An Adaptive Vehicle VIN Recognition System Based on Machine Vision

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Abstract: This paper presents a VIN (Vehicle Identification Number) recognition system based on machine vision. By capturing the VIN code on the car through the camera, the management system of unlicensed merchandise car garage is realized. The system achieves locally adaptive non-linear interference detection through improved threshold partition and morphological change pretreatment methods. Experiments show that the algorithm can be well adapted to dynamic environment and effectively improve the recognition accuracy.The algorithm fully considers the problems of backlighting and low illumination, and is simple in calculation and short in processing time. It is suitable for embedded devices with low computational speed.

1. Introduction

In recent years, vehicle identification technology has been widely used in parking management system, vehicle access system, etc. [1-2]. It mainly relies on machine vision to recognize the license plate number to achieve the purpose of intelligent management.As for the delivery system of commercial vehicles, the traditional strategy cannot be implemented in the system because the license plate is not installed in the new vehicle. In recent years, many researchers have done related work, through two-dimensional code, RFID (Radio Frequency Identification) and other schemes to identify commodity vehicles, but still cannot solve the problem of high cost. The scheme of commodity vehicle logistics management using VIN code has been widely used because of its convenience and low cost. However, due to the backlighting, low illumination and a series of non-linear impulse errors caused by open-air dynamic environment, it is difficult to adapt to high-precision scenes. Aiming at the difficulty of dynamic environment identification, a new VIN processing algorithm is proposed in this paper. The robust of the system is effectively enhanced by a locally adaptive non-linear intervention algorithm, which is adjusted by threshold partition and morphological changes. Experiments show that the algorithm can be well adapted to dynamic environment.

2. Algorithm description

The background processing module is used to suppress the errors from the external environment. Finally, the recognition results are obtained by combining the training module's font. The system flow charts of the three modules are as follows:

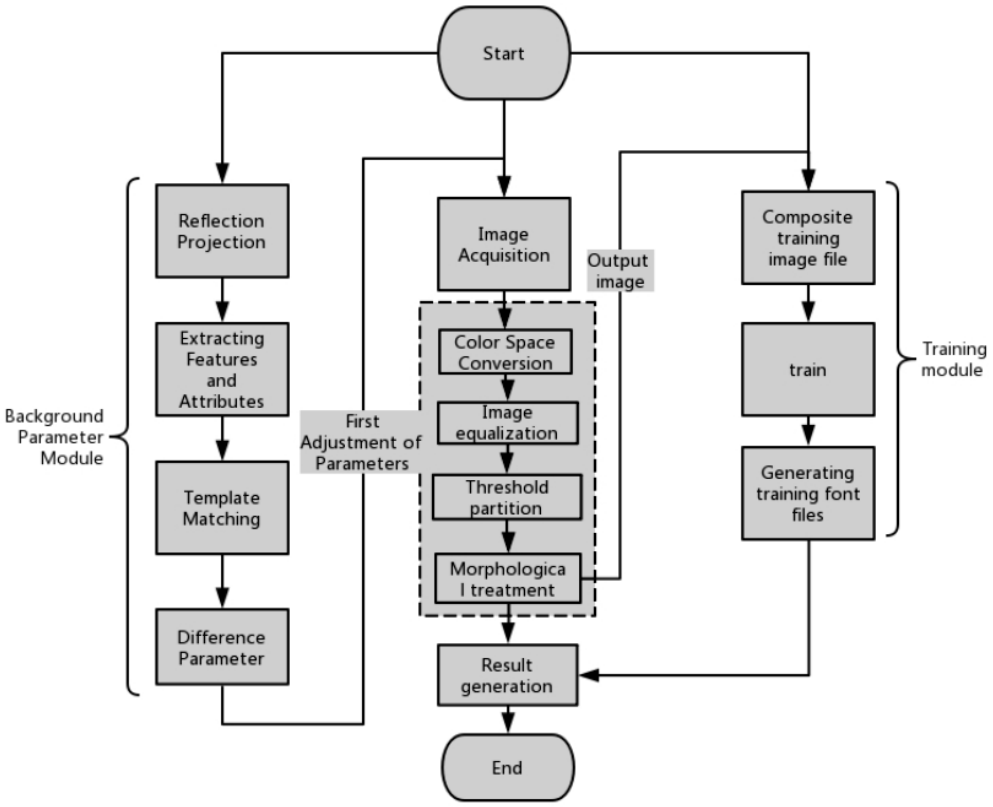

Figure 1. The flow chats

As can be seen from Figure 1, the work of the system depends on three main modules.

After the original image is captured by the camera, the background information is extracted by histogram back projection algorithm, and the current background noise evaluation value is generated by matching the feature extraction of background information with the background database file. The noise belongs to global noise.Most of the global noise can be eliminated by using the difference principle to return the adjustment parameters. The second module is the interest processing module, which transforms the color space and equalizes the color space to prevent the overexposure of the backlight environment and the insufficient intensity of individual points. Then the local threshold is divided and the image is binarized. Combining the third part of the training, the final recognition results are generated. The pseudocode of the algorithm is as follows:

STEP1: [Background Parameter Module]
IF successfully obtain a frame, Reflection Projection
Extracting Features and Attributes, Template Matching and Pararmeter
STEP2: [Image preprocessing]
FOR (i= first pixel, i<=last pixel, step+1)
RGB color space→HSV color space
END FOR.
IF stringcquisition =TRUE
THEN GOTO STEP3
STEP3: [Bring into Training Set]
IF String acquisition= NULL
THEN REURN TrainedString = train (resultString)
END IF.

