Fingerprint verification system based on curvelet transform and possibility theory

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Abstract A fingerprint feature extraction step represents the success key of the fingerprint verification process. In a matching step, the good processing of those features would generate a measure that reflects more accurately the similarity degree between the input fingerprint and the template. In our study, we propose a novel fingerprint feature extraction method based on the Curvelet transform to reduce the dimensionality of the fingerprint image and to improve the verification rate. Like all extractors, the features which are generated by the Curvelet transform are usually imprecise and reflect an uncertain representation. Therefore, we proposed to analyze these features by a possibility theory to deal with imprecise and uncertain aspect in our novel fingerprint matching method. Thus, this paper focused on presenting a novel fingerprint features extraction method and a novel matching method. The features extraction method consists of two main steps: decompose the fingerprint image into a set of sub-bands by the Curvelet transform and extract the most discriminative statistical features of these sub-bands. A possibility based representation of those statistical features would be achieved by a possibility theory. So, the proposed fingerprint matching method is based on the use of the possibility theory as a global framework, including knowledge representation (as a possibility measure); in order to build a possibility fingerprint knowledge basis to be exploited in order to make a fingerprint verification decision. An extensive experimental evaluation shows that the proposed fingerprint verification approach is effective in terms of fingerprint image representation and possibility verification reasoning.

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