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AN IMPROVED IMAGE COMPRESSION USING CURVELET TRANSFORM IN IRIS IMAGES FOR AUTHENTICATION

M.Shobana[1] and R Poomurugan[2]
[1,2]ECE, Gnanamani college of technology

Abstract - Methodologies for visually lossless compression of monochrome stereoscopic 3D images are measured for quantization distortion in JPEG2000. These thresholds are found to be functions of not only spatial frequency, but also of wavelet coefficient variance, as well as the gray level in both the left and right images. The left image and right image of a stereo pair are then compressed jointly using the visibility thresholds obtained from this model to ensure that quantization errors in each image are imperceptible to both eyes but can't use this model for authentication purpose. In this proposed system the new method of Curvelet Transform in blend with Lifting Scheme and Huffman coding are used to compress iris images for secure authentication. In different types of wavelet transforms, the Curvelet transform provides better results for the curvy portions of iris images. Along with Curvelet transform, Lifting Wavelet transform is applied to the co-efficient of the Curvelet transformed image which will provide the high detailed image.

Keywords - Authentication, jpeg2000, Curvelet transform, lifting scheme, Huffman coding

I. INTRODUCTION

Basically, an image is a rectangular array of dots, called pixels. The size of the image is the number of pixels (width x height). Every pixel in an image is a certain colour. When dealing with a black and white (where each pixel is either totally white, or totally black) image, the choices are limited since only a single bit is needed for each pixel. This type of image is good for line art, such as a cartoon in a newspaper.Another type of colorless image is a gray scale image. A gray scale image, often wrongly called "Black and white" as well, uses 8 bits per pixel, which is enough to represent every shade of gray that a human eye can distinguish.When dealing with color images, things get a little trickier. The number of bits per pixel is called the depth of the image (or bit plane). A bit plane of n bits cans have2n colours. The human eye can distinguish about 224 colours, although some claim that the number of colours the eye can distinguish is much higher. The most common colour depths are 8, 16, and 24 (although 2-bit and 4-bit images are quite common, especially on older systems).

There are two basic ways to store colour information in an image. The most direct way is to represent each pixel's colour by giving an ordered triple of numbers, which is the combination of red, green, and blue that comprises that particular colour. This is referred to as an RGB image. The second way to store information about colour is to use a table to store the triples, and use a reference into the table for each pixel. This can markedly improve the storage requirements of an image.

Transparency refers to the technique where certain pixels are layered on top of other pixels so that the bottom pixels will show through the top pixels. This is sometime useful in combining two images on top of each other. It is possible to use varying degrees of transparency, where the degree of transparency is known as an alpha value. In the context of the Web, this technique is often used to get an image to blend in well with the browser's background. Adding transparency can be as simple as choosing an unused colour in the image to be the "special transparent" colour, and wherever that colour occurs, the program displaying the image knows to let the background show through.

File formats

There are a large number of file formats (hundreds) used to represent an image, some more common than others. Among the most popular are:

Gif (graphics interchange format)

The most common image format on the Web Stores 1 to 8-bit colour or gray scale images.

Tiff (tagged image file format)

The standard image format found in most paint, imaging, and desktop publishing programs Supports 1- to 24- bit images and several different compression schemes.

Sgi image

Silicon Graphics' native image file format Stores data in 24-bit RGB colour.

Sun raster

Sun's native image file format; produced by many programs that run on Sun workstations.

Pict

Macintosh's native image file format; produced by many programs that run on Macs Stores up to 24-bit colour.

Bmp (microsoft windows bitmap)

Main format supported by Microsoft Windows Stores 1-bit, 4-bit, 8-bit, and 24-bit images.

XBM (X Bitmap)

A format for monochrome (1-bit) images common in the X Windows system.

JPEG File Interchange Format

Developed by the Joint Photographic Experts Group, sometimes simply called the JPEG file format. It can store up to 24-bits of colour. Some Web browsers can display JPEG images inline (in particular, Netscape can), but this feature is not a part of the HTML standard.

The following features are common to most bitmap files:

1. Header: Found at the beginning of the file, and containing information such as the image's size, number of colours, the compression scheme used, etc.
2. Colour Table: If applicable, this is usually found in the header.
3. Pixel Data: The actual data values in the image.
4. Footer: Not all formats include a footer, which is used to signal the end of the data.

