A FLEXIBLE TECHNIQUE FOR IMAGE DOWNSAMPLING USING A GENETIC ALGORITHM AND A DIGITAL CURVELET TRANSFORM

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ABSTRACT

Propelled pictures are used everywhere and are definitely not hard to manage and change in view of the availability of various picture getting ready and adjusting programming. Repeat the image to a lesser extent and change the look of the image. This can be useful at times when the original version of the original will give you a slim version of the film. There are several methods of image downsampling. This sheet uses performance capabilities for a collage based on digital curve transfers and

1. INTRODUCTION

is a method model to make the mechanized picture tinier by removing the pixels. [1] Usually, automated concealing pictures are addressed by each set by setting express characteristics for (YUVtype) allow accurate luminosity and chromosomes coordinate with the number of bits required for an image acceptable color illustration. This diminishing relies upon high affectability to the human eye of splendid changes than the discoloration changes. In some approaches, some pixels (sometimes called macro pixels) have to be assigned the same Color (chromosomes) for some groups while the thought behind this methodology is to set the individual estimation of the brightness components

generic algorithms. Genetic Algorithm (GA) is attached by the Digital Curvelet Transform (DCT). Originally DCT The length of the map decreases by using. Using this reduced map, gateways and entry worth are coordinated by the utilization of hereditary estimation. From the appraisal of results, it will when all is said in done be picked that the proposed method is quick and exact.

Catchphrases: Image Downsampling, Genetic Algorithm (GA), Digital Curvelet Transform (DCT), Motion Filter, Soft Thresholding.

for each pixel. There are different sample forms depending on the process of underestimating the process and the base plan. Your optical resolution master scan is a accessible image that is a access image that is full of downsampling.

Only by having both professional and access records, the essential game-plan can sway, in any case at a near stature and width they are the actual Proxy. As we know, below-sample a digital image is small MOF changes the pixels by removing the statistical process. Instead, up-maples n pixel by adding the digital image to zoom into a statistical process. Generally, the pattern directly down-sampling and down sampling and divided. Live below-modeling the communication

[4] with the comparison is very easy. Pictorial cycle in general spatial or frequency domains handle. Spatial domain, the input image to the appropriate. It is alluded to as immediate downsampling, which is the most straightforward downsampling calculation.

Be that as it may, you can utilize elective items the downsampled spectrum [1] is seen in a straightforward flawed film due to interlocking. When high-resolution images are needed for many display, crop, film seen in a low-display. As such, the picture downsampling has changed into a standard measure when diagram the picture. The average picture downsampling modes don't unequivocally address the closeness of the chief picture, and renders the perceived appearance of a picture resolution. In particular, the fallen areas will have a sharp look, the resulting image appears to be higher than its full grammar. While high quality images are the changed version will time index,

The traditional approaches to the bottom-scaling first disintegrate bit streams and use the necessary processing function (re-summary). In current information, efficient bottom-templating technique is offered, in which the entire domain of the space is rejected. The structure of the paper is as indicated by the going with. Fragment 2 relies on techniques to diminish and assess a piece of the past research done by specialists. Section 3 gives two or three stray bits of picture downsampling frameworks. The proposed falling philosophy is. Area 5 gives results and chats on the proposed work. Besides, Section 6 of the proposed system wraps up.

2. A STUDY OF RECENT RESEARCH IN FIELD

Previous research improve the nature of the record picture at bit rate, after encoding (DS) before the index and predefined model. Nowadays, more and more downturns will appear with more efficiency. However, some of the lessons of literacy in writing are read.

