Towards a Complete Rule-Based Classification Approach for Flat Fingerprints

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Abstract

Biometrics, particularly fingerprints, are becoming widely used in the information security field due to the fact that they cannot be lost or stolen as easily as a password or Personal Identification Number (PIN). A challenge with the use of fingerprints is the time taken to search through a large database to find a matching entry. For this reason, fingerprint classification is used to divide fingerprints into different bins to reduce search time. However, many fingerprint classification methods that use the number and types of singular points fail when fingerprints are captured in such a way that one or more of the singular points are missing. This is often the case when using flat fingerprints, which do not contain as much area as rolled fingerprints. This work implements an algorithm which includes new rules to account for more instances of flat fingerprints with missing singular points, specifically when the delta of a Right Loop or Left Loop fingerprint is not captured, when one of the loops of a Whorl fingerprint is not captured, and when no singular points are captured. The algorithm was tested on 833 flat fingerprint images from the FVC2002 Database 1 and 809 flat fingerprint images from the FVC2004 Database 1 and achieved accuracies of 91.1% and 91.8% respectively, which is far higher than two previous rule-based approaches applied on the same images. The additional rules thus show an improvement over previous works, specifically when applied to flat fingerprints.