Bandwidth and transmission

In our high stress, high productivity society, efficiency is key. Most people do not have the time or patience to wait for extended periods of time while an image is downloaded or retrieved. In fact, it has been shown that the average person will only wait 20 seconds for an image to appear on a web page. Given the fact that the average Internet user still has a 28k or 56k modem, it is essential to keep image sizes under control. Without some type of compression, most images would be too cumbersome and impractical for use. The following table is used to show the correlation between modem speeds and download time. Note that even high speed Internet users require over one second downloading the image.

Table 1.1 Bandwidth and Transmission

Modem Speed	Throughput – How	Download Time For a
14.4k	1Kb	40 seconds
28.8k	2Kb	20 seconds
33.6k	3Kb	13.5 seconds
56k	5Kb	8 seconds
256kDSL	32Kb	1.25 seconds
1.5M T1	197kB	0.2 seconds

1.1 Download time comparison an introduction to image compression

Image compression is the process of reducing the amount of data required to represent a digital image. This is done by removing all redundant or unnecessary information. An uncompressed image requires an enormous amount of data to represent it as an example, a standard 8.5" by 11" sheet of paper scanned at 100 dpi and restricted to black and white requires more than 100k bytes to represent. Another example is the 276-pixel by 110-pixel banner that appears at the top of Google.com. Uncompressed, it requires 728k of space. Image compression is thus essential for the efficient storage, retrieval and transmission of images. In general, there are two main categories of compression. Lossless compression involves the preservation of the image as is (with no information and thus no detail lost).Lossy compression on the other hand, allows less than perfect reproductions of the original image. The advantage being that, with a lossy algorithm, one can achieve higher levels of compression because less information is needed. Various amounts of data may be used to represent the same amount of information. Some representations may be less efficient than others,depending on the amount of redundancy eliminated from the data. When talking about images there are three main sources of redundant information:

1. Coding Redundancy- This refers to the binary code used to represent grey values.
2. Interpixel Redundancy- This refers to the correlation between adjacent pixels in an image.
3. Psycho visual Redundancy - This refers to the unequal sensitivity of the human eye to different visual information.

In comparing how much compression one algorithm achieves verses another, many people talk about a compression ratio. A higher compression ratio indicates that one algorithm removes more redundancy then another (and thus is more efficient). If n1 and n2 are the number of bits in two datasets that represent the same image, the relative redundancy of the first dataset is defined as:

Rd=1/CR, where CR (the compression ratio) =n1/n2

The benefits of compression are immense. If an image is compressed at a ratio of 100:1, it may be transmitted in one hundredth of the time, or transmitted at the same speed through a channel of one-hundredth the bandwidth (ignoring the compression/decompression overhead). Since images have become so commonplace and so essential to the function of computers, it is hard to see how we would function without them.

1.2 The image compression model

Although image compression models differ in the way they compress data, there are many general features that can be described which represent most image compression algorithms. The source encoder is used to remove redundancy in the input image. The channel encoder is used as overhead in order to combat channel noise.A common example of this would be the introduction of a parity bit. By introducing this overhead, a certain level of immunity is gained from noise that is inherent in any storage or transmission system. The channel in this model could be either a communication link or a storage/retrieval system. The job of the channel and source decoders is to basically undo the work of the source and channel encoders in order to restore the image to the user.

Fidelity criterion

A measure is needed in order to measure the amount of data lost (if any) due to a compression scheme. This measure is called a fidelity criterion. There are two main categories of fidelity criterion: subjective and objective. Objective fidelity criterion, involve a quantitative approach to error criterion. Perhaps the most common example of this is the root mean square error. A very much related measure is the mean square signal to noise ratio. Although objective field criteria may be useful in analyzing the amount of error involved in a compression scheme, our eyes do not always see things as they are which is why the second category of fidelity criterion is important. Subjective field criteria are quality evaluations based on a human observer. These ratings are often averaged to come up with an evaluation of a compression scheme. There are absolute comparison scales, which are based solely on the decompressed image, and there are relative comparison scales that involve viewing the original and decompressed images side by side in comparison.

