Detection and Recognition of Broken Character in Car Plate Image

Suhaila Abd Halim and Mohd Syazreen Zulkifli
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Selangor
suhaila@fskm.uitm.edu.my
syazreenzulkifli@gmail.com

ABSTRACT

In Malaysia, there are many cars that have a broken character on their car plates. This case affects the process of recognition of the car plate especially when any unexpected and dangerous situation such as accident and car robbery. In literature, there are some researches on broken character reconstruction and reconnection on a different kind of application which are vital for character recognition system. Therefore, this study is concerned to develop a tool with recognition algorithm that able to detect the broken character on car plate by using Template Matching. Two type of approaches which are correlation and similarity measure are measured in Template Matching. In this study, a car plate image with broken character is segmented using Connected Component Labelling. Then, the process of character relocation is completed before the detection and recognition process using Template Matching. Results for both approaches are shown for measurement purposes. As conclusion, the tool using the recognition algorithm is suggested to be an alternative in the area of character recognition in car plate to assist in the recognition of the broken character. This study is significant due to its importance in various real world applications such as Road enforcement system, police traffic control, parking ticketing system, or hometown security management.

1 INTRODUCTION

System of car plate detection and recognition system can be called as automatic license plate Number Recognition (ALPNR), Car Plate Number Recognition (CPNR) and Automatic Vehicles License Plate Recognition (AVLPR). In Malaysia, CPNR is being used widely in order to monitor a lot of traffic problems. As mentioned in [1], there is a lot of areas that CPNR can be applied, for example, security control of restricted areas, traffic law enforcement, congestion pricing, and automatic toll collection. These kinds of problems would be easier with the presence of the CPNR system so that it can reduce the intervention of the human factor and able to condensing the processing time to solve the problem as well. Reference [2] had developed an interesting system by using the concept of CPNR for the parking system.

However, by referring to [3], they identified that there are possibly some challenges to proceed with the CPNR process. For example, the plates may be covered by dust, shaking images, low density of light, tilted character, and broken character. All of these problems may defect the process of CPNR because of the unsuitable procedure that cannot adapt to the problems used in the recognition system. Therefore, this study interested to do research more about one of the challenging factors which is broken character on the car plate to ensure the problem can be solve using CPNR.

In addition, the research about types of broken character such as this study is very limited. However, there exists some study for a broken character in different areas such as on documentation [4], ingots [5], and handwritten [6]. Yet, it seems like it has a common problem where the study is more on the method of re-join the broken character to form the original character. It differs from the focus of this study, where it concentrates on the broken car plate that difficult to predict the original character by human vision and cannot be reconnected.

2   OBJECTIVE

The objective of this study is to develop a graphical user interface (GUI) to recognise a broken character on the car plate image. The GUI able to detect the existence of broken character and produce a list of posible character for the broken one.

3   SIGNIFICANCE

This study has many significance in many applications due to the development of technology. General problems relating to car plate for system recognition can be minimized. Moreover, real world applications such as Road enforcement system, police traffic control, parking ticketing system and hometown security management also sometimes need to deal with the problem of broken character on the car plate.

4   METHODOLOGY

The interface of GUI is developed using MATLAB. Fig. 1 shows the interface of detection and recognition of broken character plate number. There are three main axes in this GUI, the left axis is used to display the original image, the middle axis is to display the number plate area and the right axis is to display the detection of broken number plate.
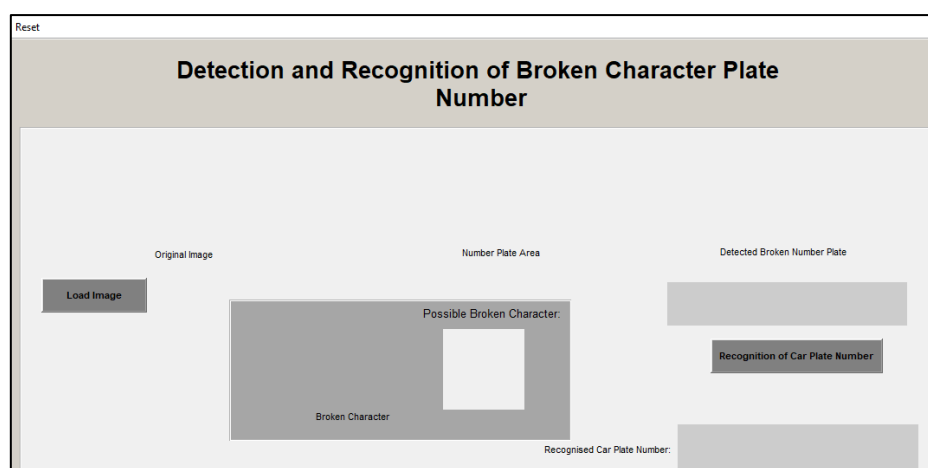

Fig. 1 Interface of System

There are two buttons that are to load image and recognise of car plate number. The first button is to load original image before further process and the second button is to pre-process the image, detect the broken character and produce message whether the image consists of broken or non-broken character. Then, a list of possible broken character is produced.

