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Dimension-Feasible Area-of-Interest in Scalable Image Representation

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Abstract: Locating Arena of interest (AOI) from Out Of Non Interest Arena Space in an image based in fidelity are the major Change and important functionality .In this paper I propose a flexible image representation with the Arena of Interest in a Spatial Domain which maximizes image Hierarchy. The AOI Disciplines of our Image representation is a Result of Grid transformation. With we know only the Center of AOI and Expansion Specification.

Keywords: Arena of interest, Discrete cosine transform, Joint Photographic Experts Group (extended range),Coarser Image.

I. INTRODUCTION

The scope of Past image representation with AOI is Much Fidelity to its Particular Arena (AOI) of an Image than others Non –AOI. The Selected AOI will remain unchanged in pixels, while the Non-AOI will be compressed as Maximum As possible based on Band limited Transmission. However, as the size of devices varies from High Definition Television to modern Mobile phone and as more and more high clarity Multimedia are to be transmitted via the internet, and the scalable AOI functionality in a Static Image is supported in JPEG 2000, JPEG XR,JPEG-LS with the Wavelet Transform. Here the outline of AOI is in the Smoothing filtered. Then, a methodology to relate the selected low Inverse Wavelength data of the AOI to the higher frequency coefficients is needed to separate the wavelet coefficients of the [3] AOI from non-AOI.. As a result, the AOI in the lower pixel representation images becomes too small to be recognized, making the AOI functionality in the base layer of the scalable representation worthless. So has to provide a worthy AOI functionality in the scalable image representation, it is necessary to locating the AOI from the non-AOI in terms of relative size as well as fidelity in all levels of the hierarchy. In the spatial domain, the AOI functionality can be performed by a grid deformation. The original image grid can be deformed such that the distances among neighboring grid points in the AOI are maximize, while those in the non-AOI are minimize. Then, uniform sampling in deformed grid becomes equivalent to obtaining non uniform samples in the original image space.it has been shown that if the original signal can be transformed into a band limited signal by an inverse grid Deform function, then it can be perfectly reconstructed from the uniform samples obtained in the grid-deformed domain. Of course, the perfect signal reconstruction involves the ideal Smoothening filtering. In this paper. I adopt a Non uniform Grid Deformation function which guarantees no overlapping within the AOI region. But Allows Aliasing in the Non- AOI. Our non-uniform deform function will be much different from the present Content aware image Resizing methods. The main theme in image resizing to create AOI controllable in size and Fidelity [4]. Thus the non-uniform deform function needs to multiplicative inverse for both Encoding and Decoding Our Non-linear Transformation combines uniform samples and size ,producing no exterior subsamples process to put out Coarser image for next level of image hierarchy. Also the Amount of Size expansion of AOI is easily driven by a parameter.by applying the inverse operation to the coarser image, we can produce prediction of its one level finer image. Generally a Predicted JPEG 2000 Image is subtracted from the original image at the level of hierarchy to get a Residual Error Image .just find out all the error by overlapping in non-AOI are stored in this residual Image for the image Reconstruction. We have to perform a same operation for all levels [1].

II. HIERARCHY REPRESENTATIONS IN SPATIAL DOMAIN

From original image I^0 at the Lowest level of the Hierarchy,a typical pyramidal representation of the image produces a coarser image I^1 by 2-D smoothing filtering followed by subsampling by a factor of k for both rows and column[2]. Then the Generated coarser image I^1 is used to reconstruct i^0 by up-sampling and Smoothing filtering producing a difference error image $R^0= I^0-i^0$ .These reduction and reconstruction process are continued until we reach coarsest level L at the top of the Pyramid.

$$I^{l+1} = [f(I^l)] \;\; k\downarrow \qquad (1)$$

$$I^l = g([I^{l+1}] \;\; k\uparrow \qquad (2)$$

$[f(I^l)]$ k represents the 2-D smoothening filtering f on Il followed by a Down Sampling by a factor of k and $g([I^{l+1}]$ k is the up-sampling by k with zero stuffing for points followed by an interpolation filter g

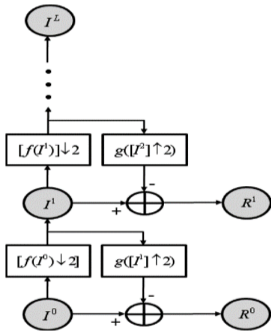

Fig. 1. Typical Hierarchical representation of image.