Karl S. Ni and Truong Q. Nguyen [3] proposed research work, the most obvious study of the use of Vector Recreation (SVR) application was conducted through various structures for superior resolution problem. diagnosis, was detected and updated with the ideal part. This was finished by structuring a piece learning issue in SVR position as a raised enhancement issue, particularly as a semi-characterized programming (SDP). An extra hinder can be added to the four areas that interrupt the interaction with the SDP. Once the optimization is completed, the response of the SVR supervision receives the opportunity to use a singular and open assistance vector lit up for all image content, and the results are stunning for smaller planning sets. Further, advance is a mix of collection and SVR-based frameworks, in which the solution is expanded into packages. The kernel resolution package, the vector space, uses the specified specifications for the individual picture substance to portray the space with a shared look, giving incredible results.

presented distinctive face revelation technique concealing pictures. The relies upon theory that the skin is segregated from the establishment by concealing acknowledgment. By controlling those faces, it changes the unpretentious gatherings. The changed gathering computation proposed another extent of twofold face area, with its central parameters great with the accurate information of face inquiries in the image. Town Spilling was used to diminish the clustering and structure. The introduction of the proposed structure is appeared by tests.

practical approach Adapting the sample the image place reverting it further with the moralization, the steering low-pass pre filtering. As a result, the following modelled image is a regular square sample grid, thus pressure and spread with no change to the present picture coding models and structures. The decoder recently adjusted the lower objectives picture, by then up converts it to the principal objectives in a restricted Minute Square Recovery program, using the 2-D fragmentation model, knowing the priorities with the lowest direction. Integrated Communications and Degradation (, which can comply with JPEG 2000 at low and middle bit rates in CNNR operations, achieves the proposed compression approach and excellent display quality. The lower bit-rate performance of this approach, not only the hardware refining and energy efficiency, may also be negative for the image quality.

A interpolated adaptive bottom-sample calculation for low piece rate picture list. Given an image, the proposed calculation had the option to get a low-goals picture, from which the great picture input image can be interpolated with the same resolution. Differences from independent-down-sampling methods independent from interpretative processes, down-sampling protocol connect the below-sample interpolation process. As a result, the bottom-modeling protocol had the decision to keep up the chief substance of the information film. Coming up next is test united with Photo Expert Group, Total assortment based post arranging was then utilized for diminished low destinations picture. At last, the prepared picture was obstructed to keep up the foremost targets of the information film. Test outcomes that utilization down surveyed picture through calculation, can achieve the interpolation image with higher quality. In addition, the protocol low-bit ratio reached higher performance than the JPEG for image index.

Lu Fang et al. [7] have worried about Sample picture utilizing sub pixel methods to accomplish better liquidity of little fluid gem shows (LCDs). There is an issue, for example, high goals picture or video shows on low goals show terminals. Characterize a low goals resolution, the image should be compressed. Signal-processing theory states that the correct DMA has a suitable cut frequency for low-pass filter, followed by pattern below. In this manner, you have to clear various profitable picture nuances. The sybixel-based showing is using the manner in which that each pixel on a concealing LCD is truly made of red, green

and blue pixel stripes that give you an outright high quality. Why is it possible to take frequency-domain analysis and a more explicit solution that explains what's happening in the sub-model model. According to recurrence space examination and perception, low-pass channel cut recurrence ability for sub-pixel-based deterioration is reached out past Newcastle's recurrence and extended through a novel Antilasing channel. Utilizing the accompanying proposed channels for both sub-pixel-based base example (DSD) and diode DSD (DDSD), two propelled programs, for example, DSD recurrence area investigation (DSD-FA) and DDSD recurrence space examination (DDSD-FA)) essentially. Test outcomes demonstrate that the proposed DSD-F and DDT-F can give higher outcomes when contrasted with existing sub-pixel or pixel-based inspecting strategies.

Yongbing Zhang et al [8] has proposed an introduction ward picture down examining (IDID), There is a halfway example underneath. With an introduction technique, the's IDID will probably acquire an example picture below, which will reduce the gaps between the input image and the image of the chess model. By using at least squares the algorithm, the IDID solution is obtained as a reverse operator of the solution. We design a Content-based IDID for interpolation instructions with various interpolitical coefficients. Many test attempts prove the efficiency efficiency.

Tooth, L. et al. [5] have the determination of the Luma-chroma shading particular for monochrome spots discovered uncommon highlights. These are displayed on a human visual framework based improvement issue with a two-period cost functionality modeled on the subsection-based single-color image model, which is modeled on the anti-alternating filter design and receiving a closed-form solution. Our choice of lightning throwing and other periods of time will alter the alarm in the Lama-Kroma space. The simulation results suggest that the proposed system, in addition to the usual pixel and subpixel-based modes, avoids significant colorful problems.

