VEHICLE DETECTION SYSTEM THROUGH IMAGE ANALYSIS USING LOG-GABOR FILTER

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ABSTRACT
This Vehicle detection based on image analysis has attracted increasing attention in recent years due to its low cost, flexibility, and potential toward collision avoidance. In particular, vehicle verification is especially challenging on account of the heterogeneity of vehicles in color, size, pose, etc. Image based vehicle verification is usually addressed as a supervised classification problem. Specifically, descriptors using Gabor filters have been reported to show good performance in this task. However, Gabor functions have a number of drawbacks relating to their frequency response. The main contribution of this paper is the proposal and evaluation of a new descriptor based on the alternative family of log-Gabor functions for vehicle verification, as opposed to existing Gabor filter-based descriptors. These filters are theoretically superior to Gabor filters as they can better represent the frequency properties of natural images. As a second contribution, and in contrast to existing approaches, which transfer the standard configuration of filters used for other applications to the vehicle classification task, an in-depth analysis of the required filter configuration by both Gabor and log-Gabor descriptors for the application is performed for fair comparison. The extensive experiments conducted in this paper confirm that the proposed log-Gabor descriptor significantly outperforms the standard Gabor filter for image-based vehicle verification.
1. Introduction
Vehicle detection based on image analysis has attracted increasing attention in recent years due to its low cost, flexibility, and potential toward collision avoidance. In this project, there is the proposal and evaluation of a new descriptor based on the alternative family of log-Gabor functions for vehicle verification, as opposed to existing Gabor filter-based descriptors. These filters are theoretically superior to Gabor filters as they can better represent the frequency properties of natural images. As a second contribution, and in contrast to existing approaches, which transfer the standard configuration of filters used for other applications to the vehicle classification task, an in-depth analysis of the required filter configuration by both Gabor and log-Gabor descriptors for the application is performed for fair comparison.

2. EXISTING SYSTEM
Most of the reported methods address vehicle detection in two stages, namely hypothesis generation and hypothesis verification. In the former, a quick search is performed so that potential locations of the vehicles in the image are hypothesized. The search is typically based on some expected feature of vehicles, such as color, shadow, vertical edges, or motion. The aim of the second stage is to verify the correctness of the vehicle candidates provided by the hypothesis generation stage. Traditionally, fixed or deformable models have been used for vehicle verification; However, the increase of processors speed in the last years has enabled the use of learning-based methods for real-time vehicle verification. In particular, this is usually addressed as a two-class supervised classification problem in which a set of samples are trained in search of specific feature descriptors of the vehicle and the nonvehicle classes. Some widespread descriptors include Gabor filters, principal component analysis (PCA), and histograms of oriented gradients (HOG).

A. DISADVANTAGES OF EXISTING SYSTEM
First, the bandwidth of a Gabor filter is typically limited to one octave (otherwise it yields a too high DC component), thus a large number of filters is needed to obtain wide spectrum coverage. In addition, as suggested, the amplitude of natural images (defined as the square root of the power spectrum) falls off in average by a factor of roughly 1/f. This is in contrast to the properties of Gabor filters: on the one hand, a big extent of the Gabor response concentrates on the lower frequencies, which in turn results in redundant information of the filters; on the other hand, the high frequency tail of the images is not captured.

B. PROPOSED SYSTEM
In this paper, an alternative representation of images for vehicle classification using log-Gabor filters instead of Gabor filters is proposed and evaluated. Log-Gabor filters are designed as Gaussian functions on the log axis, which is in fact the standard method for representing the spatial frequency response of visual neurons. Their symmetry on the log axis results in a more effective representation of the uneven frequency content of the images: redundancy in lower frequencies is reduced, and the response of the filter in the linear frequency axis displays a tail in the higher frequencies that adapts the frequency fall-off of natural images. Furthermore, log-Gabor filters do not have a DC component, which allows an increase in the bandwidth, and hence fewer filters are required to cover the same spectrum.
3. ADVANTAGES OF PROPOSED SYSTEM

Log-Gabor filter banks are proven to yield better results than Gabor filter banks using the same number of filters due to their more effective coverage of the spectrum, and to scale better as the number of filters decreases. The extensive experiments enclosed in this paper confirm the theoretical superiority of these filters over Gabor filters in this field.

4. MODULES

* Input Module
* Feature Extraction Module
* Applying Various Filters
* Gabor Filter Based Classifier

MODULE DESCRIPTION

Input Module
In this module, we design the user interface for providing the input for the project. The user can select the image input from the dataset images consisting of vehicle and non-vehicle images.

Feature Extraction Module
In this module, we perform the operation of feature extraction. Several strategies can be taken to define the feature vector from the result of Gabor filtering. A set of simulations have been performed on the GTI vehicle database to derive the combination of parameters of the Gabor filter bank that yields best vehicle classification performance.

Applying Various Filters Module:
In this module, we apply various filters to the input image. The log-Gabor functions adapt better than Gabor functions to the inherent frequency content of natural images and are able to cover a larger spectrum with the same number of filters. Thus, it is especially interesting to observe their behavior when decreasing the number of filters in the bank.

Log-Gabor filters Module:
In this paper, an alternative representation of images for vehicle classification using log-Gabor filters instead of Gabor filters is proposed and evaluated. Log-Gabor filters are designed as Gaussian functions on the log axis, which is in fact the standard method for representing the spatial frequency response of visual neurons. Their symmetry on the log axis results in a more effective representation of the uneven frequency content of the images: redundancy in lower frequencies is reduced, and the response of the filter in the linear frequency axis displays a tail in the higher frequencies that adapts the frequency fall-off of natural images. Furthermore, log-Gabor filters do not have a DC component, which allows an increase in the bandwidth, and hence fewer filters are required to cover the same spectrum.
5. CONCLUSION

Instead of using Gabor filters we use Log-Gabor Filters as they can better represent the frequency properties of natural images.

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