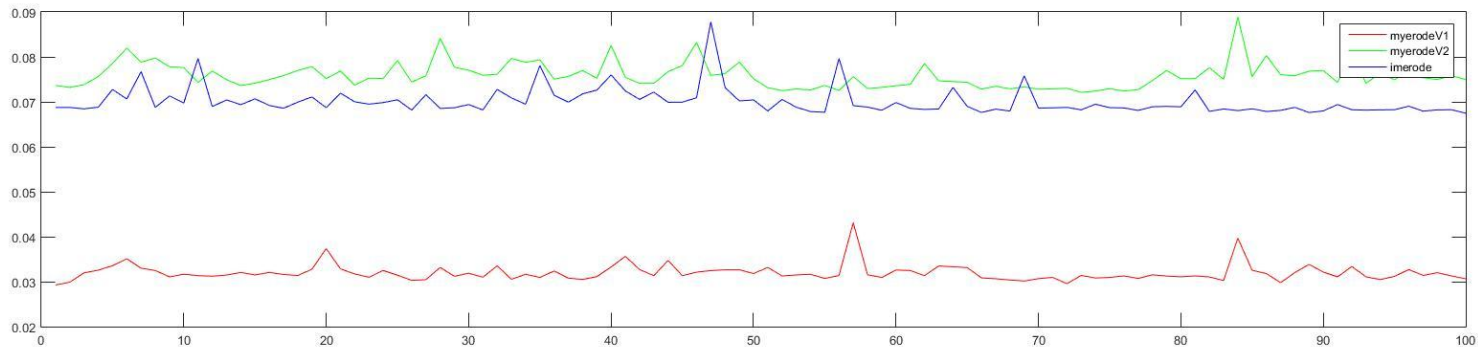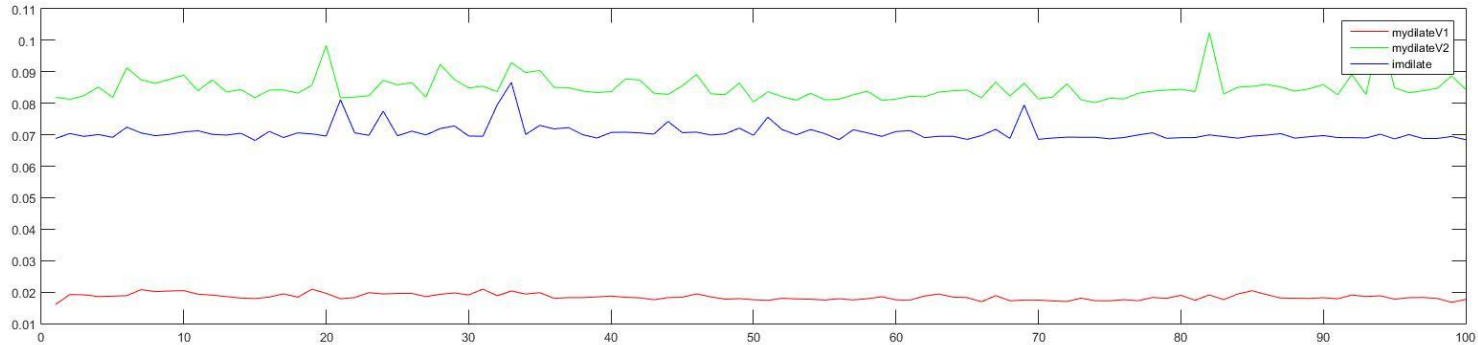
2 versions:
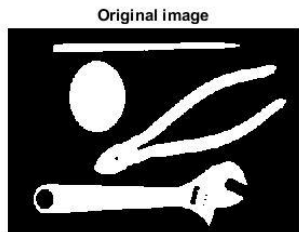
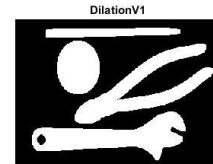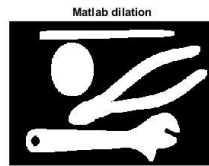➔ **v1:** using 'xcorr2()', 'xconv2()'
➔ **v2:** using 'ordfilt2()'

*efficiency % (100 · im/my)

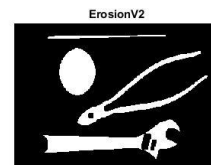| Efficiency*	Dilation	Erosion
V1	382.4991 %	219.2976%
V2	120.2001%	108.2080 %