3.**Picture DOWNSAMPLING TECHNIQUE**

The Down Model and Sampling are two essential and generally utilized picture limits, with picture show, weight, and dynamic transmissions applications. While a practically identical two-dimensional (2D) portrayal, looking at is a decrease in the zone plan. It is ordinarily used to reduce aggregating or possibly move necessities. The spammed space contains two stages underneath another model. Quickly, changing the picture is sifted by a low exchanging pass channel, and it has a subset of the desired factor in each dimension [11]. A sample of 2D representation of an image is increasing in the spatial response. This is used to zoom in to a small area of the image, to remove the pixilation effects that appear when the lower picture is shown in relatively large frame. More recently, the following model and modeling was used in conjunction with: Lassie Compression, Implementation of Multilation Lost and Progressive Transmission. The standard modes for

base/demonstrating are Delimitation/Copy and Piliner Interpolation, which give low vision execution. The more noteworthy the utilization of the base/model, particularly the ones that improve their prescribed procedures

$$f(t) - \sum_{n=-\infty} f\left(\frac{n}{2w}\right)\left(\frac{\sin \pi(2wt-n)}{\pi(2wt-n)}\right)$$

The sample, and changes. sample is satisfactory, the signal is used as a low-pass filter anti-filter filter to reduce signal bandwidth before being modelled below; generally process (low pass channel, at that point the example beneath) is known as a delimitation. In the event that the first signal data transfer capacity is limited, then the sample signal below may be Nyquist compatible so that the sample below can be done directly without additional distillation. The sample rate does not change the signal bandwidth below model. The new sample rate is the only reason to filter the bandwidth which will become less demanding for the Nyquist and then avoid the case that causes the associating by being underneath the Nyquist least. Along these lines, in the accompanying model condition, the counter associating channel must be a low pass channel. Be that as it may, with a continuous signal sampling, the alternator-alternative filter may be filter or a filter.

4. PROPOSED WORK

Pressure guidelines JPEG, MPEG, H.26x introduction serves numerous buyers and business interactive media applications,

incorporating mixed media substance spread in its shortened structure. A progressively productive picture of demonstrating model was proposed in this paper. Here we utilized the example of the pictures beneath utilizing DWT. Our proposed methodology comprises of four functions as an input image model. shows flow sampling technique.
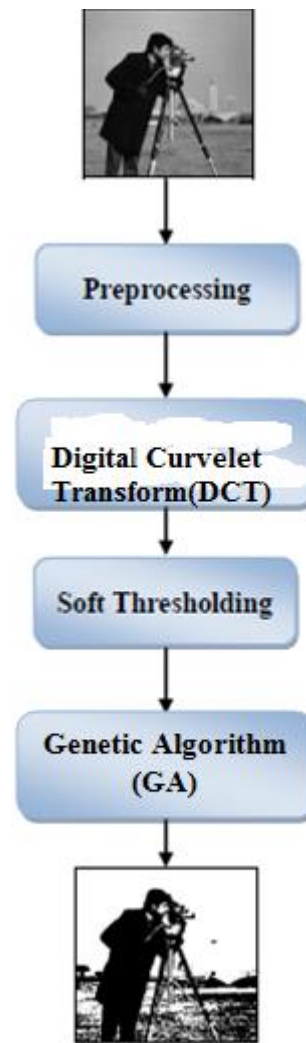

Fig.1 Proposed Flow Diagram

The four degrees of our proposed methodology are given underneath:-

• Preprocessing

• Digital Curvelet Transform

• Soft Thresholding

• Genetic Algorithm

In our proposed methodology, the info picture is set up to plan for the model beneath. At that point utilize the DVD for the picture, at that point apply the delicate edge to lessen the foundation. From that point onward, hereditary calculation is distinguished in the delicate power estimations of the film, utilizing the Euclidean separation to expel the size of the film to evacuate comparative squares. This gives the example yield of the given information picture.

