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FUZZY BASED IMAGE ENHANCEMENT THROUGH LIFTING WAVELET TRANSFORM

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Abstract—

Wavelet based logic is a form of many valued logic, it deals with reasoning that is approximate rather than fixed and exact. Compared to traditional binary sets (where variables may take on true or false values) fuzzy logic variables may have a truth value that ranges in degree between 0 and 1. Fuzzy logic has been extended to handle the concept of partial truth, where the truth value may range between completely true and completely false. When linguistic variables are used, these degrees may be managed by specific functions. Fuzzy logic has been applied to many fields, from control theory to artificial intelligence.

In this paper, the traditional image enhancement algorithms enhance noise signal in image while they enhance image, which leads to the descent of information entropy. Designing image enhancement systems with good nature is a goal which all researchers pursue. Method of lifting can best deal with MRA Multi-resolution Analysis method which is time and memory consuming which impedes its real-time application. The process of lifting method was introduced. Method of image enhancement based on lifting wavelet was introduced. The algorithm and traditional wavelet image enhancement algorithms are compared. Result of the experiment indicate, the quality of image have been improved. It is better than traditional wavelet image enhancement algorithms.

Keyword:-*Fuzzy based Image, wavelet, Transform, defuzzification*

I. NTRODUCTION

Image enhancement plays a fundamental role in many image processing applications where human beings makes decisions depended on the image information. But some problems arise in the interface between the observer and the machine. In the image processing, we usually use some objectives quality criteria to ascertain the goodness of the results.

Ex- the image is good if it possesses a low amount of fuzziness.

In this paper, we introduce an image enhancement system that is based on the combination of differently enhanced images. The basic idea is aggregation. The transformation should reach a maximum (the transformation is that part of the image information that reaches the observer, and can be perceived by him/her). We use fuzzy measure theory, Dempster rule and fuzzy if-then rules to overcome the mentioned difficulties.

The aim of this paper is to examine a set of wavelet functions (wavelets) for implementation in a still image compression system and to highlight the benefit of this transform relating to today's methods. The paper discusses important features of wavelet transform in compression of still images, including the extent to which the quality of image is degraded by the process of wavelet compression and decompression. Image quality is measured objectively, using peak signal-to-noise ratio or picture quality scale, and subjectively, using perceived image quality. The effects of different wavelet functions, image contents and compression ratios are assessed.

II. RELATED WORK

A comparison with a discrete-cosine- transform-based compression system is given. Our results provide a good reference for application developers to choose a good wavelet compression system for their application. Index Terms—discrete cosine transforms, image coding, transform coding, wavelet transforms.

Wavelet analysis has received considerable interest in the recent years because of its efficiency in the several practical applications. Image processing for wavelet transformation is considered as one of the most powerful methods that provide a good quality of results. However, its implementation may be too time-consuming accordingly to the problem size. Parallel processing can be a solution to speed up wavelet transformation programs Compressing an image is significantly different than compressing raw binary data. Of course, general purpose compression programs can be used to compress images, but the result is less than optimal. This is because images have certain statistical properties which can be exploited by encoders specifically designed for them. Also, some of the finer details in the image can be sacrificed for the sake of saving a little more bandwidth or storage space. This course, general purpose compression programs can be used to compress images, but the result is less than optimal. This is because images have certain statistical properties which can be exploited by encoders specifically designed for them. Also, some of the finer details in the image can be sacrificed for the sake of saving a little more bandwidth or storage space. This recent growth of data intensive multimedia- based web applications have not only sustained the need for more efficient ways to encode signals and images but have made compression of such signals central to storage and communication technology. The wavelet transform has emerged as a cutting edge technology, within the field of image compression. Wavelet-based coding provides substantial improvements in picture quality at higher compression ratios. Over the past few years, a variety of powerful and sophisticated wavelet-based schemes for image compression have been developed and implemented.

Types of Compression Systems: There are two types of compression systems:

A. Lossy Compression System

Lossy compression techniques can be used in images where some of the finer details in the image can be sacrificed for the sake of saving a little more bandwidth or storage space.

B. Loss less compression system

Lossless Compression System which aim at minimizing the bit rate of the compressed output without any distortion of the image. The Decompressed bit-stream is identical to original bit-stream.

