Fast and Accurate Indexing Technique for Large Multi-Biometric Data Sets

Somnath Dey, Debasis Samanta*

Email: dsamanta@iitkgp.ac.in

Abstract

Biometric-based person identification is gaining importance and now-a-days it is required to process a large amount of biometric data in the order of millions. Therefore, the traditional approach where the identity of a query template is decided by matching the query template with all stored templates is impractical. The problem is further compounded when we have to deal with two or more biometric traits. In this paper, we propose an approach to index a large pool of multi-biometric data so that the matching process can be accomplished in a real time without compromise in accuracy of person identification. Our proposed indexing technique is based on the relative scores. In our approach, the relative scores are calculated against a set of reference subjects corresponding to each trait. Next, we combine the scores using Support Vector Machine (SVM) based score level fusion technique. These scores are used to generate index key for a subject. Based on the index code values we store the subject identity into the database. We create index spaces in the database and store subjects’ identities in a table. The position in the table is calculated based on the relative index key values. At the time of querying, we retrieve a candidate set for a query index key corresponding to each biometric trait. We introduce a new rank based fusion technique on the retrieved candidate sets using SVM rank. The major contributions of this paper is generating index key based on relative scores and table-based index space organization which allow us to retrieve a small set of candidates by searching a small part of the database. Further, SVM-based rank level fusion gives accurate ranking among the retrieved candidates. The experimental results substantiate that our approach is capable of retrieving biometric data with a higher hit rate and lower penetration rate. We have experimented our approach with a set of virtual user database of size 2625. We achieve 99.55% hit rate with 17.77% penetration rate with this set of users. With our proposed approach, it is possible to retrieve a set of identities similar to the query template in the order of milliseconds and is independent of sizes of databases. Thus, the organization index space proves to be effective for fast and accurate retrieval. Moreover, our proposed approach can be extended for any number of biometric modalities.

Keywords: Multimodal biometric, Identification system, Data indexing, Iris Biometric, Fingerprint Biometric, Face Biometric, Biometric.