4.1 Preprocessing

The information picture here is changed from RGB to Gray scale picture. The adjusted picture is then given to the movement channel contribution to diminish movement content in the image. The sifted filename was part into little squares. appeared in Fig. 2 for further procedure of picture down inspecting.
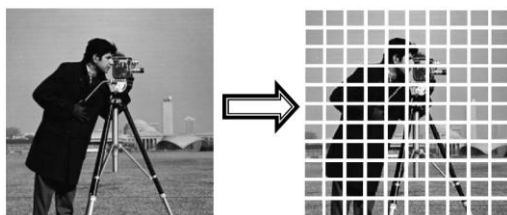

Fig. 2 Sample Segmentation of images

4.2 Digital Curvelet Transform (DCT)

After splitting the blocks into images, D.T. Each package of the D-Block category should be used. Digital Curvelet Transform [13] is used primarily to reduce the size of the film at every level, e.g., a square image of size 2i ×2i pixels at level L reduces to size 2i/2 × 2i/2 pixels at next level $L+1$. The image is decomposed into four sub images, at each level. The sub images are labeled LL, LH, HL and HH. LL corresponds to the coarse level coefficients or the approximation image. This image is used for further decomposition.
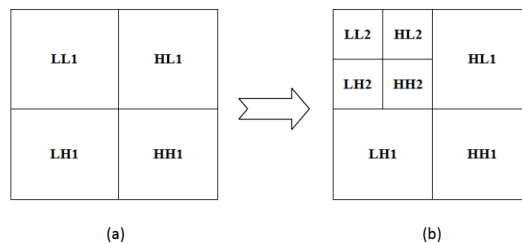

(a)   (b)

Fig. 3 (a) Level-1 DCT and (b) Level-2 DCT

After that a square is slided over the resulting picture and picture is analyzed from the upper left corner to the lower right corner. The DCT change is resolved, for each square, the DCT coefficients are taken care of as one line in the cross section . The cross section will have lines and segments, Where and speaks to number of lines and sections of information picture individually

.

The input image then proposes two distinct practices of reliable curve. The transition to mathematical change is changed in this section.These digital changes can be taken as input Cartesian arrays of linear and form f [t1, t2], 0 ≤ t1, t2 <n, which is a set of expressions by CD (j,l,K) Digital Analysis

$$CD(j,l,k) = \sum_{0 \le t1, t2 < n} f[t1, t2] \varphi_{j,l,k}^{D}[t1,t2]$$

$$D_i = \begin{cases} 0 & \text{If } S_i < threshold - \frac{range}{2} \\ f(S_i) & \text{If } threshold - \frac{range}{2} \le S_i < threshold + \frac{range}{2} \\ S_i & \text{If } S_i \ge threshold + \frac{range}{2} \end{cases} \quad (1)$$

Where each ϕ D (I,j,k) is a computerized arcade waveform (here and underneath, superscript D is" advanced "). Since the logical figuring is standard, we don't really make these advanced waveforms, which are in a roundabout way characterized by the rules; Over time they are direct unique markers speaking to columns and colums agents. We present these waveforms since it gives the capacity to clarify straightforwardness and clarify the ceaseless time hole. Two computerized changes share a typical structure, which presents key contrasts before extending.

4.3 Soft Thresholding

After using DWT for all compilers in the image, soft Thresholding is used to reduce the background in the image, so VoXels are reduced with extreme values below the initial value (set to zero or set to zero). During the visualization, these gates become more transparent. If the original value S_i of a voxel is $S_i > (threshold\ value + range/2)$ then the final filtered value D_i does not change $(D_i = S_i)$. If $S_i < (threshold\ value - range/2)$ then the voxel is deleted $(D_i = 0)$ For the values in between, a smooth function is applied: if $(threshold\ value - range/2) < S_i < (threshold\ value + range/2)$ then $D_i = f(S_i)$ according to the shape function, which in the case of the FastMip renderer, for instance, is a sinusoidal.

During the study can be used on a soft door, for example cross-coefficients in a joint-analytical analyser. These cutting coefficients are based on binary images, where intensity voices at the bottom of the vault are set to zero, and the intersections above the gateway are calculated for volumes. To keep away from sharp changes, this picture is certifiably not a legitimate paired (0 or 1) however greyscale, the middle estimations of the pixels, the force of a specific range around the portals.

