International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 02 Issue: 01 | Mar-2015 www.irjet.net p-ISSN: 2395-0072

A NOVEL FINGERPRINT COMPRESSION STANDARD BASED ON SPARSE REPRESENTATION

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Abstract - ***Identification of individuals by means that of their biometric characteristics very hip among the society. Among this, fingerprint recognition is a very important technology for private identification thanks to its distinctive structure. Giant volume of fingerprint are collected and hold on everyday in a very wide selection of applications. During this context, the compression of those information might become imperative beneath bound circumstances because of the massive amounts of information concerned. This paper compare completely different compression standards like JPEG,JPEG-2000,WSQ,K-SVD etc. A new compression standards based on sparse representation also introduced. The experiments demonstrate that this is often economical compared with many competitive compression techniques particularly at high compression ratios.***

Key Words: *Compression, JPEG, JPEG-2000, K-SVD, WSQ*

1. INTRODUCTION

Huge volumes of fingerprints are collected associated remain daily in an passing wide selection of applications, together with forensics, access management etc., and fingerprint unit of measurement evident from the data of Federal Bureau of Investigation (FBI) . Fingerprint identification is usually utilized in forensic science to support criminal investigations, and in biometric systems like civilian and industrial identification devices. Since large volume of data consumes further quantity of memory, the information contained in fingerprints ought to, therefore, be compressed by extracting only visible parts. Fingerprint footage exhibit characteristic high energy in sure high frequency bands succeeding from the ridge-valley pattern and various structures . The DCT [2]-based encoder is assumed as compression of stream of 8X8 very little blocks of images. This remodel is adopted in JPEG[3]. The JPEG compression theme has many advantages like simplicity, catholicity and handiness. However, it's a nasty performance at low bit-rates in the main as a result of the underlying block-based DCT theme. For this reason, as early as 1995, the JPEG-committee began to develop a wavelet-based compression for still pictures, specifically JPEG 2000[5]. Targeted at fingerprint pictures, there are a unit special compression algorithms. The foremost common is wavelet Scalar Quantization(WSQ)[6]. It became the Federal Bureau of Investigation standard for the compression of five hundred dpi fingerprint pictures. Impressed by the WSQ algorithmic program, a number of wavelet packet based mostly fingerprint compression schemes are developed. But, these algorithms have a standard downside, particularly while not the power of learning the fingerprint pictures can't be compressed well currently. Thus a unique approach supported distributed illustration is given [1]. Here options are a unit extracted and represent them as lexicon atoms. In most Automatic Fingerprint identification System (AFIS), the most feature accustomed match two fingerprint pictures are a unit trivialities (ridges endings and bifurcations). Therefore, the distinction of the trivialities between pre- and post-compression is taken into account within the paper.

2. EXISTED METHODS

In this section, we have a tendency to compare the projected technique with existing fingerprint compression algorithms like JPEG, JPEG-2000, WSQ, K-SVDetc.

JPEG

For the past few years, a joint ISO/CCITT committee referred to as JPEG (Joint Photographic Experts Group)has been operating to ascertain the primary international compression normal for continuous-tone still pictures. To satisfy the differing wants of the many applications, the JPEG normal includes two basic compression strategies i.e. a DCT-based technique is fixed for "lossy''compression, and a prognostic technique for "lossless'' compression. JPEG has undertaken the bold task of developing a all-purpose compression normal to satisfy the requirements of virtually all continuous-tone still-image applications.The JPEG compression theme has several benefits like simplicity, catholicity and accessibility. However, it's a foul performance at low bit-rates in the main as a result of the block-based DCT theme. For this reason, as early as 1995, the JPEG-committee began to develop a brand new wavelet-based compression normal for still pictures, specifically JPEG 2000.

JPEG 2000

In 1996, the JPEG committee began to research potentialities for a brand new image compression normal to serve current and future applications. The need to produce a broad vary of options for varied applications in a very single compressed bit-stream prompted the JPEG committee in 1996 to research potentialities for a brand new compression normal that was named JPEG-2000.In JPEG 2000,DCT of JPEG is replaced with DWT(Discrete wavelet Transform)[3]. The DWT-based algorithms embody 3 steps: a DWT computation of the normalized image, division of the DWT coefficients and lossless coding of the quantized coefficients. Compared with JPEG, JPEG 2000 provides several options that support ascendible and interactive access to large-sized image. It co-jointly permits extraction of various resolutions, constituent fidelities,regions of interest etc.

