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Segmentation Plate and Number Vehicle using Integral Projection

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Abstract — Ticket system on the shopping mall and offices have a way to write it by the manual and automatic way. Most of the systems in use are by manual rather than automatic. With the problem, the manual system will be replaced with an automatic system that can recognize the number on the license plate. One method used to detect the plate and number that can be used is the method of finding contour. Finding contour can locate the number plate by detecting the rectangular shape of an image. This method is very important to be able to detect the number plate because there are many forms contained in the vehicle. Segmentation is used to recognize the characters on the car number plate using integral projection. Integral projection can separate the characters contained on the car number plate to facilitate processing on character recognition. The successful use of this method is 83.3%. Errors are usually caused by the faded car plate colors.

Keywords— active contour, integral projection, plate number, region of interest

I. INTRODUCTION

The plates were almost identical to cars and emerged during the early transition period of horseback riding between 1890 and 1910. New York states in the United States required the use of license plates since 1901. Early number plates were made of porcelain burned to iron, or Ordinary ceramics that are not burned, so easily broken and impractical. Numerical plates then include cartons, leather, plastics, even copper, and soybeans. The initial number plate has a variety of shapes and sizes, so that when moved between vehicles there should be a new hole to insert the bolt into the bumper. The standardization of new license plates began in 1957 when the automobile factory agreed with various international standards governments and organizations. The number plate has a serial number of letters and numbers arranged in the vehicle. This number in Indonesia is called a policy number and is usually combined with other information about the vehicle concerned, such as color, brand, model, year of manufacture, vehicle identification number and of course the name and address of the owner. All these data are also listed in the Letter of Vehicle Registration Number or vehicle registration which is a proof that the police number was indeed assigned to the vehicle.

Ticket systems in malls and offices have a way to write them manually and automatically [1]. In the manual parking system, the officer records the ticket number according to the license plate of the vehicle. Until now, the available system is taking a plate with the camera image and will be displayed on the ticket of the bar code but not to recognize the contents of the license plate of the vehicle. From these problems, came the idea to detect vehicle license plate and at the entrance of the parking lot automatically. with this system will allow parking attendants to match the license plate on the vehicle. To overcome these problems can be used segmentation method that is able to distinguish the number plate contained on the car. One method that can be used is to find the contour method. Find the contour can find the license plate by detecting rectangular shape of an image. In [2], the design of a new genetic algorithm(GA) is introduced to detect the locations of license plate (LP) symbols. An adaptive threshold method is applied to overcome the dynamic changes of illumination conditions when converting the image into binary. Connected component analysis technique (CCAT) is used to detect candidate objects inside the unknown image. A scale-invariant geometric relationship matrix is introduced to model the layout of symbols in any LP that simplifies system adaptability when applied in different countries.The result [2] computation time is long.

In this research we use simple method that is with crop ROI from plate of vehicle, where previously there was a process of finding contour to find a square shape on the front of the car which is believed to be a plate then look for character with integral projection. It is expected that with this system the process of obtaining the number plate is faster because the search process plate only in the selected area and it can speed up the computation time.

II. THEORY SUPPORT

Active contour method is very important to be able to detect the number plate because there are many forms contained in the vehicle.

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Fig.1. Personal Vehicle Number Signs (1) Private, (2) Government, (3) General, (4) Transportation Dealer.

Any color on the license plate can distinguish the ownership of the vehicle. In addition to the color, there is the numbering code on the license plate to know the area and the validity period of the vehicle.

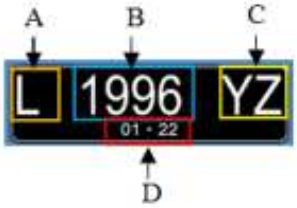

Fig.2. Numbering of Vehicle Number Signs

Information :

A = Regional code number
B = Serial number of registrations
C = ID number
D = Expiry date

III. METHODOLOGY

In this section, we represent a segmentation procedure developed on the license plate and vehicle number. Plat and Vehicle segmentation procedures involve grayscale, adaptive threshold, find contour, canny edge detection, ROI, threshold, and integral projection. The procedure is graphically depicted in the schematic diagram shown in Fig.3.