4.4 Genetic Algorithm (GA)

Consequent to using a fragile gap with all of the bits of the film, GA [14] is used to recognize the amount of center points and the utmost value.In this procedure, the chromosome An is encoded as a twofold string of the proportional size L^r of the reduced histogram, such that $A = a_0, a_1, a_2, a_3, KK, a_{L-1}^r$, where the character a_i is equivalent to 0 or 1. Where demonstrates the pinnacle or valley of the histogram. In the event that ,, at that point the position shows the estimation of the limit. Subsequently the quantity of zeros-bits happened in shows number of thresholds.The qualification for a picture has characterized as pursues

$$F(k) = \rho * (Disk(k))^{1/2} + (\log_2(k))^2 \qquad (2)$$

Here $Disk(k)$ represents the within-class variance

$$Disk(k) = \sigma_w^2(k) = \sigma_T^2 - \sigma_B^2(k) \qquad (3)$$

(2)

The main term of measures the expense brought about by the inconsistency between the thresholded picture and the first picture. The subsequent term estimates the expense came about because of the quantity of bits used to speak to the thresholded picture. In this condition, is a positive weighting consistent.

The quantity of edges is controlled by tallying the quantity of zero-bits in the string and the limit esteems are dictated by the positions involved by these zero-bits in the string. The capacity has a special least, which is a significant bit of leeway. The ideal class number and as well as can be expected be controlled by the accompanying condition:

$$F(k^*) = \min \{F(k)\} \qquad (4)$$

The hereditary calculation begins with a haphazardly created populace of arrangements. The underlying populace is of fixed size . For each string in the populace , bits (0 or 1) are arbitrarily created. The present populace advances to the following populace of a similar size utilizing three standard hereditary tasks: choice, hybrid and transformation. The development procedure is iterated until a predefined number of ages are come to.

Picking is much the same as the regular survival of bile living beings. Each string is an activity worth determined by exercise assessment. The likelihood of each chose string is an extent of its activity esteem.

In this paper, the challenge assurance system is executed as seeks after: two

strings and of the present masses are heedlessly picked and the string with the best health worth is picked to have a spot with the mating pool. This strategy is reiterated, until filling a mating pool of a comparable size that the masses.

The hybrid administrator picks two strings and of the present populace. Single hybrid is connected as pursues: produce an irregular whole number inside and make two posterity by swapping every one of the characters of and after position q. The hybrid is performed with the hybrid likelihood . An arbitrary number can be created inside [0, 1], related with each pair of strings chose in the mating pool. On the off chance that the arbitrary worth is not exactly ,, at that point the hybrid is performed, generally no hybrid is performed.

Change is an infrequent adjustment of a character with a low likelihood . The proposed transformation is performed in two stages. Initial, a standard change is utilized in the accompanying manner: for each string delivered by hybrid activity, an arbitrary worth is produced inside [0, 1]. On the off chance that the arbitrary number is not exactly ,, at that point a character at an irregular position is picked and its worth is changed (for example one changes 0 to 1, or 1 to 0). Be that as it may, the hybrid and standard change administrators can make strings with a few progressive zero-bits. In this circumstance, a few limits with progressive qualities show up. To beat this bothersome circumstance, an answer comprises in keeping, among progressive zero-bits, just the first, and in changing the staying progressive zero-bits.

On account of the decreased element of the histogram, the edge esteems controlled by the GA are at lower level, for example . Therefore, the edges dictated by the GA must be extended in the first space. For this situation, every edge is duplicated by a factor , as pursues,

$$\hat{t_i} = t_i 2^r \text{, for } i = 1, \text{K } k-1 \text{, such that } \hat{t_i} \in [0 \ L]$$
(5)

After finding the entry value, each group is compared to other groups in the use of the distinctive method of Euclidean. This comparison helps you find a similar set to be removed for removal. Comparing all similar packages, after removal, the film's low output

5. RESULTS AND DISCUSSION

In this area we can discover the outcomes and discourse of the proposed technique. Our proposed picture is utilized for lessening the technique and

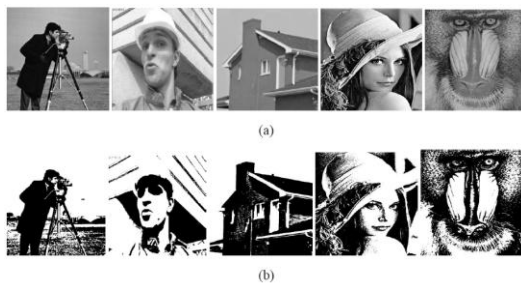given the consequences of different pictures broke down and determined in this area.

