IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 13, Issue 1, Ver. II (Jan.- Feb. 2018), PP 75-79
www.iosrjournals.org

A Comparison and Analysis of Image Resizing Using Discrete Cosine Transform Technique

Navdeep Kumar
*[*1]ECE Department, Ch. Devi Lal State Institute of Engineering & Technology, Panniwala Mota,(Sirsa),*

Abstract: *Image resizing is a need of today's world. Image resizing is required in various applications, such as transmission, storage, retrieval, and display of digital images. In this paper I went through new techniques of image resizing. During this survey it is found that image resizing in DCT domain is more efficient than the existing techniques in spatial domain due to various reasons as discussed in the subsequent part of the work. One of the techniques is implemented in MATLAB and results are shown. A comparison in terms of computational complexity is made on the basis of literature survey with one of the most popular technique in spatial domain and result is shown.*

I. Introduction

Image resizing of the digital image is to change the spatial resolution of the image. It can also be interpreted as up sampling or down sampling of the image. Image resizing is required in various applications, such as transmission, storage, retrieval, and display of digital images. For example, in different channels with varying bandwidths, the same image may be transmitted at different spatial (or spectral) resolutions. In internet applications also, for browsing a remote image (or video) database, initially down sampled images may be sent and, depending on the interest and request from the client, images of larger size are sent later. There are many techniques in spatial domain like bilinear transformation and Pixel replication. But, since images are now stored and transmitted in compressed domain, it is efficient to resize them in compressed domain only instead first transform into spatial domain then resize and again transform back to compressed domain. Widely used image compressed format JPEG uses DCT as standard for compression due to its better energy compaction property. So, manipulating image in compressed domain is actually manipulating image in DCT domain. Numerous approaches have been applied to image and video processing in the compressed domain. Among the many image manipulation processes, image resizing is a fundamental and important operation for various multimedia applications. It is demonstrated that image resizing in the compressed domain rather than in the spatial domain is generally efficient in terms of image quality and computation amount.

DISCRETE COSINE TRANSFORM(DCT)

The discrete cosine transform (DCT) is well known for its highly efficient coding performance and is widely used in many image compression applications.
The DCT of an *N* point data sequence *x(n), n* = O, l,..N - 1 is definedas:

$$C(k) = \sum_{n=0}^{N-1} 2x(n) \cos\left(\frac{(2n-1)\pi k}{2N}\right), \quad 0 \leq k \leq N-1.$$

Discrete transforms of finite-length sequences play an important role in many signal processing applications. To this end, various discrete transform families have been advanced along with the fast algorithms for their computations. Of all such transforms, the discrete cosine transform (DCT) is generally recognized as the most effective way to encode image information. **As**a result, the DCT has been adopted in the JPEG coding standard for still images and the MPEG coding standard for video images .In general, DCT décor relates the data being transformed so that the most of its energy is packed in a few of its transform coefficients.

SCHEME USED FOR IMAGE RESIZING

The given arbitrary-ratio image resizing method is performed by combining the IDCT and forward DCT of composite length sequentially. In general, a downsized image in the DCT domain can be obtained by truncating the high-frequency DCT coefficients and an upsized image is implemented by zero padding.

According to the resizing ratio, the number of truncated coefficients and the number of padded zeros are appropriately determined, and the IDCT and DCT of the corresponding lengths are performed. The proposed L/M-fold resizing is performed by the sequential operations of the IDCT and DCT. For a two-dimensional (2-D) image, the one-dimensional (1-D) sequential operations of the IDCT and DCT are performed in the horizontal direction and then in the vertical direction. Therefore, different resizing ratios can be applied to the horizontal and vertical directions, respectively. First describe the 1-D resizing method, which can be applied to a 2-D image independently in the horizontal and vertical directions. Let L/M be an irreducible fractional number. This method of L/M - fold resizing is processed with M-blocks unit, each block having a length of eight. First, the (8+q)-sample IDCT is performed for M -blocks. On this occasion, zero padding of q samples is required in advance. The inverse transformed sequences have a total of $M\times(8+q)$ samples in a group of M blocks, which are retransformed by DCT with alength of $(L\times(8+q))/M$

.We then truncate the high-frequency coefficients except eight low-frequency coefficients, thereby reconstructing L blocks of eight samples in the DCT domain. The resized image can be obtained through this IDCT and DCT processing. No further processing is needed.

