

## **An Integrated Approach to Fingerprint Indexing Using Spectral Clustering Based on Minutiae Points**

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**Abstract**—Fingerprint indexing is an efficient approach that improves matching performance significantly in Automated Fingerprint Recognition Systems (AFRSs). Fingerprints are currently the most highly reliable and widely biometrics trait for identification and 1 – 1 matching. Hence, it would be very desirable to optimize them for identification and 1– 1 matching applications. This work proposes an indexing approach based on minutiae points to reduce database search space. This is motivated by the fact that predefined classes (Left Loop, Right Loop, Whorl, Tented Arch, Plain Arch) are not always equally distributed in the search space i.e. some classes are more dominant than others. In such cases, a matching module can take hours to find an exact match. We solve this problem by constructing a rotational, scale and translation (RST) invariant fingerprint descriptor based on minutiae points. The proposed RST invariant descriptor dimensions are then reduced and passed to a spectral clustering algorithm which automatically creates 50 classes. Each of these 50 classes are then represented with a B+-Tree data structure for fast indexing. The keys used in each cluster are distances of feature vectors from the center of the cluster where they belong. Instead of searching a query to only a predicted cluster we also proposed to search for it in other clusters by employing triangle inequality rule. The system proposed is 81.4443% accurate on the NIST 4 special database. The results we got are promising because NIST 4 special database contains a lot of partial fingerprint.