2. EVALUATING MORPHOLOGICAL OPERATORS

Original image

Dilation

Matlab dilation

DilationV1

V1

DilationV2

V2

Erosion

Matlab erosion

ErosionV1

V1

ErosionV2

V2

3. GRANULOMETRY

Mean Granulometry with a triangle SE Image

Mean Diff Granulometry with a triangle SE Image

square SE Image

square SE Image

Optimal size

Mean Granulometry with a line SE Image

Mean Diff Granulometry with a line SE Image

Mean Granulometry with a cross SE Image

Mean Diff Granulometry with a cross SE Image
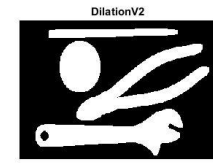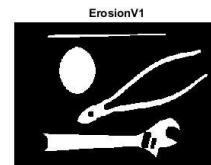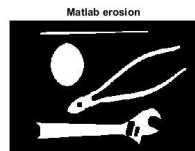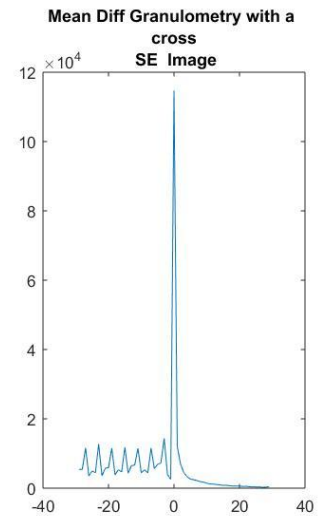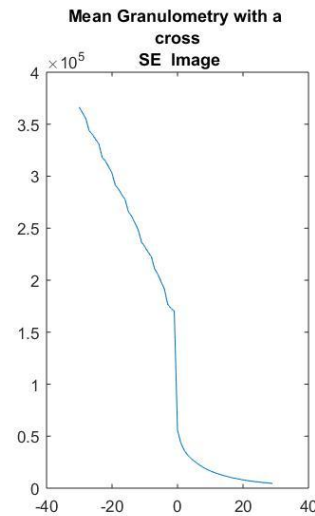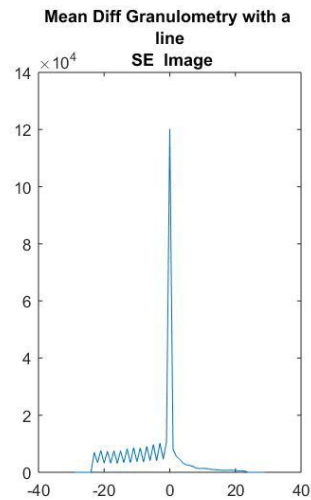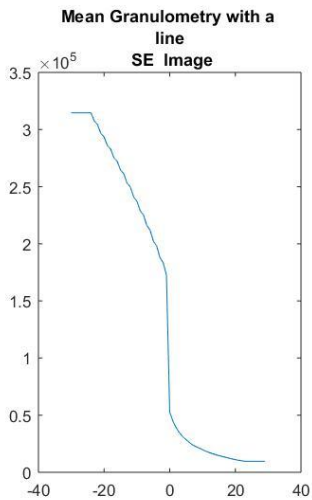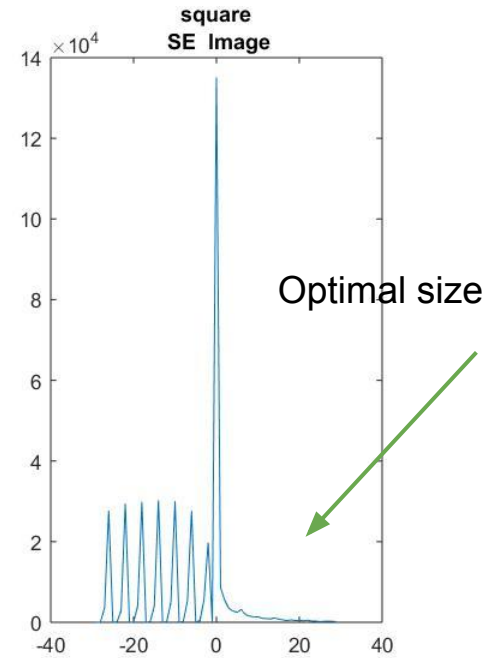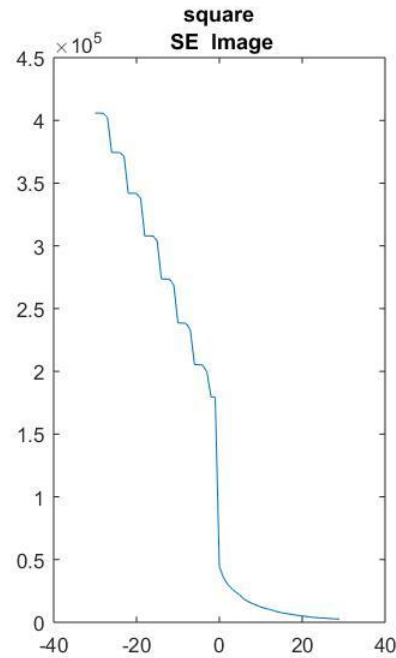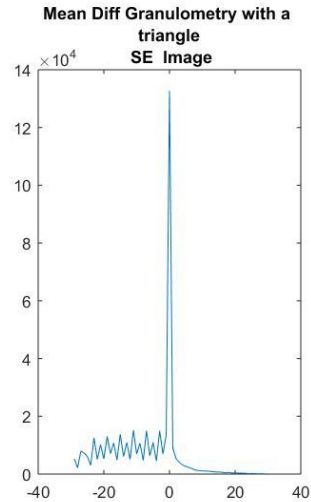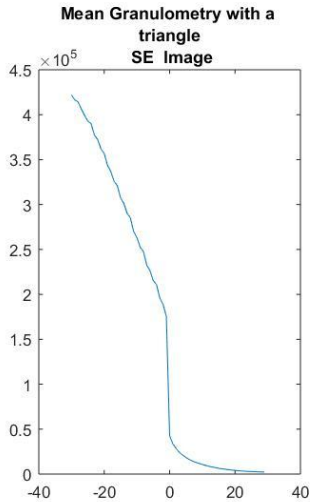
4. Evaluating morphological method