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The reduction and reconstruction processes can be expressed as follows

$$I^{l+1} = \zeta(I^l(S[\Omega^l]))$$
$$\bar{I}^l = \zeta(I^{l+1}(S^{-1}[\Omega^{l+1}])) \quad (3)$$

where ζ is a nonlinear function to fill up empty pixels created in the AOI and to blend the remaining pixels in the non-AOI.

III. AOI-BASED NONUNIFORM 1-D INTERVAL TRANSFORMATION

We introduce our Nonlinear Grid Transform for 2-D images. We can illustrate the Basic idea of the nonlinear Transformation. We want to Reduce 1-D discrete –time data{C[n]:n=0,……..,N-1} of length N to another 1-D signal {D{m}:m=0,…….M-1}with length M(M<N).Also ,We suppose that the interval of interest in C[n] is Centered at C. the non-IOI located far away from will be mapped in a many-to-one fashion, yielding contraction. In this way, the expanded indices around C' may create empty sites to be filled by the neighboring nonempty data from $a[n]$, while each mapped index beyond C' may have multiple points from $a[n]$, yielding a blended site in area that is Conversely, the in- verse mapping, expanding to can be similarly done. M (M<N) we suppose that the interval of interest IOI around C of N[n] is mapped to an Expanded interval in =g(around C')[4].

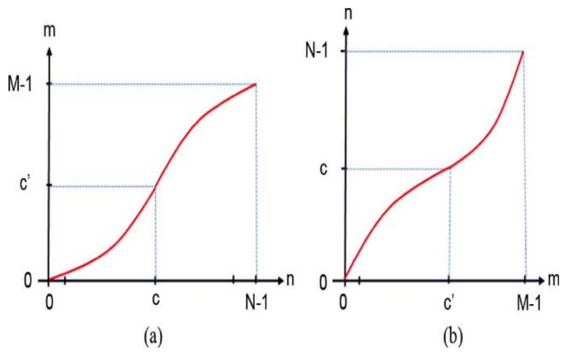

Fig 2 wavelength transform on jpeg 2000/JPEG XR IMAGE

Wavelet transform in 2-D is For image processing. For 2-D wavelet transform, we need one 2-D scaling function, Φxy and three two-dimensional wavelet functions, Φ^H(x,y), Φ^V(x,y),and Φ^D (x,y), Each is the product of a one-dimensional scaling function Φ and corresponding wavelet Φ

$$\phi(x,y) = \phi(x)\phi(y)$$

$$\varphi^H(x,y) = \varphi(x)\phi(y)$$

$$\varphi^V(x,y) = \phi(x)\varphi(y) \quad (4)$$

$$\varphi^D(x,y) = \varphi(x)\varphi(y) \quad (5)$$

For image processing, these functions measure the variation of intensity for the image along different directions : Φ^H , Φ^V measures variations along Columns and Rows respectively. Similarly Φ^D tells you the variation on Diagonals [3].

$$\phi_{j,m,n}(x,y) = 2^{j/2}\phi(2^j x - m, 2^j y - n)$$

$$\varphi^i_{j,m,n}(x,y) = 2^{j/2}\varphi^i(2^j x - m, 2^j y - n) \quad (6)$$

where the index I defines the direction of the wavelet functions. The discrete wavelet transform of function f (x, y) of size M x N is

$$W_\phi(j_0,m,n) = \frac{1}{\sqrt{MN}}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f(x,y)\phi_{j_0,m,n}(x,y)$$
$$W^i_\varphi(j,m,n) = \frac{1}{\sqrt{MN}}\sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f(x,y)\varphi^i_{j,m,n}(x,y) \quad (7)$$

It is interesting to identify the border between the IOI (or AOI in 2-D image) and the non-IOI. The data inside the border will remain intact because the (discrete) index mapping to the next level of the hierarchy is one-to-one or one-to-many within the border, while some of data outside the border are discarded because the mapping is many-to-one.

