EFFICIENT FINGERPRINT COMPRESSION USING COMBINED SPIHT AND K-SVD ALGORITHMS

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ABSTRACT

Digital images are focused to a wide variety of distortions during processing, compression, storage and reproduction any of which may cause in a dreadful condition of visual quality. Many systems use digital image compression when it is needed to transmit or store the image. JPEG, JPEG 2000, WSQ compression is the most popular image compression techniques but did not rebuild boundaries of an image perfectly. Here the new compression technique is used. Sparse method such as KSVD and SPIHT algorithm are combined which gives better result rather than the separately and K-SVD algorithm is used for dictionary creation It gives the better compression ratio.

Keyword: - *Fingerprint compression, sparse representation, Singular Value Decomposition, JPEG, JPEG2000, WSQ.*

1. INTRODUCTION:

Recognition of images is very important such as biometric identifications. Fingerprint identification is commonly used in forensic science. Now a days large number of fingerprints are collected hence problems occurs for memory utilization hence compression techniques are used. There are many compression techniques such as JPEG, JPEG 2000, WSQ ,DWT are most existing compression techniques. Among all biometric recognition techniques fingerprint recognition is very popular. In this paper combination of sparse representation techniques, it will gives better compression techniques and also PSNR

Large number of fingerprints are collected and stored every day in a wide range of applications. In 1995, the size of the FBI fingerprint card record contained over 200 million items and record size was increasing at the rate of 30000 to 50000 new cards per day. Large volume of data consumes the amount of memory. Generally compression technology can be classified into lossless and lossy.

Lossless compression is a discussion of data compression algorithms that allows the original data to be perfectly recreated from the compressed data. By divergence, lossy compression permits reconstruction only of an approximation of the original data, though this usually increases compression rates (and therefore reduces file sizes).

Lossless compression allows the exact original images to be recreated from the compressed data. Lossless compression technologies are used in cases where it is important that the original and the decompressed data are similar. Avoiding alteration limits their compression efficiency. When used in image compression where slight distortion is acceptable, lossless compression technologies are often employed in the output coefficients of lossy compression. Lossless data compression is used in many applications such as ZIP file format and in the GNU tool gzip.

Lossy compression is the type of data encoding methods that uses partial data discarding to represent the content. These techniques are used to decrease data size for storage, handling, and transmitting content.

This is opposed to lossless data compression which does not damage the image. The amount of data decline possible using lossy compression is often much higher than through lossless techniques.

Lossy compression technologies usually transform an image into another domain, quantize and encode its coefficients. During the last three decades, transform based image compression technologies have been extensively investigated. Two most common options of transformation are the Discrete Cosine Transform (DCT) and the Discrete Wavelet Transform.(DWT) Lossy compression is most commonly used to compress multimedia data (audio, video, and images), especially in applications such as streaming media and internet telephony.

The aim of this project is to implement techniques for fingerprint image enhancement and minutiae extraction. After the image enhancement construct a base matrix whose columns represent features of the fingerprint images, referring the matrix dictionary whose columns are called atoms, for a given whole fingerprint, 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 and encode the coefficients and other related information using lossless coding methods.

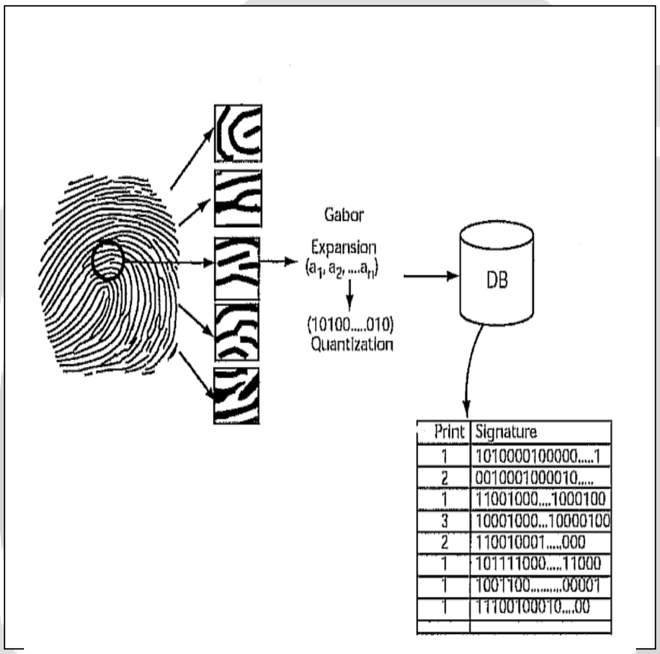

Fig 1 .Gabor determination for each patch

2. Literature Survey:

In last scarce years Fingerprint compression become more and more common for wallop the important data to lock the data. the primary goal of pattern recognition is supervised or unsupervised classification [1]. Among the various frameworks in which pattern recognition has been traditionally articulated. More recently, neural network techniques and methods introduced from statistical learning theory have been receiving increasing attention. The design of a recognition system needs careful attention to the following issues: definition of pattern classes, sensing environment, pattern representation, feature extraction and selection, cluster analysis, classifier design and learning, selection of training and test samples, and performance evaluation. In this field, from the last few years the general problem of recognizing complex patterns with arbitrary orientation, location, and scale remains unsolved. New and emerging applications, such as data mining, web searching, retrieval of multimedia data, face recognition, and cursive handwriting recognition, require robust and efficient pattern recognition techniques.