3. Main modules design

The dynamic adaptability of image processing system mainly depends on three points. First, how to extract background information effectively is extremely important. The camera shooting VIN

code belongs to the near-focus camera, but the background is in the mid-range, the image boundary is blurred, and the discrimination is not obvious. The camera shooting VIN code belongs to the near-focus camera, but the background is in the mid-range, the image boundary is blurred, and the discrimination is not obvious. Better weather background information can be extracted by using histogram projection algorithm. Secondly, the image preprocessing module, the result of image processing directly affects the final recognition accuracy. In the dynamic environment, it is difficult to guarantee the image exposure, so it is necessary to equalize the image. Global threshold is difficult to deal with the non-linear error of multi-noise points. Therefore, the local threshold is used to binarize the 50*50 pixels of the local matrix mask selected for the size of the license plate. Figure 2 shows the flow chart of image preprocessing to Filter out noise that is not in the area of interest.

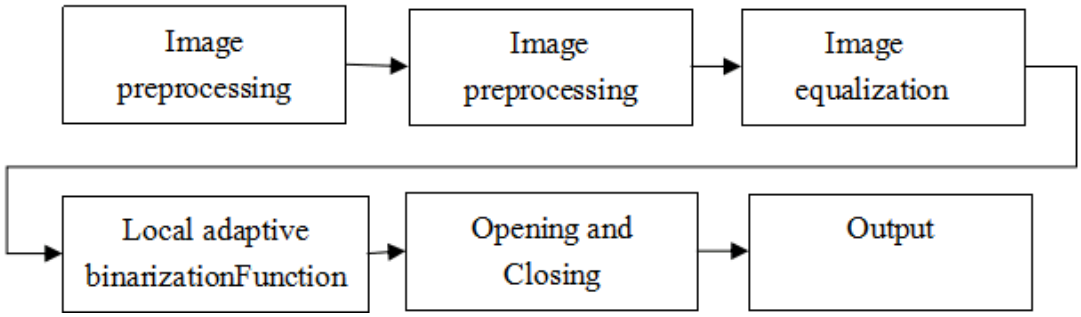

Figure 2. Image preprocessing

In target processing, it is considered that vehicle VIN codes are in the same horizontal position and can be processed by block. Finally, the processed results need to be input into the training set that has been trained. The following Figure 3 shows the process of image training font library.

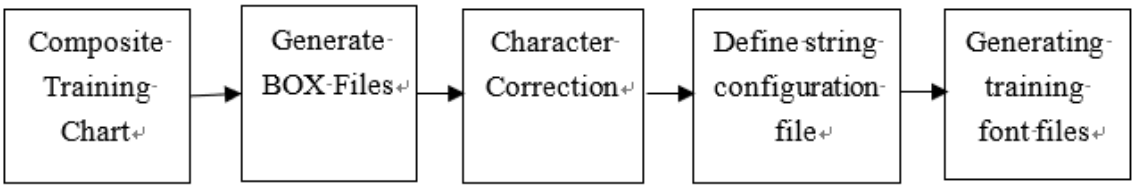

Figure 3. The process of image training font

4. RESULT AND ANALYSIS

The laptop running the algorithm is configured as follow: CPU-Intel(R) Core (TM) i5-5200U CPU @ 2.20GHz, graphics card-AMD Radeon R7 M270 memory-6GB.Figure 4 shows the processing effect of global threshold partition for local backlight of license plate. Figure 5 shows modular local threshold partition.It can be seen that the distortion of global processing is obvious at the end of the string due to excessive exposure. This problem can be well avoided if local thresholds are used.

Figure 4 Global Threshold Processing

Figure 5. Local Threshold Processing

As shown in Figure 6, red represents the histogram of gray-scale image in the backlight environment, and blue represents the histogram after equalization. The equalized image has more obvious contrast, which is conducive to the division of local thresholds. Figure 7 shows a

comparison of the error rates for different groups of pictures after and before the improvement of the algorithm. The error rates are significantly reduced.

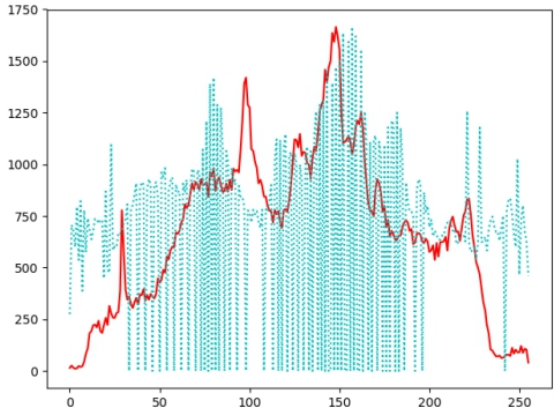

Figure 6 Equalized image histogram

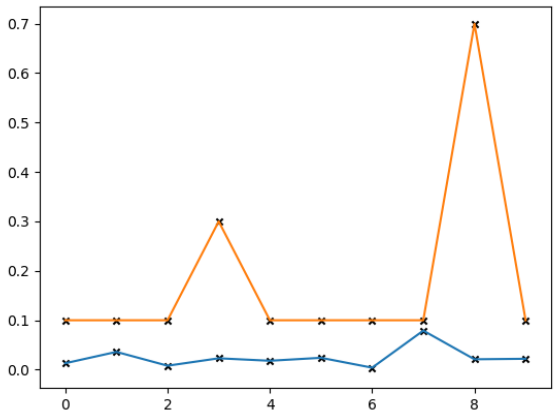

Figure 7. Local Threshold Processing

5. Conclusion

In this paper, a VIN recognition system system based on machine vision is proposed.The system realizes the local adaptive nonlinear intervention algorithm through the improved threshold partition and morphological change pretreatment. This algorithm takes full account of backlight, low illumination, simple calculation, short processing time, suitable for embedded devices with low computing speed.

Acknowledgements

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