WSQ

The on top of algorithms are unit for general compression. Targeted at fingerprint pictures, there are a unit special compression algorithms. The foremost common is wavelet Scalar Quantization(WSQ). It became the Federal Bureau of Investigation normal for the compression of five hundred dpi fingerprint pictures. The WSQ category of encoders involves a decomposition of the fingerprint image into variety of sub bands, every of that represents info in a very explicit waveband. The sub band decomposition is achieved by a distinct wave transformation of the fingerprint image .Each of the sub bands is then quantal mistreatment values from a division table. The quantized coefficients are a unit then passed to a Huffman cryptography procedure that compresses the information. Huffman table specifications should be provided to the encoder.

K-SVD

K-SVD[9](Single value decomposition) is associate in Nursing repetitious technique that alternates between thin cryptography of the examples supported the present wordbook, and a method of change the wordbook atoms to higher match the information. The update of the wordbook columns is combined with associate in Nursing update of the thin representations, thereby fast convergence. The K- SVD algorithmic rule is versatile and might work with any pursuit technique (e.g., basis pursuit, FOCUSS, or matching pursuit). we have a tendency to analyse this algorithmic rule and demonstrate its results on each artificial tests and in applications on real image information. The k-svd isn't effective once the wordbook size is therefore giant.So a brand new compression normal supported thin approximation is introduced.

3. PROPOSED METHOD

The higher than algorithms have a standard disadvantage, i.e, while not the power of learning, the fingerprint pictures can't be compressed well currently. So, a completely unique approach supported distributed illustration is given during this paper. The projected technique has the power by change the lexicon. The precise method is as follows: construct a base matrix whose columns represent options of the fingerprint pictures, referring the matrix lexicon whose columns area unit referred to as atoms; for a given whole fingerprint, divide it into tiny blocks referred to as patches whose variety of pixels area unit capable the dimension of the atoms; use the tactic of distributed illustration to get the coefficients; then, quantize the coefficients; last, inscribe the coefficients and different connected data mistreatment lossless secret writing ways. Given a replacement fingerprint, slice it into square patches that have identical size with the coaching patches. The scale of the patches incorporates a direct impact on the compression potency.The rule becomes a lot of economical because the size will increase. Additionally, to create the patches work the lexicon higher, the mean of every patch has to be calculated and deducted from the patch. After that, cypher the distributed illustration for every patch by finding the l0 downside. Those coefficients whose absolute values area unit but a given threshold area unit treated as zero. For every patch, four types of data ought to be recorded. They're the mean value, the amount regarding how many atoms to use, the coefficients and their locations. For rising rule,Use Orthogonal matching pursuit rather than Matching pursuit for constructing the lexicon.

We can enhance the algorithm by using OMP(Orthogonal Matching Pursuit)algorithm instead of MP(Matching Pursuit) algorithm.

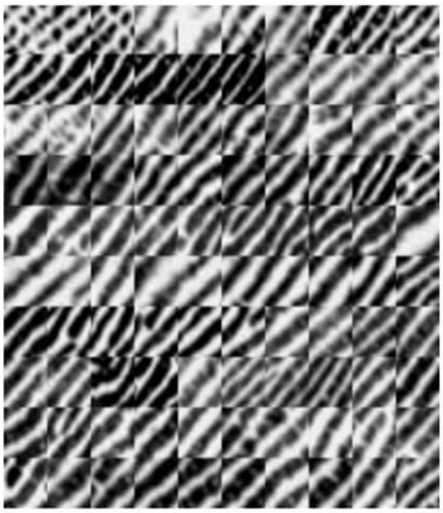

Fig1.100 patches with size 20*20

In OMP dictionary atoms taken once never taken again; there by reduces the total algorithm complexity. Compared with general natural images, the fingerprint images have simpler structure. They are only composed of

ridges and valleys. In the local regions, they look the same.