Due to the increasing requirements for transmission of images in computer, mobile environments [2], the research in the field of image compression has increased significantly. Image compression plays an important role in digital image processing, it is also very important for efficient transmission and storage of images. When we compute the number of bits per image resulting from typical sampling compression is needed. Therefore development of proficient techniques for image compression has become obligatory .This paper is a survey for lossy image compression using Discrete Cosine Transform, it covers JPEG compression algorithm which is used for full-colour still image applications and describes all the components of it. Image Compression addresses the problem of reducing the amount of data required to represent the digital image. We can achieve compression by removing of one or more of three basic data redundancies:

(1) Spatial Redundancy or correlation between neighboring pixels.

(2) Due to the correlation between different colour planes or spectral bands, the Spectral redundancy is founded.

(3) Due to properties of the human visual system, the Psycho-visual redundancy is founded.

We find the spatial and spectral redundancies when certain spatial and spectral patterns between

The pixels and the colour components are common to each other and the psycho-visual redundancy produces from the fact that the human eye is insensitive to certain spatial frequencies.

The time-frequency and time-scale communities have recently developed a large number of over complete waveform dictionaries—stationary wavelets, wavelet packets, cosine packets, chirp lets, and warp lets, to name a few [4]. Disintegration into over complete systems is not irreplaceable, and several methods for decomposition have been proposed, including the method of frames (MOF), matching pursuit (MP), and, for special dictionaries, the best orthogonal basis (BOB). Basis pursuit (BP) is a principle for decomposing a signal into an “optimal” superposition of dictionary elements, where *optimal* means having the smallest $l1$ norm of coefficients among all such decompositions. We give examples exhibiting several advantages over MOF, MP, and BOB, including better sparsely and super resolution. BP has interesting relations to ideas in areas as assorted as ill-posed problems, abstract harmonic analysis, total variation denoising, and multiscale edge denoising. BP in highly over complete dictionaries leads to large-scale optimization problems. With signals of length 8192 and a wavelet packet dictionary, one gets an equivalent linear program of size 8192 by 212,992. Such problems can be attacked successfully only because of recent advances in linear and quadratic programming by interior-point methods. We obtain sensible success with a primal-dual logarithmic barrier method and conjugate gradient solver.

Images, captured with digital imaging sensors, transmitted through various channels, often contain noise [3]. In literature, many image restoration techniques exists for the reduction of noise from degraded image, but they usually do not succeed when applied to diversified fields degraded images with Speckle, Poisson, Gaussian and Salt & Pepper noise. In this paper, provide performance analysis of state of art image restoration techniques i.e. patch based image restoration technique for various combinations of noise and diversified field images, and also a new scheme for the removal of noise is proposed. The resulting restoration technique is shown to outperform alternative state-of-the-art restoration methods with synthetic noise to diversified field images both in terms of speed and restoration accuracy. Digital images play an important role in daily life application such as satellite television, imaging under water, magnetic resonance, computed tomography as well as in area of research and technology such as Medical, geographical information system and astronomy. Visual information is usually considered the most illustrative, informative, direct and comprehensive among all kinds of information perceived by human beings. Data sets collected by image sensors are generally contaminated by noise. Imperfect instrument, problem with the data acquisition process, and interfering natural phenomena can all degrade the data of interest. Image is greatly affected by capturing instruments, data transmission media, quantization and discrete sources of radiation. Furthermore, noise can be introduced by transmission errors and compression. Many diagnoses in Medical field are based on biomedical images derived from x–ray, computerized tomography (CT), ultra-sound, magnetic resonance imaging (MRI) and in geosciences scientists use remote sensing images to monitor planetary bodies, distant starts, and galaxies, so image must be without noise. Digital images are prone to a variety of types of noise.

3. PROPOSED SYSTEM

SPIHT Algorithm:

In this system Perform Thinning and Binarization of input image and Wavelet decomposition then use SPIHT encoding method .Set a threshold. Coefficients having value less than threshold are treated as zero. Slice the fingerprint image into equal size patches. For each patch, mean is calculated and subtracted from patch. For each patch, calculate the coefficients by solving minimization problem. Record the non-zero coefficients along with their locations and then Encode atoms, mean value of each patch ,Quantize and encode the obtained coefficients. Output the compressed stream

KSVD Algorithm:
In proposed K-SVD Method, select the atoms from the input that atoms can be patches from the image; patches are overlapping and then use OMP or any other fast method. That output gives sparse code for all signals and then minimizes error in representation replace unused atom with minimally represented signal then identify the signal that use the k-th atom. Deselect K-th atom from dictionary and then find the coding error matrix of these signals. Then minimize this error matrix with rank – 1 approx from SVD.
$[U,S,V] = svd(E_k)$

