

# ANPR

(Contour Detection Algorithm)

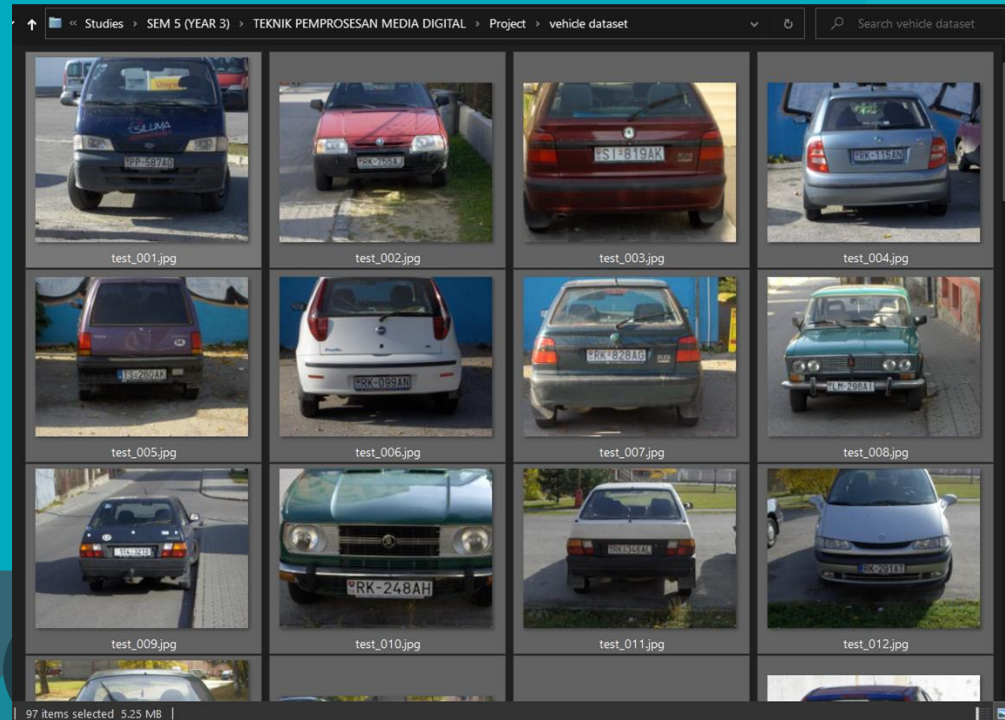
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# Image Acquisition

- We used Vehicles Images dataset in this project.
- The dataset is provided by Ondrej Martinsky
- There are a total of 97 images in this dataset.



# Image Pre-Processing

## 1. Noise Reduction

Noise reduction is used to reduce or remove the visibility of noises by smoothing the entire images but keeping areas near contrast boundaries. This method can obscure fine and low contrast details.

In this project we utilised Median Filter algorithm to reduce the noise in the images. We decided to use Median Filter as it works well to preserve sharp edges.

123	125	126	130	140
122	124	126	127	135
118	120	150	125	134
119	115	119	123	133
111	116	110	120	130

Neighbourhood values:

~~115, 119, 120, 123, 124,~~  
~~125, 126, 127, 150~~

Median value: 124

Instead of replacing the pixel value with the mean of a neighboring pixel values, the median of those values is used instead. The median is derived by numerically ordering all of the pixel values in the surrounding neighbourhood and then replace the pixel in question with the middle pixel value. An example calculation is shown in the example.

How Median Filter Works

## Result



Input (Original Image)



Output (Noise Reduction)

## 2.

## Grayscale Conversion (RGB >

Grayscale)

There are three algorithms for converting color to grayscale which are :-

- Lightness (Formula :  $\max(R, G, B) + \min(R, G, B) / 2$  )
- Average (Formula :  $(R + G + B) / 3$  )
- Luminosity (Formula :  $0.21 R + 0.72 G + 0.07 B$  )

In this project, we decided to use luminosity approach. The luminosity approach is an advanced variation of the average method. It averages the results as well, but it does it in a weighted manner to accommodate for human perception. For instance, we (human) are more sensitive to green than other colors, so green is weighted most heavily.

Example:



Original



Lightness



Average



Luminosity

## Result



Input (Noise Reduction)



Output (Grayscale)

# Edge Detection

## Sobel Operator

- Sobel operator works by calculating the gradient of image intensity at each pixel within the image. Then it finds the direction of the largest increase from light to dark and the rate of change in that direction.
- Sobel operator also shows how that edge is likely to be oriented.

## How Sobel Operator Work

- Each point in the image is subjected to the sobel operator.
- A horizontal and vertical filter is applied to each point to identify variations in the intensity when compared to its immediate neighbours.
- The sobel operator creates gradient approximations by using two  $3 \times 3$  kernels convolved with the original image.

-1	0	+1
-2	0	+2
-1	0	+1

Gx

+1	+2	+1
0	0	0
-1	-2	-1

Gy



## Result



Input (Grayscale)



Output (Edge Detections)

## Binarization

Binarization is used for computing the threshold value to differentiate object and background pixels.

In this project, we used Otsu's thresholding method. The thresholding method used by Otsu entails iterating through all potential threshold values and calculating a measure of spread for the pixel levels on each side of the threshold. The goal is to obtain the least threshold value for the total of foreground and background spreads.

Example:



## Result



Input (Edge Detections)



Output (Binary Image)

## Contour Detection

Contour is a closed curve joining all the continuous points having some color or intensity.  
Find points where intensity of colors changes significantly and then simply turns the pixels on.  
Contours are abstract collections of points of segmentation corresponding to the shapes of objects.

Example:



## Result



Top contour



Plate Contour

## Result



Plate detection



Cropped number plate

Task	October		November				December				January			
	W2	W3	W4	W5	W6	W7	Mid semester break	W8	W9	W10	W11	W12	W13	W14
Literature review														
Proposal and presentation video submission														
Image acquisition														
Pre-processing														
Localization														
Project presentation														

**SCHEDULE**

# Conclusion

There are 6 steps taken in total to achieve a final result. In conclusion an image will undergoes noise reduction, grayscale conversion, edge detection, binarization and finding contour to localize a plate number given.



A graphic of a yellow sign with a white center and dark blue text 'Thank You'. The sign has a grey border and four dark blue dots in the corners of the yellow sections. The background is teal with geometric shapes.

**Thank You**