A Novel Fingerprint Compression Standard Based On Sparse Representation

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Abstract- *one person can be differed from another person using fingerprint only. No two persons having same fingerprints. It's a unique identity of a person. Now a day, fingerprint recognition is very popular for private identification we are very thankful for its distinctive structure. Large volumes of fingerprint are collected and hold on every day in a very wide selection of applications. In this paper we compare different compression standards like JPEG, JPEG-000,WSQ,K-SVD etc. we introduced a new compression standard based on sparse representation.*

Keywords- Sparse Representation, Fingerprint Compression, K-SVD,

I. INTRODUCTION

In proposed framework, build a base network whose segments speak to highlights of the fingerprint pictures, alluding the grid lexicon whose sections are called iotas; for a given entire fingerprint, separate it into little pieces called patches whose number of pixels are equivalent to the measurement of the particles; utilize the strategy for scanty representation to acquire the coefficients; then, quantize the coefficients; last, encode the coefficients and other related data utilizing lossless coding systems. In this section we are discussing about some previous existing systems regarding fingerprint compression.

Kalandar Shafi, Maya V. Karki [1] conducted Experiments on four set of databases. BY USING Random select and K-SVD the Dictionary is constructed. As compared to Random select method K-SVD performs better in dictionary construction. On different types of patch sizes they performed experiments. In that patch size of 12 × 12 gives better performance compared to other patch sizes. The proposed algorithm is also compared with SPIHT and WSQ. The Experimental results show that proposed algorithm outperforms SPIHT and WSQ in most of the cases.

Jampani Prabhakar, P. Sreenivasulu [2] they reviewed different compression techniques and compared their Performance at high compression ratios. The performance results shown that better competitive compression techniques like JPEG, JPEG 2000, WSQ,K-SVD etc, particularly at high compression magnitude relation and may hold most of the trivia robustly throughout the compression and reconstruction.

Mahesh N. Karanjkar, Trishala K. Balsaraf [3] the various compression methods are adapted to compress the fingerprint images are studied and compared their Performance especially at high compression ratios. Their proposed work provides algorithm for fingerprint image compression which is done by using SPIHT and K-SVD compression method. Their proposed work also provides algorithm for fingerprint image compression which is based on sparse representation which works for high image compression ratio.

Naja M, Afzal [4] algorithm has higher complexities due to the block-by-block processing mechanism. Optimization of code of the different compression techniques has to be improved to reduce the complexity.

V.Hyma Madhavi, R.Kalyan, V.Murali Praveen,S.Jhansi Lakshmi [5] Compress the fingerprint image is reviewed and compared their Performance particularly at high compression ratios. A replacement compression algorithmic program supported sparse approximation is additionally introduced. Two teams of fingerprint pictures are a unit tested. The experiments show that sparse algorithmic program is economical than competitive compression techniques like JPEG, JPEG 2000, WSQ,K-SVD etc, particularly at high compression magnitude relation and may hold most of the trivia robustly throughout the compression and reconstruction.

II. OVERVIEW OF THE PROPOSED SYSTEM

In this section overview of proposed system is going to be discussing. It involves proposed system architecture which is shown in the below Fig.1

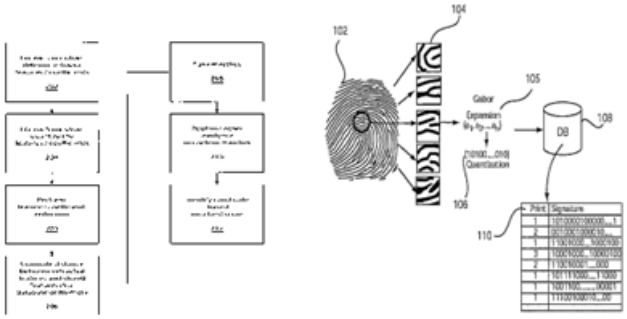

Fig.1 Proposed System Architecture

The Modules present in our proposed system are

1. Detection of fingerprints
   a. Normalization
   b. Orientation field estimation
   c. Orientation field approximation
   d. Feature extraction
2. Analysis of minutiae distribution
3. Wavelet scalar quantization (wsq) compression
4. Compression based on sparse representation

1. Detection of Fingerprints

- Normalization

An input fingerprint image is normalized by cropping a rectangular region of the fingerprint, which is located at the center of the fingerprint and aligned along the longitudinal direction of the finger, using the NIST Biometric Image Software (NBIS).

- **Orientation Field Estimation**

The orientation field of the fingerprint is computed using the gradient-based method. The initial orientation field is smoothed averaging filter, followed by averaging the orientations in pixel blocks. A foreground mask is obtained by measuring the dynamic range of gray values of the fingerprint image in local blocks and morphological process for filling holes and removing isolated blocks is performed.

