Gaussian Refinements on Gabor Filter based Patch Descriptor

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Abstract

Recent research in object detection tends to put an accent not only on global object methods, but concentrates mostly on object parts and the relationship between them. One of the most widespread part-based object model has been proposed by Felzenszwalb at al. [1]. Such systems can be divided in three main parts: the detection of interest points, the development of adequate local descriptors and the object model.

This article deals with the most important phase, the elaboration of local descriptors. Accordingly, we created a patch descriptor based on two-dimensional Gabor filters. The idea of the developed descriptor is to select only few form the multitude of definable Gabor filters, being most adequate for a given object part. In our previous works we designed a response-map, playing the role of the local descriptor, based on the above mentioned filters and GentleBoost learning algorithm [2] or the SVM classification method [3].

In this paper we propose an improvement in the filter selection process, which considers not only the magnitude of the complex Gabor filter responses, but also the real and imaginary parts and their statistical distribution.

For this purpose we created an RBF Neural Network, which is able to learn the statistical distribution of Gabor filter responses. This network improved the selection procedure of the most suitable filters for a given image patch. The idea of using RBF NN was suggested by several authors [4, 5, 6], whose system is based on the Gaussian distribution of Gabor filters.

In conclusion, we compared the above mentioned three methods GentleBoost, SVM and RBFNN and deduced that the combination of Gaussians, characterizes the patch better than only the value of magnitude of the complex responses.

Keywords: object detection, part based model, patch descriptor, Gabor filter, GentleBoost, SVM, RBF Neural Network

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