Table 1.2 Absolute Comparisons Scale

Value	Rating	Description
1	Excellent	An image of extremely high quality. As good as desired.
2	Fine	An image of high quality, providing enjoyable viewing.
3	Passable	An image of acceptable quality.
4	Marginal	An image of poor quality one Wish to improve it.
5	Inferior	A very poor image, but one can see it.
6	Unusable	An image so bad, one can't see it.

An obvious problem that arises is that subjective fidelity criterion may vary from person to person. What one person sees a marginal, another may view as passable, etc.

II.PROPOSED SYSTEM

In this proposed system the new method of Curvelet Transform in blend with Lifting Scheme and Huffman coding are used to compress iris images. In different types of wavelet transforms, the Curvelet transform provides better results for the curvy portions of iris images. Along with Curvelet transform, Lifting Wavelet transform is applied to the co-efficient of the Curvelet transformed image which will provide the high detailed image. Then, after the decomposition of iris image by Curvelet and Lifting wavelet transform, Huffman encoding is used to compress the decomposed medical image. The reconstruction of the medical image is done by applying the inverse lifting transform and Curvelet transform which resembles the original image exactly.

2.1Theory of Curvelet transform

2.1.1 Need for Curvelet transform

Wavelet transform is useful smooth functions in one dimension. Still Wavelet transform has following Disadvantage Compare to Curvelet transform. 2-D line singularities - piecewise smooth signals resembling images have 1- Dimensional Singularities. These smooth regions are separated by edges. Normally edges are discontinuous across the image. Lack of shift invariance- these results from the down sampling operation. Lack of directional selectivity- as the DWT filters are real and separable the DWT cannot distinguish between the opposing diagonal directions. The first problem of the DWT an anisotropic geometric is solved by the first order Curvelet transform which deals with the 2-D line singularities. The second order Curvelet transform deals with the image boundaries and it is very effective in various image processing applications. The second and third problems of wavelet transform can be overcome by the fast discrete Curvelet transform which is also called 2D digital Curvelet transform. In which the directional selectivity and shift invariance is improved compare to conventional DWT.

2.2 Importance of Curvelet compare to wavelets

Curvelet will be superior over wavelets in following cases:

i. This transform is optimally sparse representation of Objects with edges.

ii. This transform is optimal image reconstruction in severely ill-posed problems.
iii. This transform is optimal sparse representation of Wave Propagators.

The Curvelet represents optimal sparseness for curved punctured smooth images where the image is smooth with the exception of discontinuity of C2 curves.

2.3 C ontinuous Curvelet transform

The first Curvelet transform used as a complex series of steps involving the Ridge let analysis of the radon transform of an image. Performance of the Ridge let transform is very slow. So the use of Ridge let transform was discarded and thus new method and approach to Curvelet as tight frame is taken using tight frame, an individual Curvelet has frequency support in a parabolic wedge area of the frequency domain.
In a heuristic argument is made that all Curvelet fall into one of three categories.

i. The Curvelet coefficient magnitude will be zero. Whose length wise support does not intersect discontinuity?
ii. A Curvelet whose length-wise support intersects with a Discontinuity, but not at its critical angle. At this point The Curvelet Coefficient magnitude will be close to zero.
iii. A Curvelet whose length-wise support intersects with a Discontinuity, at there the Curvelet coefficient magnitude will be much larger than zero.

2.4 Discrete Curvelet transform

The second generation Curvelet transform has two different implementations: Curvelet via USFFT (Unequally spaced Fast Fourier transform) and frequency wrapping. Both of this Curvelet are simpler, faster and less redundant compare to first generation Curvelet (Ridge let transform).In this work Curvelet based on frequency wrapping technique is used.

Basically multi resolution discrete Curvelet transform have the advantage of FFT (Fast Fourier transform).during the FFT both the image and the Curvelet at a given scale and orientation are transformed into the Fast Fourier domain. In the spatial domain the convolution of the Curvelet transform becomes product in their Fourier domain. Curvelet coefficients are obtained by applying inverse FFT to the spectral product after the end of the whole computation process.