Method 1
Opening
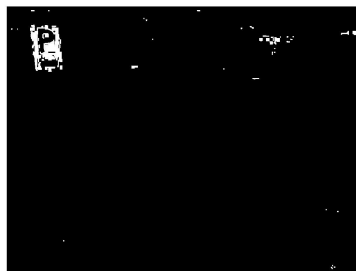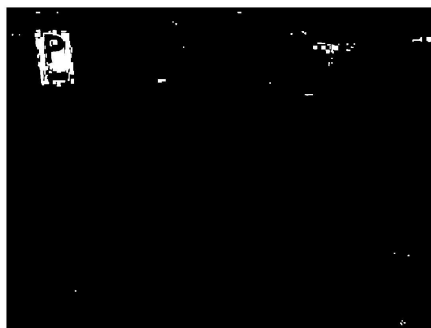
Method 2
Reconstruction

Method 3
TopHat
+
Reconstruction
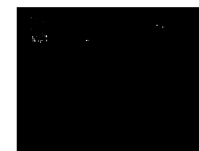
Marker

Marker

Filling holes
method

Filling holes method

Filling holes method

5. RESULTS   Color segmentation

ROC: color segmentation
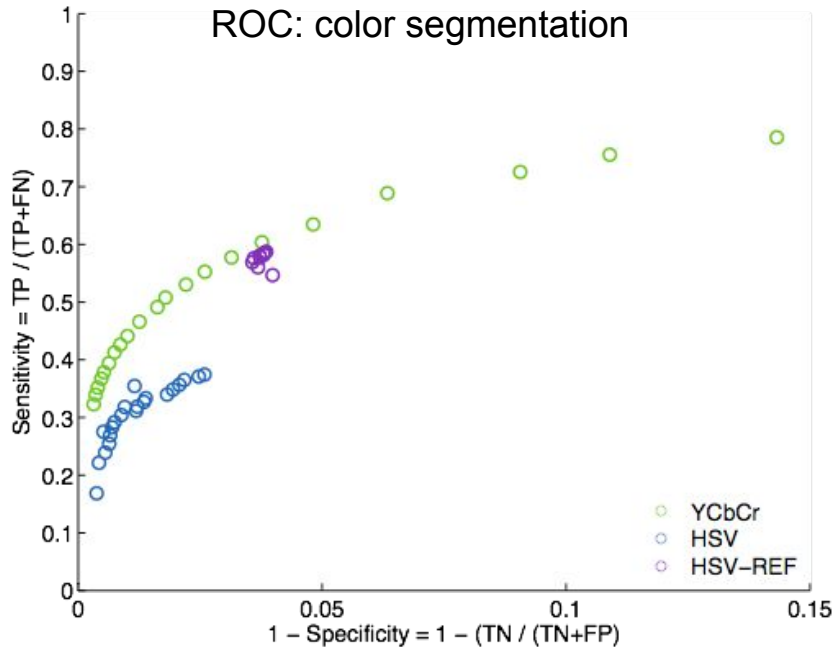
YCbCr
Cb component   range = 0.5 ∓ 0.037
Cr component   range = 0.5 ∓ 0.037

