# Random forest method for image based vehicle verification using log-gabor filter

**T. Koteswararao** **K. JhanshiRani**

***Abstract: Vehicle identification based on study of image has enthralled increasing attention in current years due to its reliability, low cost and potentiality toward collision prevention. In particular, motor vehicle authentication is especially challenging on account of the difference of vehicles in color, size, front, etc. Image-based vehicle verification is usually addresses a supervise categorization problem. The main donation of this paper is the proposal and estimate of a new descriptor based on the alternative family of log-Gabor functions for motor vehicle authentication, 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 normal images. Vehicle identification based on analysis of image has enthralled increasing attention in recent years due to its low, plasticity, and potential toward collision avoidance. 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 motor vehicle authentication.***

**Keyword: Gabor filter, Theory verification, intellectual vehicles, log-Gabor filters, Contraption learning, SVM, Random foster algorithem, PCM method, matrix form, mean, deviation, skewness.**

## I . INTRODUCTION

The increasing interest on advanced driver assistance systems (ADAS) for the improvement of road safety has been reflected in the joint involvement of universities, research centers and car manufacturers, as well as in the deployment of national and international projects to address this issue. According to statistics, most of the accidents are caused by other cars.

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 [1] correctness of the vehicle candidates provided by the hypothesis generation stage.

Some widespread descriptors include Gabor filters, principal component analysis (PCA), histograms of oriented gradients (HOG), SVM, and Random method.

In particular, Gabor filters have been broadly used for image-based vehicle verification. Traditionally, a Gabor filter bank at different scales and orientations is used for feature extraction.

Although Gabor filters have been extensively applied for a broad range of applications, they involve a number of drawbacks.

Experiments show that log-Gabor filters significantly outperform traditional Gabor filters for vehicle verification

## II.REVIEW ON GABOR FILTER

Two-dimensional Gabor functions are composed of a complex sinusoidal carrier and a Gaussian envelope. The Fourier transform of g(x, y) is given by

$$G(u,v)=\exp\left\{-\frac{1}{2}\left[\frac{(u-F_0)^2}{\sigma_u^{\,2}}+\frac{v^2}{\sigma_v^{\,2}}\right]\right\}$$

Therefore, the perception of the human visual system can be emulated through image analysis using these functions. This has motivated the use of Gabor filters for a broad spectrum of applications including image compression, [2] browsing and retrieval of image classification, and, object tracking and feature extraction for further classification. They are in all cases tightly related to the texture analysis of the image.

The fundamental equation for Gabor filter is given by

$$G_{m,n}(u,v)=\exp\left\{-\frac{1}{2}\left[\frac{(u-u_{m,n})_r^{\;2}}{a^{-2m}\sigma_u^{\,2}}+\frac{(v-v_{m,n})_r^{\;2}}{a^{-2m}\sigma_v^{\,2}}\right]\right\}$$



ISSN: 2278 – 7798 

## III . LOG-GABOR FILTERS

As stated in Section I, the properties of Gabor filters involve two important drawbacks. On the one hand, their bandwidth must be limited in order to prevent a too high DC component. Hence, a larger number of filters is needed to cover the desired spectrum.

$$LG_{m,n}(f,\theta)=\begin{cases}\exp\left\{-\frac{(\log(f/F_m))^2}{2(\log\beta)^2}\right\}\exp\left\{-\frac{(\theta-\theta_n)^2}{2\sigma_\theta^2}\right\}, f=0\\ 0, f\neq 0\end{cases}$$

Results in redundant information in the lower frequencies that could instead be devoted to capture the tails of images in the higher frequencies.

$$LG_{m,n}(\rho,\theta)=\exp\left\{-\frac{(\rho-\rho_m)^2}{2\sigma_\rho^2}\right\}\exp\left\{-\frac{(\theta-\theta_n)^2}{2\sigma_\theta^2}\right\}$$

Where $\rho=\log f$ , $\rho_m=\log F_m$ , $\sigma_\rho=\log\beta$ and $f\neq 0$

As can be observed in log-Gabor functions are symmetrical in the log-axis instead of the linear frequency axis, which yields a more effective representation of images. In turn, redundancy in the lower frequencies is reduced, thus achieving a more efficient coverage of the frequencies.

*Experimental Speciers:*

A Support Vector Machine (SVM) classifier, these classifiers are extensively used in the related literature owing to their good generalization, and have been reported to deliver better performance than other traditional methods, e.g. Neural Networks.

