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 relation-
ship between them. One of the most widespread part-based object model
has been proposed by Felzenszwalb at al. \cite{1}. Such systems can be divided
in three main parts: the detection of interest points, the development of ade-
quate local descriptors and the object model.

This article deals with the most important phase, the elaboration of lo-
cal 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 \cite{2} or the SVM classification method \cite{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 im-
proved the selection procedure of the most suitable filters for a given image
patch. The idea of using RBF NN was suggested by several authors \cite{4, 5, 6},
whose system is based on the Gaussian distribution of Gabor filters.

In conclusion, we compared the above mentioned three methods Gentle-
Boost, SVM and RBFNN and deduced that the combination of Gaussians,
characterizes the patch better than only the value of magnitude of the com-
plex responses.

\textit{Keywords}: object detection, part based model, patch descriptor, Gabor filter,
GentleBoost, SVM, RBF Neural Network
References