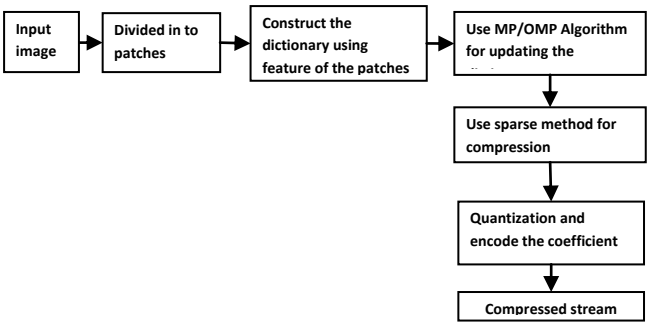

Fig: 2 Architectural diagram

Therefore, to resolve these two issues, the entire image is sliced into square and non-overlapping tiny patches. For these tiny patches, there aren't any issues regarding transformation and rotation. The scale of the dictionary isn't large as a result of the tiny blocks are comparatively smaller.

4. EXPERIMENTS

In this section, the consequences of various dictionaries on fingerprint compression is studied. There are three strategies to build the dictionary.Here, the primary is to every which way choose some patches and organize them as columns of the dictionary referred to as Random-SR[8] . The second is to pick out patches in keeping with orientations referred to as Orientation-SR . See Fig, they're one hundred patches with orientation forty five and size 20×20. The third is to coach the dictionary by K-SVD method(K-SVD-SR in short).

In this section, we tend to compare the projected technique with existing fingerprint compression algorithms. We tend to use 3 different compression algorithms, JPEG,JPEG 2000 and WSQ, that are extensively delineated before. the quality JPEG could be a a part of virtually any image process tool we tend to don't offer more reference on that. The wavelet-based JPEG 2000 we tend to use is provided by the Matlab. The WSQ rule is provided by a software system downloaded on the web. There square measure two teams of fingerprint pictures (referred to as info 1& info 2) square measure tested within the experiments. **DATABASE 1:** fifty fingerprints that square measure wont to compare numerous compressiontechnologies. **DATABASE 2:** the general public fingerprint info, together with eighty fingerprints with size three hundred × three hundred, that square measure wont to compare existing compressiontechnology.

Here KSVD-SR(K-means single worth Decomposition exploitation distributed Representation)have high PSNR worth at compression magnitude relation 20:1. The figure shows that the distributed rule outperforms the JPEG 2000 rule once the compression ratios square measure high.

5. CONCLUSION

The different compression techniques custom-made to 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. However, the algorithmic program has higher complexities owing to the block-by-block process mechanism. optimisation of code of the various compression techniques needs to be improved to scale back the complexness.

REFERENCES

[1] "*Fingerprint Compression Based on Sparse Representation*" Guangqi Shao, Yanping Wu, Yong A, Xiao Liu, and Tiande Guo

[2] N. Ahmed, T. Natarajan, and K. R. Rao, "*Discrete cosine transform*,"IEEE Trans. Comput., vol. C- 23, no. 1, pp. 90–93, Jan. 1974.

[3] C. S. Burrus, R. A. Gopinath, and H. Guo, *"Introduction to Wavelets and Wavelet Transforms: A Primer."* Upper Saddle River, NJ, USA Prentice- Hall, 1998.

[4] W. Pennebaker and J. Mitchell, *"JPEG—Still Image Compression Standard."* New York, NY, USA Van Nostrand Reinhold, 1993.

[5] M. W. Marcellin, M. J. Gormish, A. Bilgin, and M. P. Boliek,"*An overview of JPEG-2000*," in Proc. IEEE Data Compress. Conf.,Mar. 2000, pp.

[6] T. Hopper, C. Brislawn, and J. Bradley, "*WSQ gray-scale fingerprint image compression specification, Federal Bureau of Investigation Criminal Justic Information Services"*, Washington, DC, USA,Tech.Rep. IAFIS-IC-0110-V2, Feb. 1993.

[7] S. G. Mallat and Z. Zhang, "*Matching pursuits with time-frequency dictionaries*," IEEE Trans. Signal Process., vol. 41, no. 12,pp. 3397– 3415, Dec. 1993.

[8] J. Wright, A. Y. Yang, A. Ganesh, S. S. Sastry, and Y. Ma, "*Robust face recognition via sparse representation*," IEEE Trans. Pattern Anal. Mach. Intell., vol. 31, no. 2, pp. 210–227, Feb. 2009.

[9] O. Bryt and M. Elad, "*Compression of facial images using the K- means algorithm"*.

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