5   RESULT

A set of simulated data of broken and non-broken car plate image has been tested on the GUI. Fig. 2 shows the result of detection and recognition for a car plate with broken character. It can be observed that a green box appear to indicate he broken character and a message of "There exist a broken character" is appear in the GUI with a list of possible broken character.
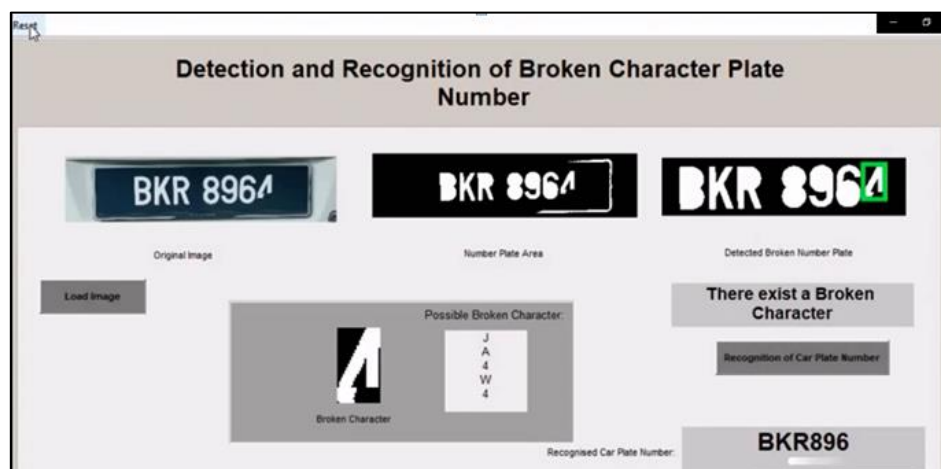
Fig. 2 Result of Car Plate Image with Broken Character

Fig. 3 shows the result of detection and recognition for a car plate with no broken character. It can be observed that a message of "There is no broken character" is appear in the GUI and a correct plate number is appearing.
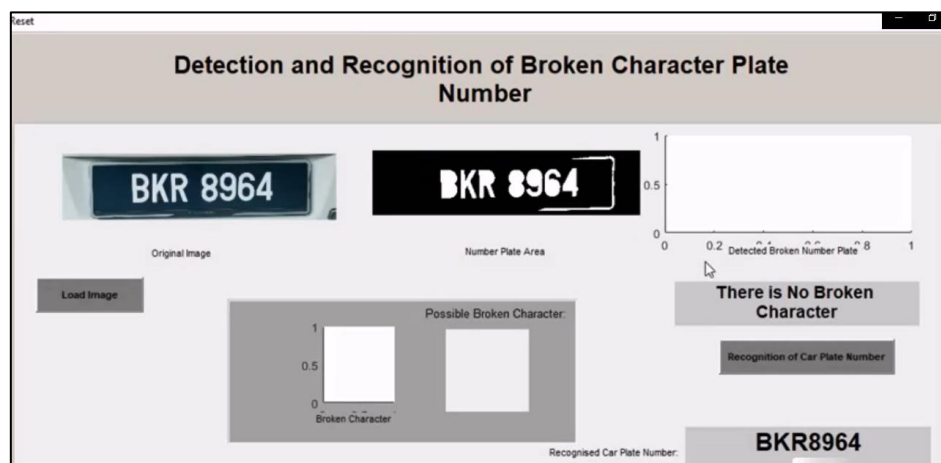
Fig. 3 Result of Car Plate Image with Non-Broken Character

The GUI has been successfully observed and demonstrated in a simulated environment however it has not been tested in real environment with real dataset.

6   CONCLUSION

As conclusion, the paper contributes on the area of law enforcement by transportation authorities, AES, smart parking and tool collection system that able to detect and recognise the broken character in car plate for security purposes. For future, it is recommended that the methods of neural network and deep learning can be used to produce better results in terms of accuracy.

REFERENCES

[1] R. Azad, B.Azad, & H. R. Shayegh, "Real-time and efficient method for accuracy enhancement of edge based license plate recognition system," *2013 First International Conference on computer Information Technology and Digital Media*, pp. 146-155, 2014.

[2] M. S. Farag, M. M. E. Din, & H. E. Shenbary, "Parking entrance control using license plate detection and recognition," Indonesian Journal of Electrical Engineering and Computer Science, vol. 15, no. 1, pp. 476-483, 2019.

[3] G. Kosala, A. Harjoko & S. Hartati, "A Study on Automatic License Plate Recognition Techniques," 25th Research World International Conference. Bali, pp. 53–59, 2016.

[4] M. Droettboom, "Correcting broken character in the recognition of historical printed document," 2003 Joint Conference on Digital Libraries, Houston, pp. 364–366. 2003.

[5] V. Novak, P. Hurtik & H. Habiballa, "Recognition of distorted characters printed on metal using fuzzy logic methods," 2013 Joint IFSA World Congress and NAFIPS Annual Meeting (IFSA/NAFIPS). 2013.

[6] K. Kaur, & A. K. Bathla, "A Review on Segmentation of Touching and Broken Characters for Handwritten Gurmukhi Script," International Journal of Computer Applications, vol. 120, no. 18, pp. 13–16, 2015.