Abstract

In this thesis, a novel robust and efficient fingerprint recognition system is developed which consist of fingerprint enhancement, fingerprint matching and fingerprint indexing. Fingerprints were used for law enforcement and civilian applications. However, fingerprint images are rarely of perfect quality. They may be degraded and corrupted due to variations in skin and impression conditions which make the fingerprint image associated with unwanted noise or information while acquiring. So, an effective fingerprint enhancement technique is necessary for removing unwanted noise. A new fingerprint enhancement is proposed by using the combination of FFT and Gaussian filter. A simple but effective fingerprint enhancement algorithm is found after adding Gaussian filter to FFT. The low pass filter will smoothen the alignment of each block after FFT enhancement. This will avoid from artificial ridge gap and hairy structure.

Another main stage of fingerprint recognition system is fingerprint matching. The accuracy of the fingerprint recognition system is highly dependent on a good fingerprint matching algorithm. A novel fingerprint recognition system based on Minheap is proposed. Minheap is constructed using the distance values after calculating the Euclidean distance of the minutiae points from the core. Then the roots of the Minheap are compare for similarity followed by deletion of the roots and heapify.There may be a slight variation of two same fingerprint images, which results mismatch, due to this, hFPM algorithm considers an error tolerance rate, ϵ, for distance difference for accuracy in the matching. The proposed matching algorithm is rotation invariance. Rotation test is perform on four different degree of rotation using FVC2002 database.

Again, an effective indexing technique will reduce the time complexity of fingerprint matching algorithm. A novel database indexing technique using distance feature is proposed. The proposed indexing technique is a very simple, fast and powerful indexing technique. In this technique, fingerprint distance feature are arrange in ascending order. Different fingerprints have different numbers of distance feature, the work consider only the

first 20 and another two more tuple were used to store indexing values. The first three average values of the tuples (T1,T2 and T3) are stored at 21st tuples and the last three average values tuples (T18,T19 and T20) are stored at 22nd tuples. The proposed algorithm will select the smaller one among the last two tuples for indexing. As the fingerprint has a flexible property, the proposed indexing algorithm considers an error tolerance 'K'. The proposed indexing algorithm is experiment on rotation test, scaling test and noise using FVC2002 database. The experimental result shows that the proposed algorithm performs well on the poor quality fingerprint image.