Hill Climbing Algorithm for License Plate Recognition

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Hill Climbing Algorithm for License Plate Recognition

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Introduction

Image thresholding converts the histogram of gray-level image into a binary level [1]. In 1978, the popular global automatic thresholding techniques were introduced first by Otsu [2]. It minimizes the mean square error between the original image and the segmented binary image in which pixels of each region are assigned the mean intensity of their respective class. Kapur et al. [3] proposed an entropic method for image thresholding. The survey about global threshold detection from Glasbey [4] presents a good overview which includes histogram concavity analysis, entropic methods, relaxation methods, multi-thresholdig methods, and the others. The survey from Mehmet et al. [5] categorizes the thresholding methods into six groups. Mehmet also conclude shape-base thresholding into three categories [6, 7, 8]: convex hull thresholding, peak-and-valley thresholding, and shape-modeling thresholding. Moreover, the threshold selection techniques can be divided into two groups, bi-level and multi-level. Multi-level thresholding techniques [9, 10, 11, 12] segment multi-modal images into many sub-images with those representing distinct objects in these images. In this paper, we use contrast adjustment to enhance high brightness objects in the multi-modal image. Then, we use the shape-base histogram analysis to find the thrashholding. The analysis process may execute iteratively from many climbing curves. After that, the high-brightness objects in the multi-modal image can be obtained. The whole algorithm present a behavior likes human vision having intuitive focus on high contrast-regions.

Hill Climbing Curve

A good threshold can be selected if the histogram peaks are tall, narrow, symmetric, and separated by deep valleys. As we investigate the histogram of images from the surveillance system in the traffic domain, they reveal a distinct phenomenon. The curve from valley to peak, we called it "climbing curve", is suitable for thresholding. Fig. 1-a shows the climbing curve in the multi-modal histogram which has multi-climbing curves. Because the image from traffic domain always focus on the