

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Overview

This chapter will evaluate the ALPR system in action using different scenarios, as shown below in cases 4.2, 4.3 and 4.4. Also, we will illustrate the system output and the process of comparing the results of the extraction.

4.2 Country pattern mismatch

In this scenario we used the image shown in figure 4-1.



Figure 4-1: captured image

The application detects all possible plate in the captured image as shown in figure 4-2, and then extract the best boxes of the license plate according to the trained detector as shown in and figure 4-3.

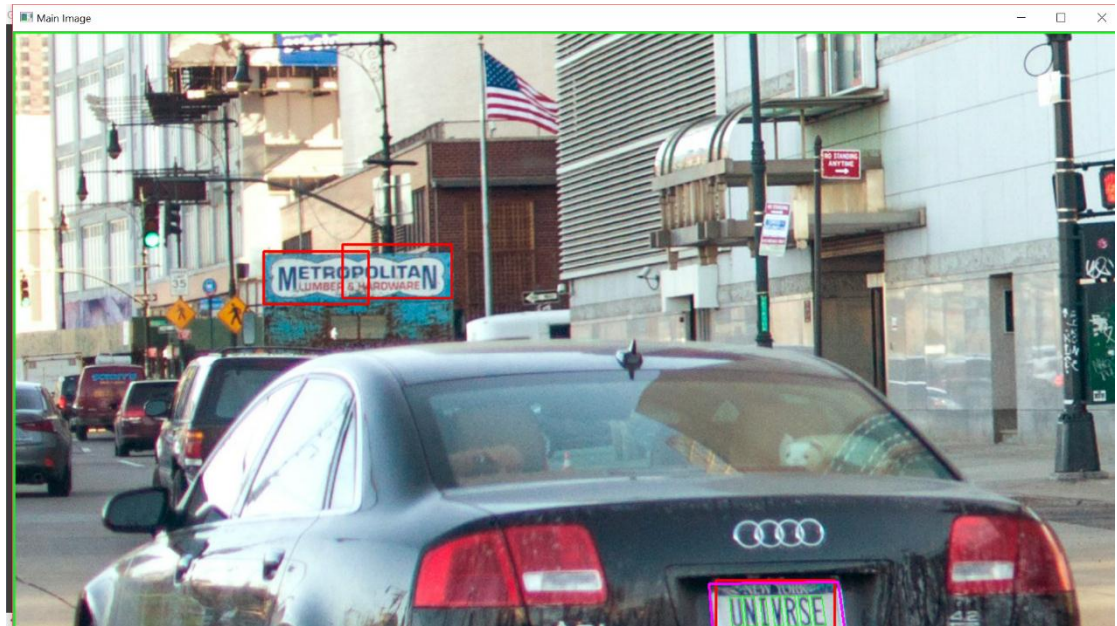


Figure 4-2: all possible plate in the image



Figure 4-3: Best box of the plate in the image

The extracted boxes pass through many preprocess as shown in figure 4-4, which provides a clean image of the license character to be recognized by the OCR.



Figure 4-4: Pre-process of the image


OCR takes place to identify the character and its confidence percent. Then the system compares the recognized characters to the country pattern, if it matched the pattern then the recognized characters will be marked as True and will be compared to the database to get the owner information. Otherwise, if there is no pattern match the highest confidence plate number will be compared to the database as shown in figure 4-5 below.

Region:

Matched License Plates:

	-- Plate #1 --	
UNIVRSE	90.2%	False
UNIVRSE	83.5%	False
UNIRSE	82.1%	False
ONIVRSE	80.5%	False
ONIVRSE	79.8%	False
ONIVRSE	79.7%	False
UMIVRSE	79.3%	False
QNIVRSE	78.0%	False
UHIVRSE	77.1%	False
NIVRSE	75.6%	False
UIVRSE	75.6%	False
UNIRSE	75.4%	False
DNIVRSE	73.8%	False
ONIVRSE	73.2%	False
ONIVRSE	73.1%	False
UMIVRSE	72.7%	False
DNIRSE	72.4%	False
ONIRSE	71.7%	False
ONIRSE	71.6%	False
QNIVRSE	71.3%	False
UMIRSE	71.2%	False
UHIVRSE	70.4%	False

License Plate ROI:



Owner name:

Owner phone:

Owner address:

Car ID:

Figure 4-5: Best license plate and owner information

4.3 Multiple plates in one image

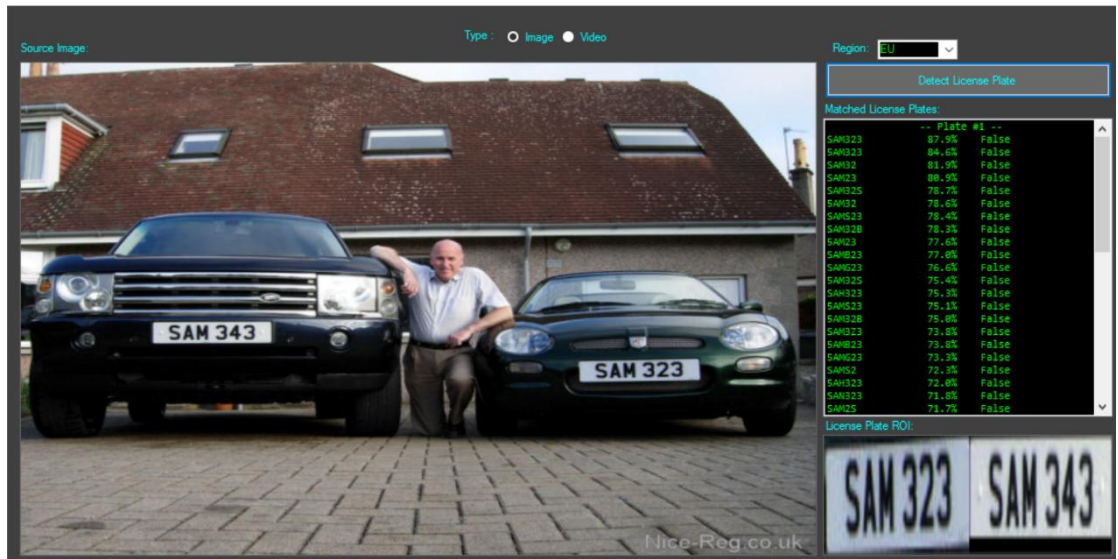


Figure 4-6: Two license plates in the same image

Figure 4-6 shows a captured image containing more than one plate. The system extracts all best boxes in the image as mentioned before. Each box passes through pre-processing phase, OCR and is compared to the database. The result is shown in figure 4-7.

Matched License Plates:			Matched License Plates:		
-- Plate #1 --			-- Plate #2 --		
SAM323	87.9%	False	SAM343	88.0%	False
SAMB23	84.6%	False	SAM34	81.6%	False
SAM32	81.9%	False	SAM348	78.9%	False
SAM23	80.9%	False	SAM343	78.3%	False
SAM325	78.7%	False	SAM345	78.0%	False
SAM32	78.6%	False	SAM43	78.0%	False
SAMS23	78.4%	False	SAMB43	77.3%	False
SAM32B	78.3%	False	SAM346	76.8%	False
SAM23	77.6%	False	SAMS43	76.5%	False
SAMB23	77.0%	False	SAH343	76.4%	False
SAMG23	76.6%	False	SAN343	73.5%	False
SAM325	75.4%	False	SA343	72.7%	False
SAH323	75.3%	False	SAM34	71.9%	False
SAMS23	75.1%	False	SAMB4	70.9%	False
SAM32B	75.0%	False	SAMS4	70.1%	False
SAM323	73.8%	False	SAH34	70.0%	False
SAMB23	73.8%	False	SAM348	69.1%	False
SAMG23	73.3%	False	SAM48	68.8%	False
SAMS2	72.3%	False	SAM345	68.3%	False
SAH323	72.0%	False	SAM43	68.2%	False
SAN323	71.8%	False	SAMB48	68.1%	False
SAM25	71.7%	False	SAM45	68.0%	False

Figure 4-7: Result of two plates image

4.4 Country plate matches the pattern



Figure 4-8: Source image

Figure 4-8 shows the captured image; Figure 4-9 shows all detected plate in the image.



Figure 4-9: all possible plates in the image



Figure 4-10: Best boxes in the image

The best boxes were passed to the OCR. The OCR recognize the characters which will is shown in a list of possible plates number. The plate which matches the pattern is compared to the database to get the owner information, as shown in figure 4-11.

Matched License Plates:		
	-- Plate #1 --	
5757	77.3%	False
57577	70.9%	True
7577	57.8%	False
5577	54.2%	False
5777	51.5%	False

Owner name:	Hussam Ghies
Owner phone:	0920915560
Owner address:	tooti
Car ID:	57577

Figure 4-11: Matched license plate and owner information

4.5 Stream video

The OpenALPR system deals with video as stream of frames or images. Each frame goes through all processes mentioned earlier. Figure 4-12 shows possible plate numbers of detected plate in frame 228.

```
Matched License Plates:  
- 4577      confidence: 72.8294  
- 5577      confidence: 72.063  
- 4757      confidence: 70.7409  
- 47577     confidence: 70.274  
- 5757      confidence: 69.9746  
- 57577     confidence: 69.5077  
- 2577      confidence: 68.9474  
- 4557      confidence: 68.2987  
- 45577     confidence: 67.8318  
Frame: 228  
Analyzing: sd  
Plate inverted: 0  
plate0: 10 results  
- 57577     confidence: 75.4709  
- 457577    confidence: 75.2599  
- 5757      confidence: 74.1032  
- 45757     confidence: 73.8922  
- 7577      confidence: 72.1995  
- 47577     confidence: 71.9886  
- 4757      confidence: 70.6208  
- 4575      confidence: 66.7747  
- 5577      confidence: 65.5644  
- 45577     confidence: 65.3534
```

Figure 4-12: Plate numbers in frame 228