Replace coefficient of atom d_k in X with entries of s_1v_1
$D_k = u_1/||u_1||_2$
Compress weight update of patch
$\arg\min_z ||Z-Y||_2^2 + \lambda||.||_p$

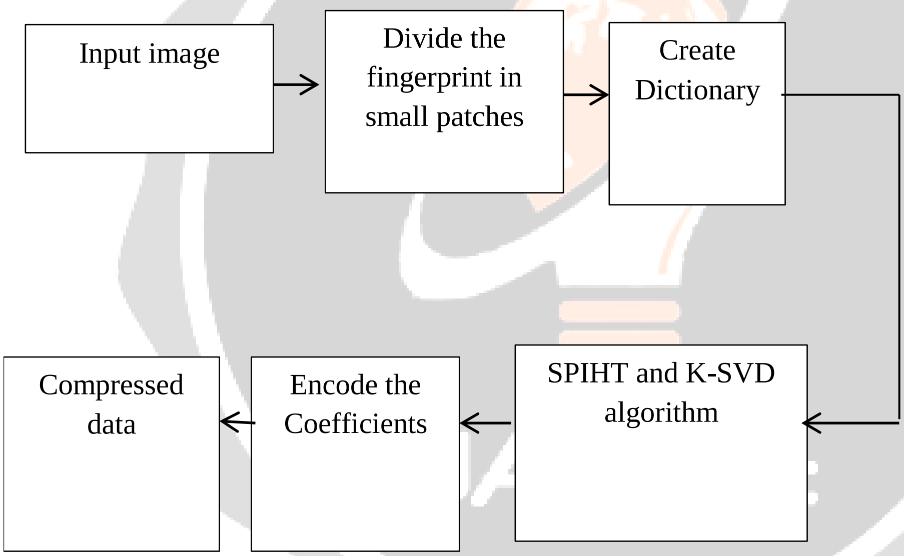

Fig 2 Block diagram of proposed system

Finally these two systems are combined to get the better result.

The effects on actual fingerprint matching or recognition are not investigated. In this paper, it will take it into consideration. In most Automatic Fingerprint identification System (AFIS), the main feature used to match two fingerprint images are minutiae (ridges endings and bifurcations). Therefore, the difference of the minutiae between pre- and post-compression is considered in the paper.

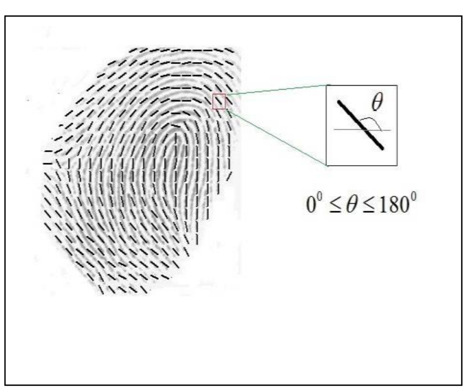

Fig. 3: A fingerprint image with its corresponding orientation image computed over a square-meshed grid. Each element denotes the local orientation of the fingerprint ridges.

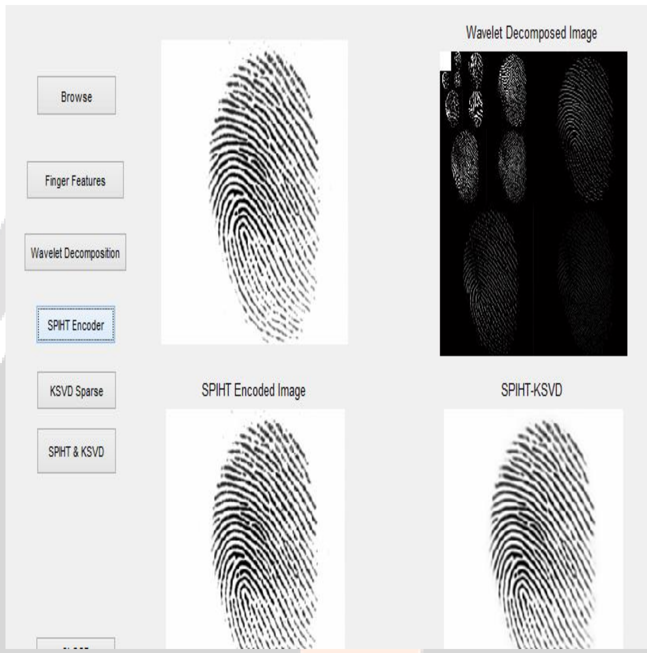

Fig 4. Result of proposed system

Original image size (Kb)	Compressed image (Kb)		
	SPIHT	K-SVD	Combine
88.3	47.2	5.60	4.15
100.2	46.8	7.98	6.3

108	46.3	12.5	10.6
120	46.1	14.8	11.9

Table No.1

4. CONCLUSION

In this proposed system SPIHT and K-SVD Algorithms are combined. Here we get the better result rather than using both the system separately and also compare this result with JPEG system and that will prove that result of proposed system are better

5. REFERENCES

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