Corner detection - Lab 5

Y. O. Sinatra Gesualdo

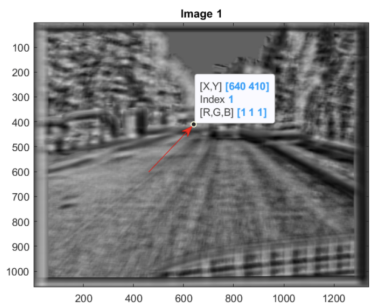
November 1, 2022

1 Introduction

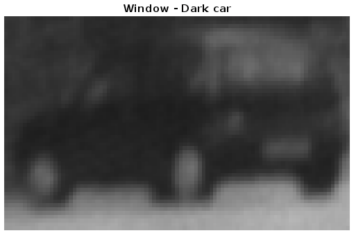
In this assignment we were asked to use two techniques for object and object detection. The first one is template matching using NCC, the other is Harris Corner for identify regions exploiting Gaussian derivative in the picture we can detect how the amplitude change, hence, distinguish flat from corner from edges regions.

2 NCC

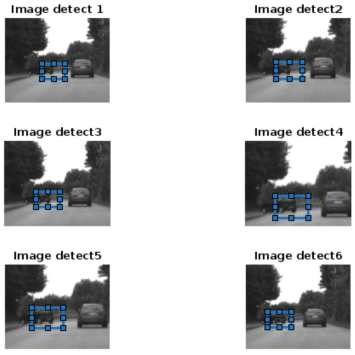
The fig.1 represent a real scenario, where an automatic vehicle capture with cameras two cars on the front. For identifying it I started processing images and make them in gray-scale because we are not interested in colors but amplitudes of pixels. We need a template, taken from the picture a box depicting a car seen from behind and note the different size between the original image and the template. What we do is Normalize cross correlation in which the algorithm look into the original image if find same pattern close to the template and when he does we extract the mast bright pixel and we get the centroid. Then is a matter of display onto the original image the rectangle knowing the size and the location of the detected object. Increasing the size of the window of the template, the results are slightly better. At first sight, the first template was smaller then figure (b) and the final template dimension proved to be more efficient in the detection and of centroid than the previous ones. Note that increasing the size increase the accuracy as well as the computation time.



(a) Centroid of the detected car



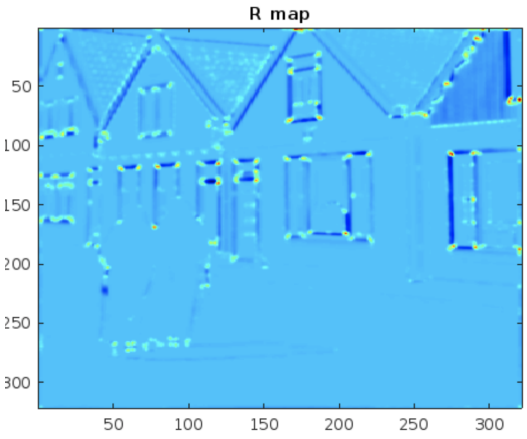
(b) Template



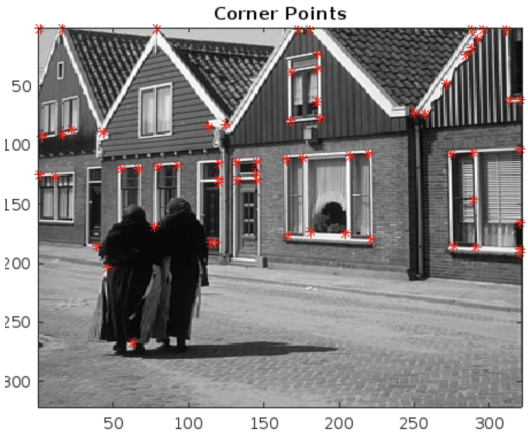
(c) Results

3 Harris corner detection

The algorithm consists on compare local intensity pixel and his sourranding, we apply gaussian derivatives in both direction for edges and mathematically, this calculation can be grouped in an importnt matrix M. By computing his eigenvalues we get the R score, which give us important information about the region detected.



The spots with a color brighter identify an high score, hence, identify corners. The describe different region we must tune a threshold for correctly split corner and edge case. When R is low the region is flat and when it is under the threshold (0.3 max(R)) is an edge. After that, with for loops we split the regions according to R obtaining blobs, whose centroid and spot can be highlighted by simple functions. The threshold must be careful tested for our purpose, and by seeing the final result, it is not completely accurate but works and may be tuned better with more detailed accuracy on the threshold.



4 Comparison with color segmentation method

Comparing the results of this experiment with laboratory work 4, it can be noted that this method is more effective since it immediately gives the location of the blobs. In color based segmentation we have to investigate blobs after blobs, compute mean and standard deviation and then assign ones or zeros if the pixel is respectively inside or outside the threshold. Appear slower in computational time and sensible to noises and smoothness.

(a) Color based approach