- **Orientation Field Approximation**

The orientation field is approximated by a polynomial model to obtain.

- **Feature Extraction**

The error map is computed as the absolute difference between and used to construct the feature vector.

2. Analysis of Minutiae Distribution

In this module, a minutia in the fingerprint indicates ridge characteristics such as ridge ending or ridge bifurcation. Based on the minutiae extracted from a fingerprint by the open source minutiae extractor in NBIS, a minutiae density map is constructed by using the Parzen window method with uniform kernel function.

3. Wavelet Scalar Quantization (WSQ) Compressions

In this module, it is used for gray-scale fingerprint images. It is based on wavelet theory and has become a standard for the exchange and storage of fingerprint images. This compression method is preferred over standard compression algorithms like JPEG

After processing the appropriate files for the encoder and decoder, a certification request containing the test report, test results, and all generated compressed and reconstructed files (cmp000xx with extensions '.wsq' and '.pgm') are forwarded to the FBI for review and evaluation.

4. Compression Based On Sparse Representation

In this module, for a given fingerprint, slice into small patches. For each patch its mean is calculated and subtracted from the patch. For each patch solve the minimization problem by those coefficients whose absolute value are less than a given threshold are treated as zero. Record the remaining coefficients and their locations. Encode the atom number of each patch, the mean value of each patch and the indexes, quantize and encode the coefficients. Output the compressed stream.

III. DESIGN OF THE PROPOSED SYSTEM

The below Fig.2 shows that block diagram of the proposed system. construct a base matrix whose columns are called atoms these are divide it into small blocks called patches whose number of pixels are equal to the dimension of the atoms; use the method of sparse representation to obtain the coefficients; then, quantize the coefficients; last, encode the coefficients and other related information using lossless coding methods.

IV. RESULTS AND DISCUSSIONS

- First consider an input image which is shown in Fig.3 and Fig.4 shows that Input image and minutiae morphological processed image

Fig.3 Input Image

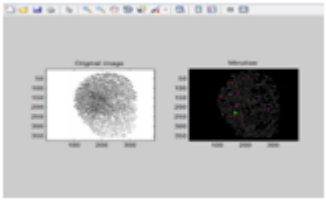

Fig.4 Input image and minutiae morphological processed image

- Region of interested image is shown in Fig.5

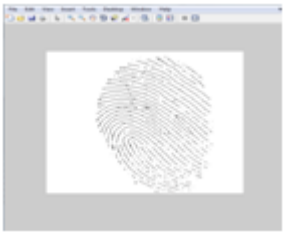

Fig.5 Region of interested image

- Original image and compressed images is shown in the below Fig.5

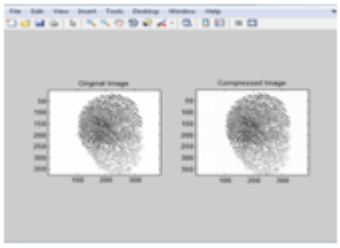

Fig.5 Original image and compressed image

- Extracted image is shown in Fig.6

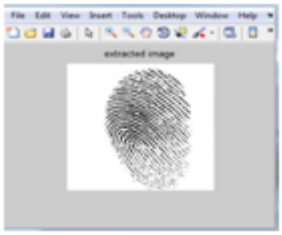

Fig.6 Extracted image

- Average performance between PSNR and Compression Ratio is shown in the Fig.7

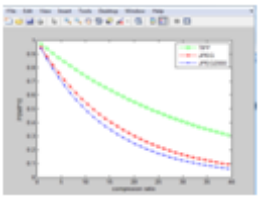

Fig.7 Average performance between PSNR and Compression Ratio

- Average performance between PSNR and Percentage of selected coefficients is shown in the Fig.8

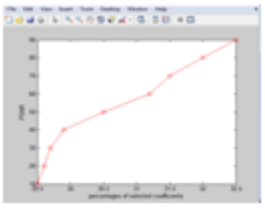

Fig.8 Average performance between PSNR and Percentage of selected coefficients.

- If fingerprints match between source and target means it displays as shown in Fig.9

Fig.9 Fingerprints matched

- If fingerprints partially matched means it displays like Fig.10

Fig.10 Fingerprints Partially Matched

V. CONCLUSION

A Novel Fingerprint Compression Standard Based on Sparse Representation successfully implemented. A new compression algorithm adjusted to finger impression pictures is presented. Regardless of the effortlessness of our proposed calculations, they contrast positively and existing more advanced calculations, particularly at high pressure proportions. Because of the square by-piece transforming component, be that as it may, the calculation has higher complexities. The examinations demonstrate that the piece impact of our calculation is less genuine than that of JPEG.

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