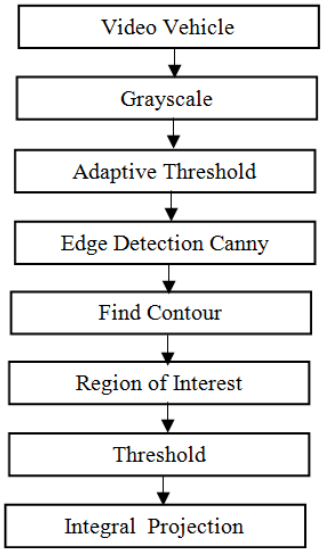

Fig. 3. Schematic diagram of the algorithm

A. *Vehicle*

In this research the input used is video. The video is taken almost the same as the car that will enter the parking lot. The video used is .mp4. The video is converted to the matrix for easier video processing because processing every image mostly uses the matrix in its processing. Below is a video display with a size of 1280 x 720. Fig. 4 shows vehicle video.

Fig. 4. Result of vehicle video

B. *Grayscale*

Grayscale aims to simplify images by summing up the desired RGB values then divided by the number of colors that simplify each pixel. Grayscale was chosen because it can simplify the RGB value to the gray degree which will facilitate the image processing process because the values contained in the pixel image will be simpler. Fig. 5. Result in the grayscale.

Fig. 5 Result of Grayscale

C. *Local Adaptive Threshold*

The process of thresholding or also called this mining produces an image that has two values on the level of gray, black and white called binary. The process of grayscale image mining to generate binary images, in general, is as follows :

$$G(x,y) = \begin{cases} 1 \; if \; f(x,y) \; ; \\ 0 \; if \; f(x,y) \; . \end{cases}$$

G (x, y) denotes the binary image of grayscale f (x, y), T represents the threshold value. The value of T has a very important role in the thresholding process and greatly affects the quality of the resulting binary image. The thresholding method used in this paper is local Adaptive Thresholding. In this local Adaptive Thresholding method, the local threshold value can be calculated in one of three ways :

$$T = \frac{\sum_{(x,y)} \quad \sum_{\in W} f(x,y)}{N_W} - C,$$

Or;

$$T = median\ \{f(x,y), (x,y) \in W\}$$

$$T = \frac{\max\{f(x,y), (x,y) \in W\} + \min\{f(x,y), (x,y) \in W\}}{2}$$

Where,

- W is a processed block,,

- NW is the number of pixels in each block W,

- C is a constant which can be determined freely. When C = 0, the threshold value is equal to the average value of each pixel in the block..

The three ways above consecutively calculate the T value by calculating the mean, median, and average values of the maximum and minimum values of pixels in the window. Fig. 6. Represents Result of local adaptive threshold

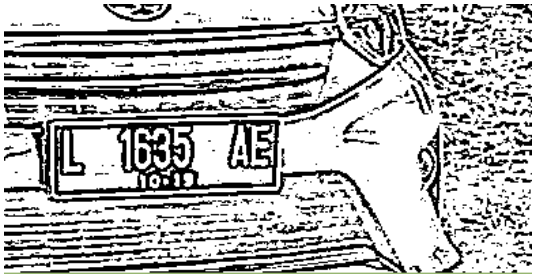

Fig. 6. Result of local adaptive threshold

D. Edge Detection Canny

Edge detection is used to detect the lines that make up the image object and will clarify from the parts. The purpose of this detection is that the objects in the image can be recognized and simplified in shape from the previous form.Fig. 7. Result of edge detection canny

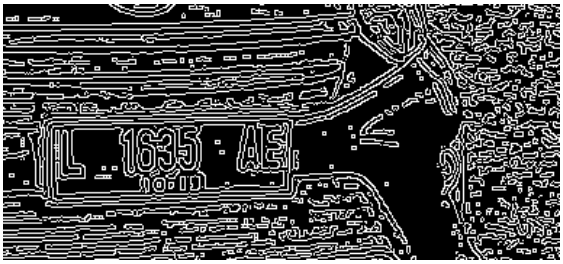

Fig. 7. Result of edge detection canny

E. Finding Contour

Finding contour will detect the number plate by detecting a square-shaped contour to separate the license plate with the vehicle.