Regarding the data set, the open access GTI vehicle image database is used for the experiments. This data set consists of 4000 positive images of vehicle rears and 4000 negative images of other elements in traffic sequences. Monochrome images are used as the proposed descriptors pertain to texture rather than color. The images are divided in four different groups according to the relative pose of the vehicle with [3] respect to the camera (close/middle range in the front, in the left and in the right, and far range), each of them comprising 1000 positive and 1000 negative image.Here the eqution mean, deviation, skewness are show in below

$$\mu_{m,n}=\frac{1}{R.C}\sum_x\sum_y\left(\left|J_{m.n}(x,y)\right|\right)$$

$$\sigma_{m,n}=\sqrt{\frac{1}{R.C}\sum_x\sum_y\left(\left|J_{m.n}(x,y)\right|-\mu_{m,n}\right)^2}$$

$$\gamma_{m,n}=\frac{1}{R.C}\sum_x\sum_y\left(\frac{\left|J_{m.n}(x,y)\right|-\mu_{m,n}}{\sigma_{m,n}}\right)^3$$

### A. *Experiments With Gabor Filter-Based Classifier:*

These parameters comprise the number of scales, N, the number of orientations, K, the maximum frequency, F0, and the scaling between center frequencies, a.

#### *1. Performance as a Function of the Number of Scales:*

Once the final set of features has been defined, the next step is to evaluate the classification accuracy as a function of the number of scales and orientations. The advantage of characterizing each region of the image separately and of having a specific classifier 1for each of them becomes apparent in this case. The final evolution of the performance as a function [4] of the number of scales (broken down by zones), as well as the gain of using an adaptable λo.

#### *2.Performance as a Function of the Number of Orientations:*

Analogously to the number of scales, it is also interesting to analyze the evolution of the performance as a function of the number of orientations. Clearly, a minimum of K =2 orientations, i.e. vertical and horizontal, is mandatory, similarly change the k value take the optimum value.

The better grasp the underlying behavior. As can be observed, the highest performance degradation occurs in the left and right sides of the close/middle range when decreasing K to 2, i.e., only considering the vertical and horizontal orientations. This is mainly due to the fact the nonvehicle images in these regions contain structures in a whole bunch of angles, such as guardrails, median stripes, traffic signs, and lane markings.

## IV.PERFORMANCE OF LOG-GABOR FILTER-BASED CLASSIFIER

In this section, the goal is to experimentally compare the behavior of the proposed log-Gabor filter based descriptor with that of the traditional Gabor filter based approach mainly reduced the Gabor filter draw backs and maintains the large band width, minimized the filter.



ISSN: 2278 – 7798 

*Experiments With Log-Gabor Filter-Based Classifier:*

*1. Performance as a Function of the Number of Scales:*

As done with the Gabor filters, different experiments are carried out by changing the number of scales from N = 1 to N = 4. The maximum frequency, F0, and the scaling between center frequencies, a, are also adjusted so that the same range of frequencies is covered. Remarkably, each filter of the log-Gabor bank can encompass a larger bandwidth than the [5] traditional Gabor function, therefore theoretically a smaller impact in the performance is to be observed when decreasing the number of scales.

In particular, the possibility to increase the bandwidth of log-Gabor filters is applied for N. The best λ0 for each image area and the accuracy rates obtained for each of them are summarized values, as well as the combined average rates.

*2. Performance as a Function of the Number of Orientations:*

The evolution of the classification performance achieved by using log-Gabor filters when varying the number of orientations is analyzed in a similar manner to that of the Gabor filter.so changes the k value after that obtained best value from k value.

*A.Comparison Between Gabor and Log-Gabor Based Classifiers*

The performance of the descriptors using Gabor and logGabor functions is enclosed in. The table also contains the standard deviation, σ, of the mean accuracy obtained after repeating the experiment 10 time so chases in order to show the statistical significance of the comparison. Note the small dispersion of the average accuracy, which is lower than the difference between the Gabor and the log-Gabor filter accuracy in all regions.

As discussed before, 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.

*B.Log-Gabor Based Classifier Versus Other Methods*

In the previous subsection, the superiority of the proposed log-Gabor filter based approach with respect to the traditional approach has been proven. However, it is also interesting to compare the performance of this method with respect to the other not Gabor-related state of the art approaches. In particular, as stated in the most widespread methods for vehicle verification, apart from Gabor filters, are Principal Component Analysis (PCA) and Histograms of Oriented Gradients (HOG) [5].