III. IMAGE ENHANCEMENT BASED ON LIFTING WAVELET TRANSFORM

The basic idea of image enhancement based on lifting wavelet transform is as follow:

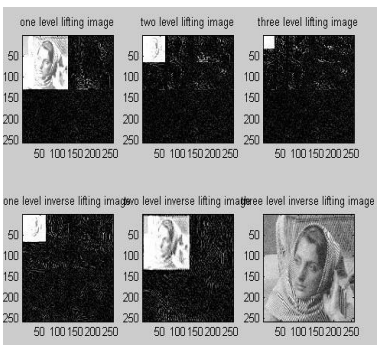


Fig.1 Image enhancement through wavelet transforms

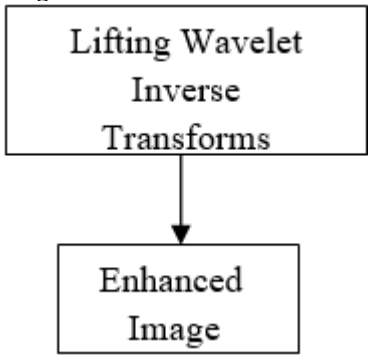
IV. IMAGE ENHANCEMENT

The choice of compression algorithm involves several conflicting considerations. These include degree of compression required, and the speed of operation. Obviously if one is attempting to run programs direct from their compressed state, decompression speed is paramount. The other consideration is size of compressed file versus quality of decompressed image.

There are essentially two sorts of data compression. 'Lossless' compression works by reducing the redundancy in the data. The decompressed data is an exact copy of the original, with no loss of data. Huffman Encoding and LZW are two examples of lossless compression algorithms. There are times when such methods of compression are unnecessarily exact. 'Lossy' compression sacrifices exact reproduction of data for better compression. It both removes redundancy and creates an approximation of the original. The JPEG standard is currently the most popular method of lossy compression. Obviously, a lossless compression method must be used with programs or text files, while lossy compression is really only suitable for graphics or sound data, where an exact reproduction is not necessary.

Firstly, we decompose the original images into four sub-images with lifting wavelet transform; Secondly, base on the gain coefficient of each sub-images to operate amplification calculating, obtain the new wavelet coefficients; finally, according to the new amplified gain coefficients to reconstruct the new image. The algorithmic framework isas follow Fuzzy Based Image Processing Fuzzy image processing has three main stages: image fuzzification, modification of membership values, and, if necessary, image defuzzification. The fuzzification and defuzzification steps are due to the fact that we do not possess fuzzy

Fig.2 Wavelet Transformation



hardware. Therefore, the coding of image data (fuzzification) and decoding of the results (defuzzification) are steps that make possible to process images with fuzzy techniques. The main Power of fuzzy image processing is in the middle step (membership modification). After the image data are transformed from gray-level plane to the membership plane (fuzzification), appropriate fuzzy techniques modify the membership values. In fuzzy sets, the membership is a matter of a degree, i.e., degree of membership of an object in a fuzzy set expresses the degree of compatibility of the object with the concept represented by the fuzzy set. Each fuzzy set, A is defined in terms of a relevant universal set X by a membership function. Membership function assigns each element x of X a number, A(x), in the closed unit interval [0, 1] that characterizes the degree of membership of x in A. In defining a membership function, the universal set X is always assumed to be a classical set. A gray value image is considered as a fuzzy set in the sense that it is a fuzzy version of a binary image, or that a gray value represents the degree to which pixel belongs to the image foreground.

Proposed Work on Fuzzy based transformation Manipulating pixel values in the compressed domain provides the basis for implementing special effects, but does little to address image and video content. For example, it would be advantageous to search an image/video database using only compressed domain operations. Several researchers have pursued this idea.

This allows the target image's index to be computed without decompressing the image, a significant savings. Seales showed that image searching using eigen-faces in the compressed domain was just as effective as in the image domain for moderate quality images, proving the validity of the technique and showing that the information lost during compression was insignificant.

The set of coefficients thus obtained is used to form a normalized vector that represents the frame. Two frames are compared by computing the dot product of their normalized representative vectors. When the dot product is sufficiently small, a scene cut is declared. The procedure is found to be fast, simple, and effective. To decode an MPEG frame, all relevant reference frames must first be decoded. Then each error term is decompression, and the result is added pixel-wise to the 16x16 pixel block in the reference frame specified by the motion vector.

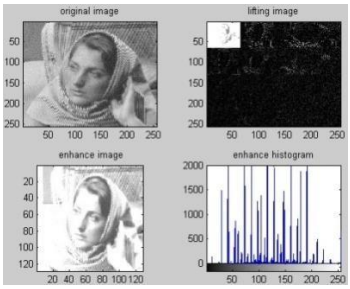


Fig.3 lifting wavelet to enhance image and histogram

I. PRINCIPLES BEHIND COMPRESSION

A. **REDUNDANCY REDUCTION**

Aims at removing duplication from the signal source (image/video).

B. **IRRELEVANCY REDUCTION**

Omits the part of signal that will not be noticed by the signal receiver.

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