License Plate Recognition for Tracking Vehicles

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Abstract— The license plate recognition for tracking stolen vehicles, the system will read the car license plate and compare with the database. Then, the system will send the warming immediately if such car is in the blacklist. The research and development team has developed the license plate Recognition by developing from microsoft visual studio 2015, VB.NET language and EmguCV command. We use the image processing and k-Nearest Neighbor (k-NN) algorithm to recognize numbers on the license plate. The experiment results, shows that the system is able to read the license plate in the middle of the image, at 1-meter distance with 100% accuracy from the samples of 30 images. Moreover, it is able to recognize the license plate from the tilted position at 80 degrees' angle and 100 degrees' angle for the distance more than 1 meter with 50% accuracy from the samples of 30 images.

Keywords—component; Vehicle, License Plate, k-Nearest Neighbor, k-NN, recognize, Tracking

I. INTRODUCTION

The one problem is always seen from the news on television, newspapers, there is car theft. It is near a harm that can be happened to everyone all the times. Although there are many innovations to support. There are still car thefts. Whether parking at a private area, still cannot protect property. This problem still occurs a lot and there is an action style ingenious, constantly evolving, stealing patterns are constantly difficult to detect and catch the culprit. Even though there is a strong policy to protect a case of car theft. But still, cannot arrest the perpetrator or tracked the stolen car. The new technology and innovations have been developing to support and protect car theft. The researcher has developed a system to read the license plate. For tracking a car's theft with image processing and k-NN techniques.

This paper focus to develop license plate recognition for tracking stolen vehicles. So, the rest organize of this paper begin with introduction and next is related work. In section 3, the proposed method was describe then the experimental and results illustrate in section 4, the last conclusion to close.

II. RELATED WORKS

A. Standard of Thailand registration license plate

The Thailand standard license plate registration, it will be approximately as 11x 38 cm. reflective. It consists of two letters in the middle of each row. The top row is divided into two categories, the left and right numbers. The left category consists of 1 consonant or 2 consonants, from 29 alphabets from 44 Thai alphabets, and numbers between 0-9 are 0,1,2,3,4,5,6,7,8,9,ก, ข, ค, ง, จ, ฉ, ช, ฌ, ญ, ฎ, ฏ, ฐ, ฑ, ฒ, ณ, ด, ต, ถ, ท, ธ, น, บ, ป, ผ, ฝ, พ, ฟ, ภ, ม, ย, ร, ล, ว, ศ, ษ, ส, ห, อ, ฮ as shown in Fig. 1. The numbers on the right are from 1 to 4 digits, each digit between 0-9. The bottom row shows the province where the vehicle is registered, printed in the same color as the top but with a smaller font size. Also divided into categories of applications into 10 categories as follows:

1) White label, black letters is a passenger car license plate not more than 7 seats.

2) White label, blue letter is a passenger car license plate over 7 seats.

3) White label, green letter is the pickup truck.

4) White label is the red alphabet is tricycle license plate.

5) Yellow label with the red letter is a taxi between the provinces.

6) Yellow label, black letters is a taxi board.

7) Yellow label, blue letters is small truck stop.

8) Yellow label green letter is a tuk-tuk.

9) Green label, white lettering is a business license plate service car and rental car.

10) Black signs are license plates, road rollers, tractors and agricultural vehicles.

Fig. 1. Example car license plate in Thailand.
(http://www.manager.net)

B. Image processing

1. Gray scale is a grayscale image with a grayscale intensity of 0-255 (8 bits) [1]-[4]. Gray Scale images are derived from RGB image conversion by standard perimeter. The color intensity of the color of the parental color is 29.9%, 58.7% green and 11.4% blue 100% the calculation as in (1).

$$Gray = 0.299 \times R + 0.587 \times G + 0.114 \times B \qquad (1)$$

The system will compare from the database and immediately alert when captures registration car plate and when data read as Gray, R, G and B are gray, red, green and blue, respectively, between 0 - 255.

2. Binary Image

The conversion of grayscale images to black and white images is called thresholding [1], [2], [4] were determine the pixels of the image and identify which points should be white (1) or black dots (0). This is a most common technic used for difference between the object and the background.
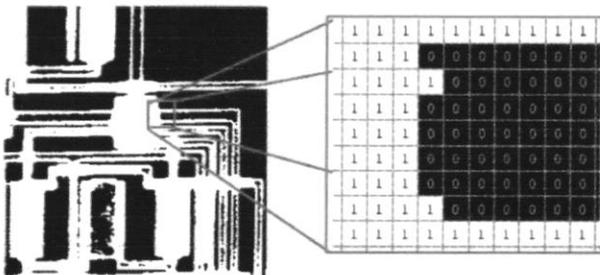
Fig. 2. Example, the pixel values are set to 0 and 1.

(http://www.mathworks.com/access/helpdesk/help/toolbox/images/)

The values of any pixel are less than the thresholding value set to 0 (black dot) and the value of any pixel in the image is greater than or equal to the thresholding value set to 1 (white dot) as Fig 2.

3. k-NN Recognition and Learning

Finding the nearest neighbor [5] [6] is a simple and easy way to understand. The data classification, we use the interesting information compare with other information and if the interesting information closest to the system, the nearest information is k (constance) values, which means the nearest approximation of k for train, the closest test data is given to the data that train is closest to the test data should be in the Class and the closest value to the training set, and the test data is in the class, if the value is equal the sum distance of the neighbor each of the value by selected the closest value as shown in Fig 3.
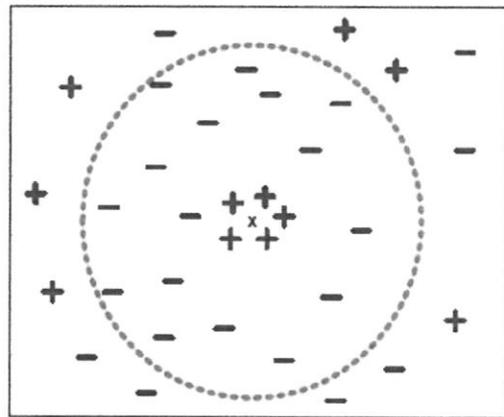

Fig. 3. k-NN algorithm.

4. Emgu CV 3 is a language link developed for Image Processing and Computer Vision. It is a computer language that able 2 ways converts of a command set between .NET Library and OpenCV. OpenCV's support for .NET for developments, such as C #, VB.NET, C ++, Iron Python, etc.

5. Microsoft Visual Studio is an application software that developed by Microsoft. It's a tools and helps for developer's computer programing, web sites, web applications and web services. Windows, Pocket PCs, Smartphones, and Web browsers. Visual software can be using .NET to programming, such as VB.NET, * C ++, * C #, * J # *, etc

III. PROPOSED METHOD

Structure of the license plate reading system for tracking car theft that can be displayed Fig. 4 which has five main components as follows:

Step 1: input image process.

Step 2: the preliminary image processing.

Step 3: the license plate checking.

Step 4: recognition process.

Step 5: output process.