All the coefficients of the scale and orientation are in ascending order. Inverse FFT cannot be applied on the obtained frequency spectrum because the frequency response of a Curvelet is a trapezoidal wedge which needs to be wrapped into a rectangular support to perform the inverse Fourier transform.The Frequency wrapping of this trapezoidal wedge which needs to be wrapped into a rectangular support to perform the inverse Fourier domain. The wrapping of this trapezoidal wedge is done by periodically tilting the spectrum inside the wedge and then collecting the rectangular coefficients area in the origin. Due to this periodic tilting the rectangular region collects the wedge's corresponding fragmented portions from the surrounding parallelograms. For this wedge wrapping process, this approach of Curvelet transform is known as the "wrapping based Curvelet transform".

Wrapping DCT Algorithm:

1. Take FFT of the Image.
2. Divide FFT into collection of Digital Tiles.
3. For each tile,

(a) Translate the tile to the origin
(b) Wrap the parallelogram shaped support of the tile around a rectangle centred at the origin.
(c) Take the inverse FFT of the wrapped support.
(d) Add the curvelet array to the collection of curvelet coefficients.

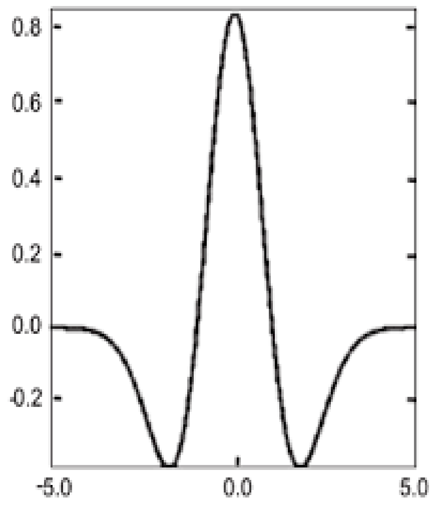


Figure 1. The Mexican hat wavelet function.

Figure 2.1 conventional wavelet (maxican hat)

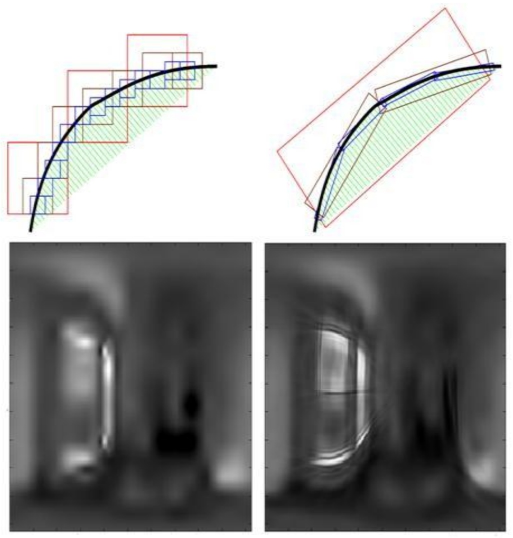


Figure 2.2 Curvelet transform

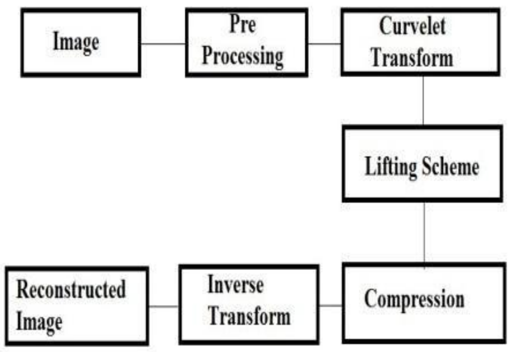


Figure 2.3 Proposed system block diagram

2.3 Proposed system block diagram modules

Step 1: In pre-processing step the wiener filter is used for removal of blur in images due to Linear motion or unfocussed optics removes the noise.
Step 2: Pre-processed image is decomposed by discrete Curvelet transform.
Step 3: After that Integer wavelet transform is applied on the transformed image for separating The more decorrelated coefficients.
Step4: Finally, the coefficients are encoded by Huffman encoder.
Step 5: analyze the compression ratio.
Step 6: Inverse IWT and Curvelet transform used for reconstructing the image.