IV. DISCRETE FOURIER TRANSFORM ON NON AOI REGION

By Discrete cosine transform (DCT) technique we are converting a signal into inverse wavelength components. Generally the DCT is applied on the Non AOI region which makes the adjacent pixels to overlapped to reduce the pixel rate.as a rate the compression will take place .the General function of DCT is

$$S(u) = \sqrt{2/n}\; C(u) \sum_{x=0}^{n-1} s(x) \cos\frac{(2x+1)u\pi}{2n} \qquad u = 0,\ldots,n$$

$$\text{where} \quad C(u) = 2^{-1/2} \quad \text{for } u = 0$$
$$= 1 \quad \text{otherwise} \quad (8)$$

The DCT can be the product of a vector (the input list) and the n x n orthogonal matrix whose rows are the basis vectors.

Consider the Following Orthogonal Matrix

1.	0	0	0	0	0	0	0
0	1.	0	0	0	0	0	0
0	0	1.	0	0	0	0	0
0	0	0	1.	0	0	0	0
0	0	0	0	1.	0	0	0
0	0	0	0	0	1.	0	0
0	0	0	0	0	0	1.	0
0	0	0	0	0	0	0	1.

Now Similarly Consider the Input Samples

```
input1 = Table[Random[Real, {-1, 1}], {8}]

{0.203056, 0.980407, 0.35312, -0.106651, 0.0399382, 0.871475,
  -0.648355, 0.501067}
```

Then We can Compute DCT by Matrix multiplication and get the Output for above sample as follow.

```
output1 = DCTMatrix . input1

{0.775716, 0.3727, 0.185299, 0.0121461, -0.325, -0.993021,
0.559794,
  -0.625127}
```

Generally the inverse DCT can be computed by multiplication with the inverse of the DCT matrix. And its described as follows

Inverse[DCTMatrix] . output1
{0.203056, 0.980407, 0.35312, -0.106651, 0.0399382, 0.871475, -0.648355, 0.501067}

One-dimensional DCT is useful in processing one-dimensional signals such as speech waveforms. For analysis of two-dimensional (2D) signals such as images, we have to improvise with a 2D version of the DCT. For an n x m matrix s, the 2D DCT is computed in a simple way: The 1D DCT is applied to each row of sand then to each column of the result [3]. Thus, the transform of sis given by the area of coefficient value in

$$S(u,v)=\frac{2}{\sqrt{nm}}C(u)C(v)\sum_{y=0}^{m-1}\sum_{x=0}^{n-1}s(x,y)\cos\frac{(2x+1)u\pi}{2n}\cos\frac{(2y+1)u\pi}{2m} \quad u=0,\ldots,n \quad v=0,\ldots,m$$

$$\text{where} \quad C(u)=2^{-1/2} \quad \text{for } u=0$$
$$=1 \quad \text{otherwise} \qquad (9)$$

Since the 2D DCT can be computed by applying 1D transforms separately to the rows and columns, we say that the 2D DCT is separable in the two dimensions. Thus the Fig 2 give the Graph shows non uniform transformation structure.

