Locating License Vehicle Plates in Enhanced Binary Images

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Abstract. In this paper we propose an automatic method to localize Brazilian license plates in digital images based on the maximum correlation between an enhanced image and a square wave form. The maximum correlation points out the horizontal and vertical crossing axis over the plate. The binary image enhancement is provided by the level set method, prior to locating plates.

1. Introduction

Many intelligent systems have been developed for traffic control and monitoring system in the last decade. Applications such as detection of irregular vehicles, parking and toll control, license plates localization and reading and so on are spread over the world.

Comelli et al. in [1] proposed an automatic system to recognize car license plates by dividing the process in three phases as follows: license plate location, pre-processing module and the character recognizer. In [2] Naito and Tsukada evaluated the license plates location in binary images instead of using gray level images to simplify this task. Inspired in this idea, we propose in this paper an algorithm to localize license plates in binary images. In order to correct segmentation local defects we apply the level set [3] method proposed by Malladi and Sethian on the segmented image. It improves the performance of the localization algorithm.

2. The Maximum Correlation Approach

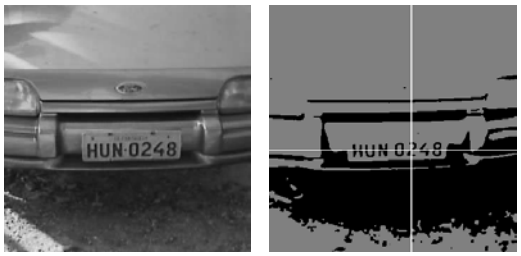
The method calculates the maximum correlation between the locally enhanced binary image and a square wave form that follows the Brazilian plate pattern.

The use of a square wave form is justified by the amplitude patterns found in the region of the characters in the binary image. We define a wave form where the period is twice the width of the character and the size of the 1-D mask is the same as the length of the plate image.

Defined the pattern of the wave form, it is calculated the correlation matrix. The maximum value in this matrix indicates the center of the axis system which crosses the plate.

3. Experimental results

The algorithm runs on a set compound of 40 real test images. The set 1 consists of 7 parked vehicles images and the set 2 of images was acquired from moving cars by a traffic control and monitoring system. The correct location of the horizontal and vertical axis crossing of the plates was measured over the test images and we obtained an overall error rate below 3%. Figure 1 shows a test run on a parked vehicle image. Figures 1a and 1b show the vehicle image and the localized plate, respectively. It is worth noting that the wave form depends on the acquisition system of the license vehicle plates and the algorithm was adjusted to the Brazilian patterns.



(a) **(b)**

Figure 1. (a) The vehicle image and(b) the localized plate.

4. Further Developments

Further developments will focus on the segmentation phase in order to provide a better performance of the proposed algorithm.

References

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