(a)

(b)

Fig. 4 (a) Input image and (b) Digital curvelet transforms Quantization output image

5.1 Performance Analysis

At first info picture changed over to dim scale picture for advantageous usefulness from the RGB size. The adjusted dim scale picture is then separated utilizing the movement channel to expel the substance of the picture in the picture. After filtration is connected, the little size pictures ought to be isolated, pursue the downsampling technique.The test picture after division is appeared in Fig.2. At that point DCT is connected to the sectioned info picture. The yield acquired by applying DWT is given in Fig. 4.

Fig. 5 (a) Input image and (b) Proposed down sampled output

By then sensitive thresholding is associated with the yield picture and a short time later GA is associated with get the undeniable downsampled picture. Fig. 5 exhibits the yield of the proposed methodology for a couple of data pictures.

Our technique utilized some sort of pictures and execution was recognized. In this segment, the exhibition examination

has been finished with the proposed ascribes utilizing Peak Signal to Noise Ratio (PSNR).

Pinnacle Signal to Noise Ratio (PSNR) The PSNR is the proportion of the most extreme power of a sign and the intensity of the contorted sound that influences the believability of its portrayal. Its worth is controlled by the accompanying condition.

$$PSNR = 20\log\left(\frac{(255)^2}{MSE}\right)dB \quad (6)$$

$$MSE = \frac{1}{MN}\sum\left(\hat{f}(x,y) - f(x,y)\right)^2 \quad (7)$$

Where MSE speaks to the Mean Square Error among information and yield pictures. Here is the all out number of pixels in the picture. is the downsampled picture and is the first information picture.

In this area, our proposed weakness strategy is contrasted with introduction subordinate Downsampling (IDID) [1] to find out more advanced performance compared to the proposed system. I give the table the values of PSNR for the present system and provide the method for the proposed collapse of two different images.

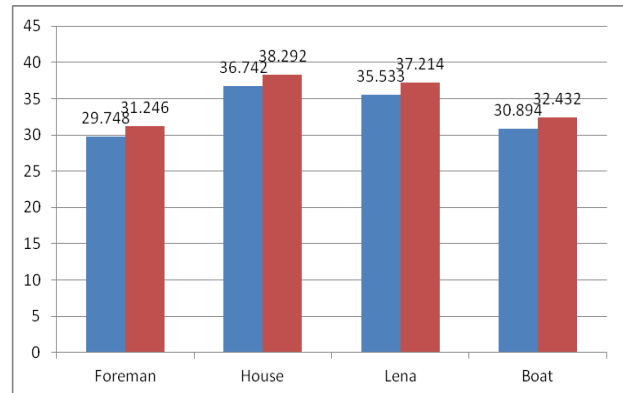Table I: PSNR values of existing and proposed methods

Fig. 6 Graphical representation of PSNR values

Drawing graphical portrayal of the PSNR estimations of the current and proposed strategy for Lena and vessel films in fig. 6 shows. By

Method	PSNR(in dB)			
	Foreman	House	Lena	Boat
Existing Method	29.748	36.742	35.533	30.894
Proposed Method	31.246	38.292	37.214	32.432

analyzing the value of PSNR, we know that the advanced performance technique is more efficient and efficient in performance than the proposed system.

6. CONCLUSION

In this article, we have proposed a hindering adequacy instrument dependent on hereditary calculation and computerized bend change. Here, when the downsampling picture is given in the information, it can without much of a stretch be utilized to channel the little squares of downsampling and partition, and afterward get the DCT picture. Lessening the proposed picture utilizes delicate edge calculation to mellow and give the best edge security. At that point the GA is utilized for appropriate

downsampling. The proposed calculation is tried with an assortment of pictures, bringing about improved yield pictures being contrasted with the presentation level. From the relative examination, we realize that this technique is more effective than the current framework.

