Identification for license plates

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***Abstract*—This report is a conclusion for our final project in ECE 4580. This project is built in MATLAB, and it can recognize license plate letter by letter by input in an image of the license plate. The reason why this topic was chosen is because this technique has been widely applied in humans' life [1], such as in public parking, chasing criminals, and the camera near the signal lights to record which vehicle breaks the traffic law. Indeed, it brings tons of convenience, and benefits to drivers. Therefore, our team want to develop this program by what we have learnt in the class, and what we have researched on the internet. Moreover, we follow the algorithm to code the program, and the experiment results will be provided in the project report.**

I. INTRODUCTION

Firstly, we started this project by searching on the internet to see what the knowledge behind this technique is. Computer vision, neural network, image gray scale, and image enhancement are used in the program, and these will be described specifically in the following section. Then, since this is a team project, separate the work logically and reasonably would be the key to succeed. Therefore, in our proposal, we divided our project into 4 parts. Then, we assign each person to do one or two parts depending on the difficulty of the work. It is the most efficient way to do a group project, and every member has their contribution to the team. For our approaches, we begin with reading the image and processing the image to a level that is easier to detect and cut. In addition to that, the plate is located from the image by using the idea of mathematical morphology. Furthermore, by using edge detection, the characters in the plate can be separated. In the last, we compare the characters to the database to get our final experiment results.

II. APPROACHES

A. Part I

In the first part, the objective is to use mathematics and algorithm to chop the image properly and image enhancement to enhance the part of the image we needed [2]. First of all, we read the image (figure1) and change it grayscale by rgbgray()(figure 2). Then, we set up a threshold which could be between 100 – 150 so that the pixel is only visible when the pixel intensity is less than that threshold. This step is to covert the image from gray scale to black and white image(figure 3).

B. Part II

In part two, two thresholds (upper bound and lower bound) technique to is applied in this step, so that we could keep the middle of the plate where the characters are located. First, we find at what range of row have the greatest number of white pixels, because the license numbers are showing in white. The step is to locate the approximate region where the license numbers are (figure 4). Then the lower row number of the region would be lower bound, the higher row number of the region would be the upper bound. In the last, the row number less then the lower bound and the row number greater than the upper bound would be chopped off. In this step, we tried several rows numbers to get an appropriate result, which will be shown in the experiment results section (figure 5).

C. Part III

In this part, the objective is to chop each character in the license plate, which prevents it being disturbed from other characters. Then separate each character by using edge

detection technique so that each of them could compare with database (figure 6) in the next step. Therefore, we could find the distance between two characters by the white pixels. Since most of license plates have the same distance between characters, this technique would apply for all the plates.

D. Part IV

After separating each character, we need to compare them with our database, which contains numbers from 0 to 9 and all 26 letters. Moreover, by comparing the distance between our license plate and template. If the character is the same as the template, then we record it and move to the next character. Using a loop to do the same thing for all the characters in the plate, and print out all the character in MATLAB, and that would be the outcome (figure 7).

III. EXPERIMENTAL RESULTS

A. Part I

The original image is shown below, the final outcome of the project should show something like: the license number is 7LBZ281.

Figure 1

Figure 2

Figure 3

B. Part II

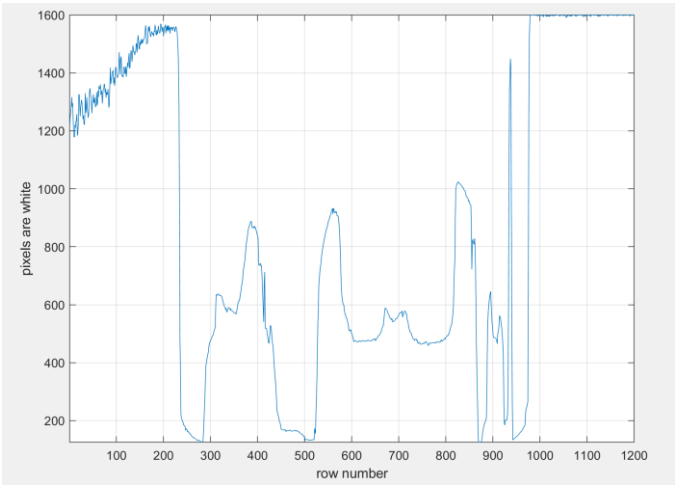

Figure 4

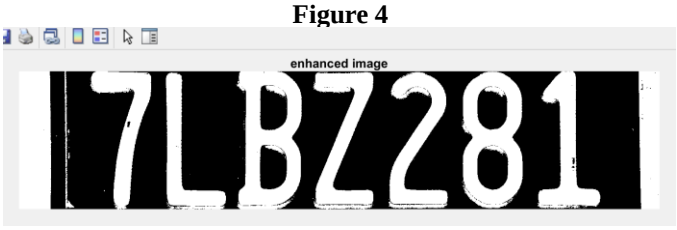

Figure 5

C. Part III

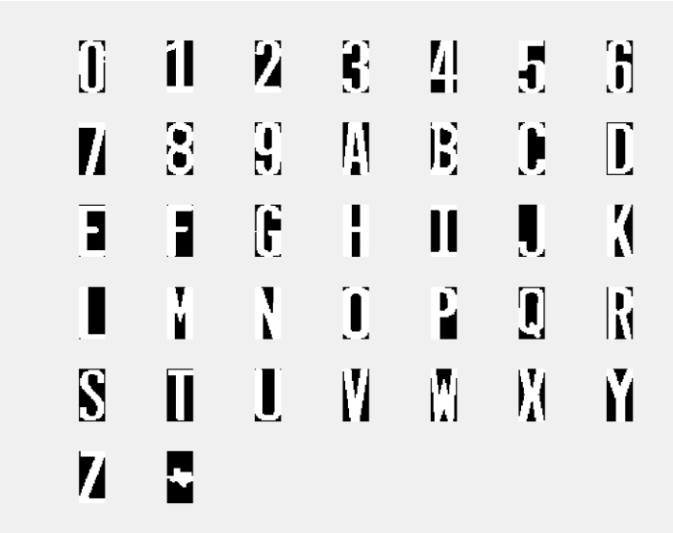

Figure 6

D. Part IV

```
LicenseNumber =

    '7LBZ281'
```

Figure 7

```
Command Window

  LicenseNumber =

      '7LDZ281'

fx >>
```

Figure 8

CONCLUSION

Overall, it is a successful final team project indeed. The final outcome is what we expected, and every team member contributes their own work to the team. Moreover, there was also a challenge while we do the last part. The database could not recognize "B", and read it as "D", so our initial outcome was (figure 8). Therefore, we had to draw a new "B" in the database, and make sure that it's readable in the MATLAB. In the last, we get our outcome, which is '7LBZ281'.

My first contribution was to determine that we are confirmed to do this license plate project. Then I created a document for the team to write the proposal. Moreover, while during the project, I was assigned to do part I and part II, which is to read the image, and covert it to black and white image. Moreover, I also did the image enhancement which is to chop off the part off the image we do not need, and the keep where we are interested.

REFERENCES

[1] Z. Zhang and C. Wang, "The Research of Vehicle Plate Recognition Technical Based on BP Neural Network," *AASRI Procedia, vol. 1, pp. 74–81, 2012.*

[2] X. Zhang, F. Xu, and Y. Su, "Research on the License Plate Recognition based on MATLAB," *Procedia Engineering, vol. 15, pp. 1330–1334, 2011.*