Lifting wavelet transforms

1. Lifting scheme is a rather new method for constructing wavelets. The main difference With the classical constructions is that it does not rely on the Fourier transform.
2. In this way, lifting can be used to construct second-generation wavelets. The basic Idea behind the lifting scheme is very simple; one tries to use the correlation in the data to remove redundancy.
3. At first the data is split into two sets (Split phase): the odd samples and the even samples.
4. N even samples are used to predict the value of a neighboring odd value (Predict phase).
5. The third step (Update phase) updates the even samples using the newly calculated odd samples such that the desired property is preserved.

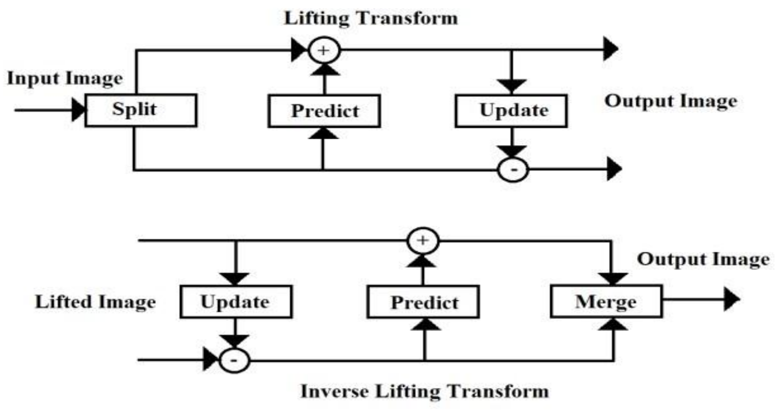


Figure 2.4 Lifting scheme block diagram

2.3 Advantages of proposed work:

1. It provides the exact information of the edges and curved surfaces of the iris images.
2. Better compression ratio and PSNR value.
3. use for authentication purpose
4. Applicable for all types of images
5. Bit per pixel ratio is low
6. Accurate image after compression

III. SOFTWARE SPECIFICATION

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include:

1. Math and computation
2. Algorithm development

3. Modeling, simulation, and prototyping
4. Data analysis, exploration, and visualization
5. Scientific and engineering graphics
6. Application development, including graphical user interface building.

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar no interactive language such as C or FORTRAN.

The name MATLAB stands for matrix laboratory. MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects. Today, MATLAB uses software developed by the LAPACK and ARPACK projects, which together represent the state-of-the-art in software for matrix computation.

MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis.

MATLAB features a family of application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow learning and applying specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others.

In MATLAB, we should start by reading Manipulating Matrices. The most important things to learn are how to enter matrices: (colon) operator, and invoke functions. At the heart of MATLAB is a new language we must learn before we can fully exploit its power. The basics of MATLAB can be studied quickly, and mastery comes shortly after. It can get high productivity, high-creativity computing power that will change the way work.

Starting and quitting mat lab starting mat lab

On the Microsoft Windows platform, to start MATLAB, double-click the MATLAB shortcut icon on Windows desktop. On the UNIX platform, to start MATLAB, type MATLAB at the operating system prompt. After starting MATLAB, the MATLAB desktop opens - see MATLAB Desktop. It can change the directory in which MATLAB starts, define start up options including running a script upon start up, and reduce start up time in some situations.

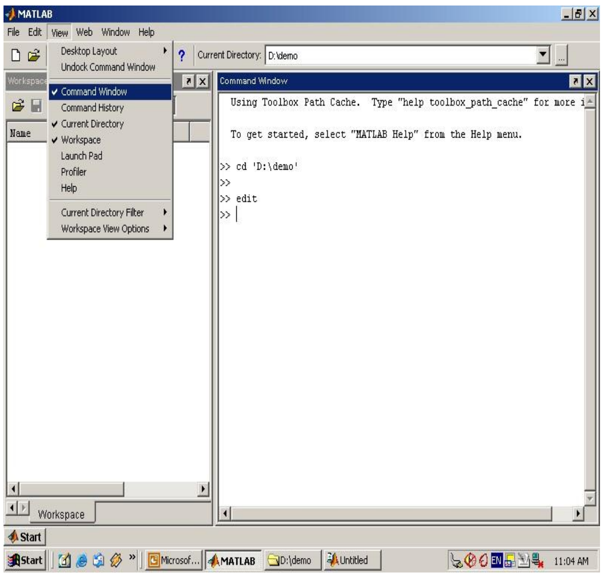
Quitting mat lab

To end the MATLAB session, select Exit MATLAB from the File menu in the desktop, or type quit in the Command Window. To execute specified functions each time MATLAB quits, such as saving the workspace, it can create and run a finish m script.