REFERENCE

[1] Yongbing Zhang, Debin Zhao, Jian Zhang, Ruiqin Xiong, and Wen Gao, "Interpolation-Dependent Image Downsampling," IEEE Transactions on Image Processing, Vol. 20, No. 11, Nov 2011.

[2] C.O.S. Sorzano, A. Iriarte, R. Marabini, and J.M. Carazo, "Effects of the downsampling scheme on three-dimensional electron microscopy of single particles," In Proc. of the IEEE International Symposium on Intelligent Signal Processing, Cantoblanco, Spain, pp. 175-179, Aug 2009.

[3] Karl S. Ni and Truong Q. Nguyen, "Image Super resolution Using Support Vector Regression," IEEE Transactions on Image Processing, Vol. 16, No. 6, pp. 1596-1610, Jun 2007.

[4] Yongbing Zhang, Jian Zhang, Ruiqin Xiong, Debin Zhao, and Siwei Ma, "Low Bit-rate Image Coding via Interpolation Oriented Adaptive Down-sampling," IEEE Transactions on Image Processing, Vol. 18, No. 3, pp. 552-561, Mar 2009.

[5] Fang, Lu, Oscar C. Au, Ngai-Man Cheung, A. K. Katsaggelos, Houqiang Li, and Feng Zou."Luma-chroma Space Filter Design for Subpixel-based Monochrome Image Downsampling.", Image processing, IEEE Transactions, Vol.No: 22.10, pp: 3818-3829, 2013.

[6] Wu, Xiaolin, Xiangjun Zhang, and Xiaohan Wang. "Low bit-rate image compression via adaptive down-sampling and constrained least squares upconversion." Image Processing, IEEE Transactions on Vol.No:18.3, pp: 552-561, 2009.

[7] Fang, Lu, Oscar C. Au, Ketan Tang, and Aggelos K. Katsaggelos. "Antialiasing Filter Design for Subpixel Downsampling via Frequency-Domain Analysis." Image Processing, IEEE Transactions on, Vol. no: 21.3, pp: 1391-1405, 2012..

[8] Zhang, Yongbing, Debin Zhao, Jian Zhang, Ruiqin Xiong, and Wen Gao. "Interpolation-dependent image downsampling." Image Processing, IEEE Transactions on Vol.no:20.11, pp: 3291-3296, 2011.

[9] Kong Wan-zeng and Zhu Shan-an, "Multi-face detection based on downsampling and modified subtractive clustering for color images," Journal of Zhejiang University Science, Vol. 8, No. 1, pp. 72-78, 2007.

[10] Taeg Sang ChoC, Lawrence Zitnick, Neel Joshi, Sing Bing Kang, Richard Szeliski, and William. T. Freeman, "Image restoration by matching gradient distributions," IEEE Transactions on Pattern Analysis and Machine Intelligence, 2011.

[11] A. N. Skodras and C. A. Christopoulos, "Down-sampling of compressed images in the DCT domain," In Proc. of European Signal Processing Conference (EUSIPCO), Rhodes, Greece, 1998.

[12] Matthew Trentacoste, Rafa Mantiuk, and Wolfgang Heidrich, "Blur-Aware Image Downsampling, Euro Graphics, Vol. 30, No. 2, 2011.

[13] Preeti Yadav and Yogesh Rathore, "Detection of Copy-Move Forgery of Images Using Discrete Wavelet Transform," International Journal on Computer Science and Engineering, Vol. 4, No. 04, pp. 565-570, Apr 2012.

[14] Rakesh Kumar, Tapesh Parashar, and Gopal Verma, "A Multilevel Automatic Thresholding for Image Segmentation Using Genetic Algorithm and DWT," International Journal of Electronics and Computer Science Engineering, Vol. 1, No. 1, pp. 153-160, Jun 2012.

[15] Lexing ying, Laurent Demanet, Emmanuel candes,"3D Discrete Curvelet Transform", Proc.SPIC 5914, sep-2005.

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