As can be observed log-Gabor based approach (LG) outperforms PCA in all image regions. In turn, although HOG show an excellent performance, the computational requirements are very costly for real-time operation. The average classification time (CT) in milliseconds required for each descriptor has been measured by mean of the SVM software applied [6] on the database images. As can be observed, the time required by HOG for classification is 8.04 ms, 17 times greater than that of LG. Considering a typical frame rate of 25 fps fast compare Gabor filter.

It is interesting to observe that, although the average performance of LG is better than that of the other methods.Here mainly used two method one is support vector(SVM) and random faster method,so this two method are compare one of the method is best.random faster is some imges possible but support vector machine is all images possible

## V.COMPARISION BETWEEN SVM AND RANDOM FOSTER METHOD

The give input image to the SVM , Random foster method some images save database.the camera capture image i.e generic image ,this two image are two mean,varition,skewness[7] eqal image equal properties verified the condition image display,otherwise not display.

## VI. RESULTS:

INPUT

Fig1

OUTPUT



ISSN: 2278 – 7798 

**Predicted class: vehicle**

INPUT

Fig2
OUTPUT


**ıery as**
**taken**
**raining**

## VII.CONCLUSION:

First, the impact of the different design parameters of the Gabor-based descriptor has been evaluated in the field of vehicle imaging, [9] yielding valuable conclusions. For instance, the optimal minimum wavelength of the filter bank, λ(m) 0 , is proven to be dependent on the pose of the vehicles, and in particular, to increase with the relative distance to them. Therefore, the descriptor has been designed with an adaptable λ(m) 0 , rendering a significant increase in performance with respect to a generic descriptor.

Most importantly, in contrast to typical approaches using Gabor filter banks, a new descriptor based on log-Gabor functions has been proposed. These functions have better theoretical properties than traditional. Log-Gabor filter banks [10] 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.

## VIII.REFERENCES


[1] Z. Sun, G. Bebis, and R. Miller, "On-road vehicle detection: A review," IEEE Trans. Pattern Anal. Mach. Intell., vol. 28, no. 5, pp. 694–711, May 2006.

[2] C. Rotaru, T. Graf, and J. Zhang, "Color image segmentation in HSI space for automotive applications," J. Real-Time Image Process., vol. 3, no. 4, pp. 311–322, Dec. 2008.

[3] L.-W. Tsai, J.-W. Hsieh, and K.-C. Fan, "Vehicle detection using normalized color and edge map," IEEE Trans. Image Process., vol. 16, no. 3, pp. 850–864, Mar. 2007.

[4] C. Hoffmann, "Fusing multiple 2D visual features for vehicle detection," in Proc. IEEE Intell. Veh. Symp., 2006, pp. 406–411.

[5] J. Hwang, K. Huh, and D. Lee, "Vision-based vehicle detection and tracking algorithm design," Opt. Eng., vol. 48, no. 12, pp. 127201-1–127201-12, Dec. 2009.

[6] T. Wang, N. Zheng, J. Xin, and Z. Ma, "Integrating millimeter wave radar with a monocular vision sensor for on-road obstacle detection applications," Sensors, vol. 11, no. 9, pp. 8992–9008, Sep. 2011.

[7] K. Yamaguchi, A. Watanabe, and T. Naito, "Road region estimation using a sequence of monocular images," in Proc. 19th Int. Conf. Pattern Recognit., 2008, pp. 1–4.

[8] J. Lou, T. Tan, W. Hu, H. Yang, and S. J. Maybank, "3-D model based vehicle tracking," IEEE Trans. Image Process., vol. 14, no. 10, pp. 1561–1569, Oct. 2005.

[9] Z. Zhang, T. Tan, K. Huang, and Y. Wang, "Three-dimensional deformable-model-based localization and recognition of road vehicles," IEEE Trans. Image Process., vol. 21, no. 1, pp. 1–13, Jan. 2012.

[10] J. Zhou, D. Gao, and D. Zhang, "Moving vehicle detection for automatic traffic monitoring," IEEE Trans. Veh. Tech., vol. 56, no. 1, pp. 51–59, Jan. 2.



**First Author T. Koteswararao** was born in Andhra Pradesh, India. He received B.Tech degree in Electronics and Communication Engineering from Sri Mittapalli College of Engineering College, Thimmalapalam, Guntur(DT). He is pursuing M. tech program in computers and communication engineering in J.N.T. University Kakinada, A.P, India.

**Second Author K. Jhanshi Rani** was born in Andhra Pradesh, India.She is pursuing Ph. D from JNT University, Kakinada. She is working as an Assistant Professor in JNT University, Kakinada, East Godavari (DT), A.P, India.




ISSN: 2278 – 7798 