HSV
Red colors
    H component   range = 5.652º ∓ 9º
Blue colors
    H component   range = 216º ∓ 9º

HSV-REF
Red color reference   H = 0º   S = 0.9
Blue color reference   H = 219º   S = 0.9

	Precision	Accuracy	Recall	F1-measure	TP	FP	FN
YCbCr	0.0616	0.9671	0.5774	0.1113	1804712	27501796	1320873
HSV	0.0989	0.9862	0.3547	0.1547	1108696	10096720	2016889
HSV-REF	0.0594	0.9657	0.5818	0.1078	1818440	28802423	130714

5. Results   Morphological methods

ROC: morphological methods

M2
Reconstruction

M1
Opening

M3   TopHat +
Reconstruction
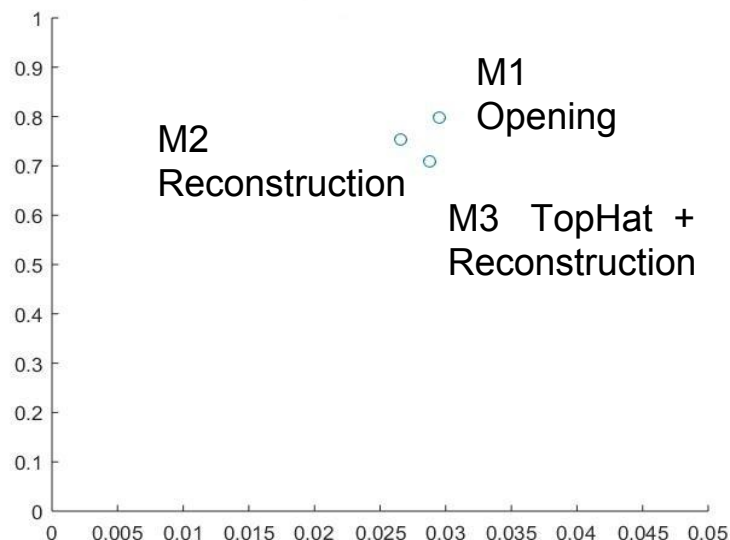
M1

Opening with a square 3x3 SE
+   Filling holes

M2

Reconstruction by erosion with a square 7x7 SE
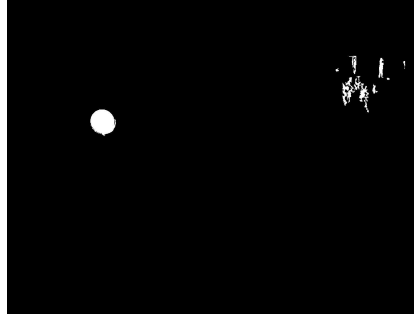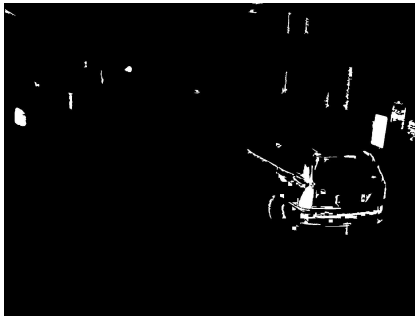+   Filling holes

M3

TopHat with a square 14x14 SE
+   Reconstruction by erosion with a square 7x7 SE
+   Filling holes

	Precision	Accuracy	Recall	F1-measure	TP	FP	FN
M1	0.0881	0.9699	0.7968	0.1587	2490585	22772149	635000
M2	0.0921	0.9727	0.7536	0.1641	2353481	23209749	772104
M3	0.0811	0.9703	0.9712	0.1456	2219487	25147302	906098

5. Conclusions   test Dataset

	Precision	Accuracy	Recall	F1-measure	TP	FP	FN
Test DB	0.108	0.9767	0.8643	0.1078	795621	6571509	124879