MATLAB desktop

When start the MATLAB, the MATLAB desktop appears, containing tools (graphical user interfaces) for managing files, variables, and applications associated with MATLAB.

The first time MATLAB starts, the desktop appears as shown in the following illustration, although your launch pad may contain different entries Use the Command Window to enter variables and run functions and M-files.



```
 Using Toolbox Path Cache.  Type "help toolbox_path_cache" for more i

 To get started, select "MATLAB Help" from the Help menu.

>> cd 'D:\demo'
>>
>> edit
>>
```

Figure 3.1 Matlab window

Features of Matlab manipulating matrices

The best way for us to get started with MATLAB is to learn how to handle matrices. Start MATLAB and follow along with each example.

It enters matrices into MATLAB in several different ways:

1. Enter an explicit list of elements.
2. Load matrices from external data files.
3. Generate matrices using built-in functions.
4. Create matrices with your own functions in M-files.

Start by entering Durer's matrix as a list of its elements. Few basic conventions are:

1. Separate the elements of a row with blanks or commas.
2. Use a semicolon; to indicate the end of each row.
3. Surround the entire list of elements with square brackets, [ ].

To enter Durer's matrix, simply type in the Command Window

```
A = [16 3 2 13; 5 10 11 8; 9 6 7 12; 4 15 14 1]
```

MATLAB displays the matrix you just entered.

```
A =16    3    2   13
    5   10   11    8
    9    6    7   12
    4   15   14    1
```

This exactly matches the numbers in the engraving. Once we have entered the matrix, it is automatically remembered in the MATLAB workspace. It refers to it simply as A.

Expressions

Like most other programming languages, MATLAB provides mathematical expressions, but unlike most programming languages, these expressions involve entire matrices.

The building blocks of expressions are:

1. Variables
2. Numbers
3. Operators
4. Functions

Variables

MATLAB does not require any type declarations or dimension statements. When MATLAB encounters a new variable name, it automatically creates the variable and allocates the appropriate amount of storage.

If the variable already exists, MATLAB changes its contents and, if necessary, allocates new storage. For example, num_ students =
25.Creates a 1-by-1 matrix named num_ students and stores the value 25 in its single element.

Variable names consist of a letter, followed by any number of letters, digits, or underscores. MATLAB uses only the first 31 characters of a variable name.

MATLAB is case sensitive; it distinguishes between uppercase and lowercase letters. A and B are not the same variable. To view the matrix assigned to any variable, simply enter the variable name.

Numbers

MATLAB uses conventional decimal notation, with an optional decimal point and leading plus or minus sign, for numbers. Scientific notation uses the letter e to specify a power-of-ten scale factor. Imaginary numbers use either i or j as a suffix. All numbers are stored internally using the long format specified by the IEEE floating-point standard. Floating-point numbers have a finite precision of roughly 16 significant decimal digits and a finite range of roughly 10-308 to 10+308.

Some of the functions, like sqrt and sin, are built-in. They are part of the MATLAB core so they are very efficient, but the computational details are not readily accessible. Other functions, like gamma and sinh, are implemented in M-files. We can see the code and even modify it if we want. Several special functions provide values of useful constants.

Operators

Expressions use familiar arithmetic operators and precedence rules.

Table 3.2 Arithmetic operators and precedence rule

+	Addition
-	Subtraction
*	Multiplication
/	Division
\	Left division (described in "Matrices and Linear Algebra" in Using MATLAB)
^	Power
'	Complex conjugate transpose
( )	Specify evaluation order

Functions

MATLAB provides a large number of standard elementary mathematical functions, including abs, sqrt, exp, and sin. Taking the square root or logarithm of a negative number is not an error; the appropriate complex result is produced automatically. MATLAB also provides many more advanced mathematical functions, including Bessel and gamma functions. Most of these functions accept complex arguments.

