Gabor feature-based tire tread patterns recognition by support vector machine

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ABSTRACT

Tire tread patterns are broadly used in the investigation of traffic accidents for recognizing the responsibility of car drivers. They are quite useful especially for a hit-and-run accident by identifying a given tread pattern to match existing tires to further reduce the scope of investigation. The above information is of importance in forensic evidence for law enforcement agencies. However, most pattern matching processes are manually operated, which are labor-intensive and require visual identifications of extensive database of tire tread patterns. In this thesis, we propose to automate the matching process of tire tread patterns by creating effective features representation, extraction and classification, and then to locate candidate matches from the database of existing tread pattern images. In the proposed algorithm, input tire images are first preprocessed by binarization as well as fast 8-connected component labeling method to enhance the features on tire surface. The grooves in tire surface are salient important features for our tire matching system. We detect the tire tread patterns of being grooved or wavy and use this feature to train several SVM classifiers. The features of tire tread patterns are then represented by Gabor wavelets, and feature extraction is further carried out by principal component analysis (PCA). The matching processes are achieved by the classifiers of SVM, Euclidean distance and cosine distance. Result shows that the recognition rate of 83% for tire images can be obtained by the SVM classifier when 15 tire tread patterns are used.

Keywords : tire tread patterns　recognition、Gabor feature、PCA、SVM

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