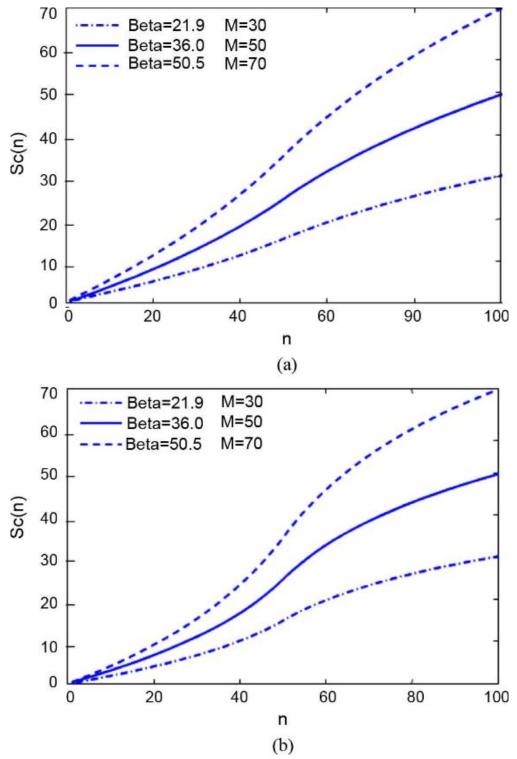

Fig 3. Non Uniform Transformation Curve Structure

V. AOI BASED REPRESENTATION OF IMAGES

In normal JPEG image the Compression Rate is maximum so as a result the image pixels get distorted much but by using JPEG 2000/JPEG XR images the Compression and Image Quality after compression will be much better. JPEG 2000 is an image can be encoded and that it is then up to the decoder to extract a Grouped Sub-set of the bit -stream to reconstruct an image of the required Resolution this functionality JPEG 2000 has a highly structured streaming bits, with header that tells the image and coding constraints used, and then a series of packet headers that tells u the data. The packet header defines the sub-set of wavelet coefficients that are occurred in the packet. This Encoding and Decoding can be performed by three mechanisms tiling; code-block selection; and coefficient scaling. The basic thing to be encoded in JPEG2000 is an image tile. An image can be coded as a single tile or can be partitioned into several parts into rectangular, non-overlapping, sub-images and each tile coded independently.as a result local memory is reduce to perform discrete wave transform. Code-block selection consists parsing a JPEG2000 bit -stream encoded to a lossless or lossless level and extracting the packets that contain the code-blocks required to decode the AOI. In addition, the decoder also needs code-blocks adjacent to the AOI to correctly perform the inverse discrete wavelet transform ,in coefficient Scaling by one special algorithm we can perform a operation Generate AOI Mask, scaling value, scale down background coefficient ,finally apply bit plane entropy. In order to compare the three possible methods of AOI coding and to investigate the effect of a number of JPEG 2000 parameters on AOI coding performance a set of six images were selected. The images used were from the JPEG 2000 set, they are all 8 bits per pixel grey-scale, Image distortion is measured as average peak signal -to-noise ratio over all six images, and the Bpp(Bits per Pixel)Rate Will make the Image to Feel the difference[2]

Fig 4 Comparison of default JPEG 2000 & maxshift AOI coding with two face AOI's (0.25 bpp)

This method the Normal image to be sent from one side to another receiver end through the transmission layer. At first the normal JPEG 2000 / JPEG XR image files are imported and the number of processing operation has to be done on it.

A. RESIDUAL IMAGE

The Residual image of the Normal Image have to be find out first with our algorithmic process.by this Residual image process. The Strong edges of our image. Has been traced out and that edges are darkened and their respective light edges is thrown to be lightened(Fig 4)Our Non-linear Transformation combines uniform samples and size, producing no exterior subsamples process to put out coarser image for next level of image hierarchy. Also the Amount of Size expansion of AOI is easily driven by a parameter.by applying the inverse operation to the coarser

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image, we can produce prediction of its one level finer image. Generally a Predicted JPEG 2000 Image is subtracted from the original image at the level of hierarchy to get a Residual Error Image