Table 3.3 Functions

Pi	3.14159265...
I	Imaginary unit, √-1
Eps	Floating-point relative precision, 2^{-52}
Realmin	Smallest floating-point number, 2^{-1022}
Realmax	Largest floating-point number, $(2-\varepsilon)2^{1023}$
Inf	Infinity
NaN	Not-a-number

List of matlab commands

1. Imread

Read image from graphics file

Syntax:

Imread (filename, *fmt*)

Description:

A = Imread (filename, fmt) reads a greyscale or colour image from the file specified by the string filename. If the file is not in the current folder, or in a folder on the MATLAB path, specify the full pathname.

2. Imwrite:

Write image to graphics file

syntax:

Imwrite (A, filename, *fmt*)

Description:

Imwrite (A, filename, fmt) writes the image A to the file specified by filename in the format specified by fmt.

3. Imshow:

Display image

Syntax:

Imshow(I)

Description:

imshow(I) displays the grayscale image I

4. RGB2GRAY

Convert RGB image or colourmap to grayscale

Syntax:

I=rgb2gray (RGB);

Description:

I = rgb2gray(RGB) converts the true colour image RGB to the grayscale intensity image I. rgb2gray converts RGB images to grayscale by eliminating the hue and saturation information while retaining the luminance.

5. Im2double

Convert image to double precision

Syntax:

I2 = im2double (I)

Description:

I2 = im2double (I) converts the intensity image I to double precision, rescaling the data if necessary. If the input image is of class double, the output image is identical.

6. Imresize

Resize image

Syntax:

B = imresize (A, [mrows ncols])

Description:

B = imresize (A, [mrows ncols]) returns image B that has the number of rows and columns specified by [mrows ncols]. Either NUMROWS or NUMCOLS may be NaN, in which case imresize computes the number of rows or columns automatically to preserve the image aspect ratio.

7. Zeros

Create array of all zeros

Syntax:

B=zeros (n) B = zeros(m,n)

Description:

B = zeros (n) returns an n-by-n matrix of zeros. An error message appears if n is not a scalar.

8. Max

Largest elements in array

Syntax:

C=max(A) C=max (A,B) C=max (A,[],dim) [C,I] = max (...)

Description:

C = max (A) returns the largest elements along different dimensions of an array.

If A is a vector, max (A) returns the largest element in A.

If A is a matrix, max (A) treats the columns of A as vectors, returning a row vector containing the maximum element from each column.

If A is a multidimensional array, max (A) treats the values along the first non-singleton dimension as vectors, returning the maximum value of each vector.

C = max (A, B) returns an array the same size as A and B with the largest elements taken from A or B. The dimensions of A and B must match, or they may be scalar.

C = max (A, [], dim) returns the largest elements along the dimension of A specified by scalar dim. For example, max (A, [], 1) produces the maximum values along the first dimension (the rows) of A.

[C, I] = max (...) finds the indices of the maximum values of A, and returns them in output vector I. If there are several identical maximum values, the index of the first one found is returned.

B = zeros (m, n) or B = zeros ([m n]) returns an m-by-n matrix of zeros.

9. Min

Smallest elements in array

Syntax:

C=min(A) C=min(A,B) C=min(A,[],dim) [C,I] = min(...)

Description:

C = min (A) returns the smallest elements along different dimensions of an array.

If A is a vector, min (A) returns the smallest element in A.

If A is a matrix, min (A) treats the columns of A as vectors, returning a row vector containing the minimum element from each column.

If A is a multidimensional array, min operates along the first nonsingleton dimension.

C = min (A, B) returns an array the same size as A and B with the smallest elements taken from A or B. The dimensions of A and B must match, or they may be scalar.

C = min (A, [], dim) returns the smallest elements along the dimension of A specified by scalar dim. For example, min (A, [], 1) produces the minimum values along the first dimension (the rows) of A.

[C, I] = min (...) finds the indices of the minimum values of A, and returns them in output vector I. If there are several identical minimum values, the index of the first one found is returned.

IV.CONCLUSION

The bit rate required for visually lossless compression of 3D monochrome stereo pairs is larger than that required for visually lossless 2D compression of the individual left and right images. However, the resulting left and right images Obtained via the existing method are visually lossless in both 2D and 3D mode, while the images compressed individually are not visually lossless in 3D mode. The existing method results in a significantly higher bit rate than proposed scheme. I will use for authentication purpose and applicable for 2D images also. Compression ratio is to be high when comparing to existing system.

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