Fig. 8. Result of Finding Contour

F. Region of Interest(ROI)

ROI is used to extract certain areas that are believed to be plates. This method is used to simplify the process so that the number plate segmentation becomes easier. In determining the ROI must determine the points x, y, length, and height of an image. So that the plate area in accordance with the desired. Figure 9. Is the region of interest

Fig. 9. Result Region of Interest

G. Threshold

The Threshold is a binary technique used to convert a gray image into a binary image. Thresholding can be used in the image segmentation process to identify and separate the desired object from the background based on the gray level distribution or image texture. In this study, after the thresholding will be seen more clearly. Objects whose colors are essentially white will be white and the black ones become black. Threshold operation performed after grayscale This operation will facilitate the segmentation of the pregnancy sac and also the fetal segmentation that will be done next. Fig. 10. Represents result threshold.

Fig. 10. Result of Threshold

F. Integral Projection

Based on the literature, it is evident that the method that exploits vertical and horizontal pixel projections [6] is the most common and simplest way to get an object in an image. Getting a binary image, how to add an image or row column and give a vector (or projection) (see Figure 11).

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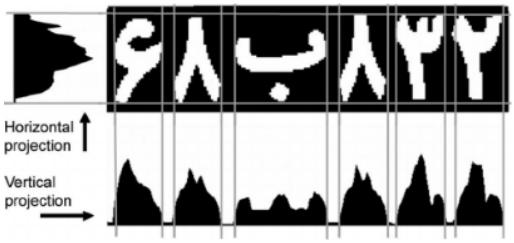


Fig. 11. Integral Projection Methode

Integral projection is a method used to search the region or location of an object. This method can be used to detect the boundaries of different image areas, so that can be searched area of character location and its features. This method can also be called the integral row and column of pixels since this integral adds pixels per row and pixels per column. From this method, it will be easy to find the area where the object is needed. Fig. 12. Represents Result of Integral Projection

Fig. 12. Result of Integral Projection

II. EXPERIMENTAL RESULT

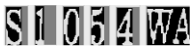
In this paper is tested to detect the plate of cars entering the parking area. A total of 45 data plates were tested in the morning, afternoon, and evening conditions. By using the Integral Platform Projection method can be separated if the histogram value on the number plate in horizontal and vertical histograms is 0, if the value of the horizontal histogram and the vertical histogram on the number plate not 0 then the characters on the license plate cant be separated.

Table I. ROI result

Condition	Plate	ROI	Result.
Morning	1		100%
Afternoon	2		100%
Evening	4		100%

Table 1 shows ROI results from contour.

Table II. Separated Character

Condition	Plate	Integral Projection	Result
Morning	1		83,3%
	2		85,7%
	3		100%
Afternoon	1		83,3%
	2		100%
	3		100%
Evening	1		83,3%
	2		85,7%
	3		100%

From table 2 shows that the system was able to detect plate number with Finding contour. Finding contour is used to find the square shape of the car which is the ROI area to recognize the plate. After the plate is found, the next process is to find characters on the plate using the projection integral method to separate each character. With this method, the plate with 7 characters can be separated, as well as a total of 6 characters. But in some circumstances for the character whose position is adjacent to the letter next to it, can be recognized into 1 letter. This is one of the weaknesses in this system. This is due to several reasons that the original writing plate is too close, but also the noise on the plate in the form of graffiti or plate is dull, making the threshold process becomes ugly.

The advantage of using this system is to accelerate the process of plate detection operations, because it uses the contour method of looking for a square shape that is in front of the car which is believed to be the plate and then become the selected area. Besides the process of integral projection is a simple calculation process using histogram, so it can speed up the computation time.

III. CONCLUSIONS AND FUTURE WORK

Based on the experimental results, before performing the number plate segmentation on the vehicle, first, search the license plate on the vehicle. The process of taking the license plate of the vehicle is done by finding contour and region of interest. As for separating each character on the license plate using integral projection. for character separation results, the projection integral method needs to be combined with other methods for character recognition, such as template matching or other methods.

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