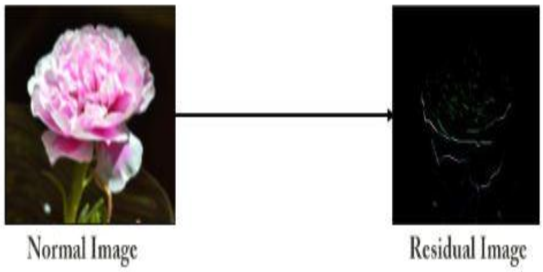

Fig 5 The Normal Image and Its Residual Image

And then the Arena of interest to be selected on the image. Where no processing operation will be occur.the remaining non-AOI region are subjected to the Wavelet transformation first. Which will reduce the noise in the image and then the noise filterd image are Processed under a Discrete cosine Transform,by this Transformic operation the Non AOI region is much compressed by overlapping the adjacent pixel , reduce the bit rate of the pixel to get a resultant compressed image size . (Fig 5).

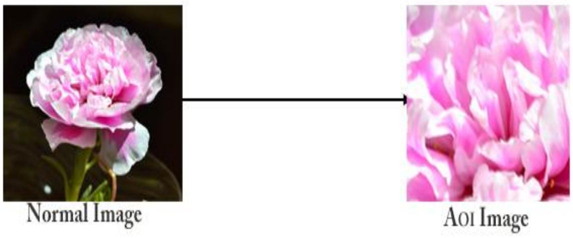

Fig 6 The Normal Image and Its AOI part

Then the Processed Image samples and the Orginal Images are packed and send through a buffer. Then the reconstruction process ie. Inverse DCT will be take place in receiver end and Resultant processed image is get back[2].

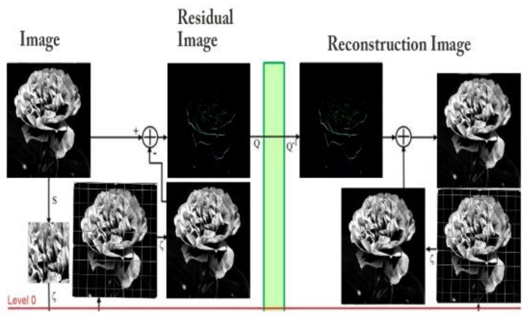

Fig 7: Image Processing Technique

The Resultant image will be in the size of at least 1/5 times the size of original image, and it is showed in the Fig 7. .As a outcome of ordered structure, we can emphasize a specific AOI in the image even if the image size is reduced. Our ordered structure yields reduced images with emphasized AOI this is a very useful performance for small displays such as mobile phone and PDA, where smallest and coarse image can clearly show the content of AOI without requesting more details in the lower levels to the sender. If the residual images are lossy coded a mismatch will happen between the transmitter and receiver. However, considering that the greater part of the energy of the residual signal is focused in non-AOI regions, most of compression items due to lossy compression will happen in the non-AOI areas of the rebuilt image. Moreover, this mismatch can be eradicated if the transmitter imitates the encoding/decoding process and then calculates the residual images. For the event of several AOIs, we can separate the image into a number of series such that the center of each AOI resides at the center of corresponding image segment. Then, we apply the no uniform transformation to each part separately and the resulting sections are mosaicked together to form the next level of the structure.

750 KB(1024 *768) 45 KB(1024*768)

VI. CONCLUSION

A new way of integrating the AOI performance into a scalable expression has been properly applied. Then no uniform changes we follow has no exact subsampling and promptly changes the aspect the images at the next rougher stage. Also, the relative dimension the AOI at the rougher levels of the image construction can be easily managed. This functionality normally prioritizes the image facts as the stage of the hierarchy elevates.as the image aspect reduces with enhancing stage of the structure, important JPEG images information are remained and squeezed at the decreased image space. This enables us to give worry to the image information for modern image transmitting. Subsequently, the recommended method can offer a great degree of flexibility to satisfy wide range of needs for AOI reflection in the scalable structure [3].

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