A Classifier-Free Codebook-based Image Classification of Vehicle Logos

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Abstract

Logo identification and classification have received considerable attention from both the machine learning and computer vision communities. Vehicle logo recognition (VLR) is used to recognise accurately the manufacturer of a vehicle by using its iconic logo. A VLR system in addition to license plate recognition aims to increase the confidence of vehicle monitoring systems in private environments such as car parks in companies, shopping malls, and institutions. VLR is a challenging process due to the presence of extensive background, clutter, different degree of illumination, varying sizes of vehicles in motion, and change of weather conditions such as fog, sunny and rainy which are present in the two-dimensional images. On the other hand, the bag-of-features (BoF) approach initiated to be used as a black box providing reliable and repeatable measurements from images for a wide range of applications such as visual object recognition. The advantages of such a BoF approach are its simplicity and state-of-the-art performance in recent VLR tasks. Most of the VLR in the literature has focused on less than twenty distinctive iconic logos of the vehicles. In this paper, we propose a novel VLR system as an alternative method to the BoF approach in which the extracted patch-based descriptors of a test image is voted against a locally merged codebooks of logos to predict the class label without the need for mapping the extracted descriptors into a fixed-length feature vector and then feeding it to a standard classifier. The proposed VLR system using SIFT descriptors is compared with the traditional BoF approach that employs a standard classifier: nearest neighbour and support vector machines. The system is evaluated on 25 distinctive vehicle classes with 20 images per class. Testing results show that our method promotes codebooks that deliver a robust classification performance of 98.6% which drastically reduces the time needed by the traditional BoF approach.

Author Keywords

Bag-of-features, Codebook, SIFT, Vehicle logo recognition