For L/M -fold resizing, M consecutive 8- sample blocks are converted to L 8-sample blocks. Therefore, M 8-sample blocks are grouped. The total sample number of the original M blocks is $M\times8$. In order to perform the proposed L/M-fold resizing, the proposed method requires that the number of total samples in a group of M blocks should be a common multiple of M and L. If not, zero padding is required for each block. Constraints of the proposed resizing method are given as follows:

Constraint I: N=Common multiple of { M,L} Constraint II: $N \geq \text{Max}\{M, L\} \times 8$

Where, N is the required number of total samples in a group of M blocks,

N is determined as:

$N = M \times (8+q),\ q \geq 0$

Where, q is smallest number of zeros that need to pad in each block to satisfy constraint I.

Now perform the following steps sequentially:

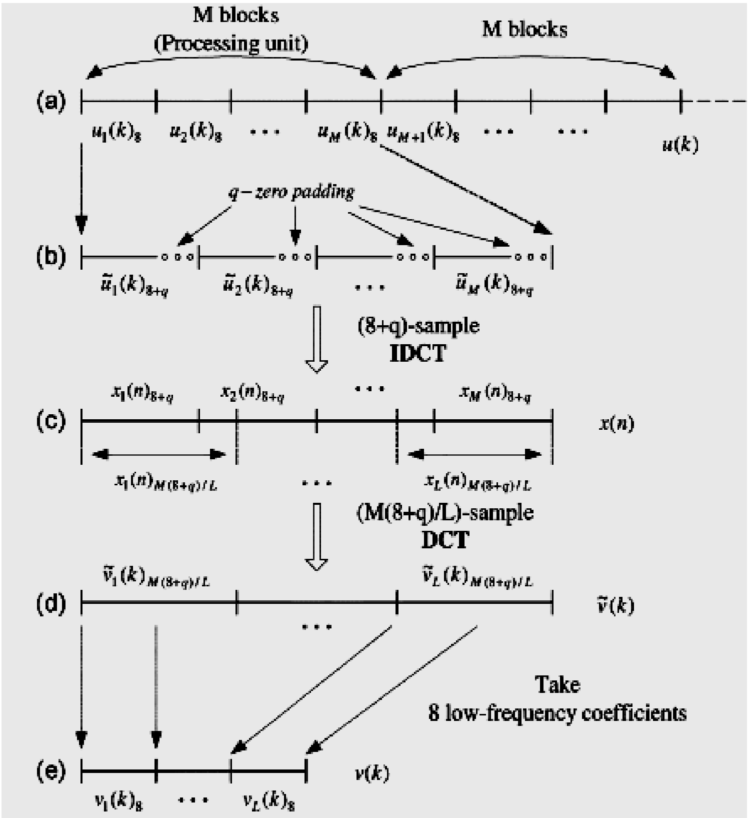
i) Take (8+q) point IDCT of each M blocks.
ii) Arrange them in L groups of $(M \times (8+q))/L$ samples.
iii) Take $(M \times (8+q))/L$ point DCT.
iv) Take 8 low frequency coefficients.

Now we have L blocks of 8 lengths each. Same procedure can now be applied along the column. Different L/M can be used.

As an example of upsizing consider M=3 & L=4.The total number of samples in 3 groups are 24. This satisfies constraint I i.e. N=Common multiple of {M,L}.But this does not satisfy constraint II i.e. $N \geq \text{Max}\{M,L\}\times 8$.Thus, we should select N=36 instead of 24 in order to satisfy constraints I and II. This requires q = 4. Then, 12-sample IDCT for 3 blocks and 9-sample DCT for 4 blocks are performed sequentially. One highest frequency coefficient is truncated for each block.

Now consider for downsizing, M=4 &L=3.The total number of samples in 4 groups are 32. 32donotsatisfyconstraintI.Onezeropaddinginto each block is required to satisfy constraints I and II.T hen take 9 point IDCT followed by 12 point DCT. Finally 8 coefficients of low frequency are taken.

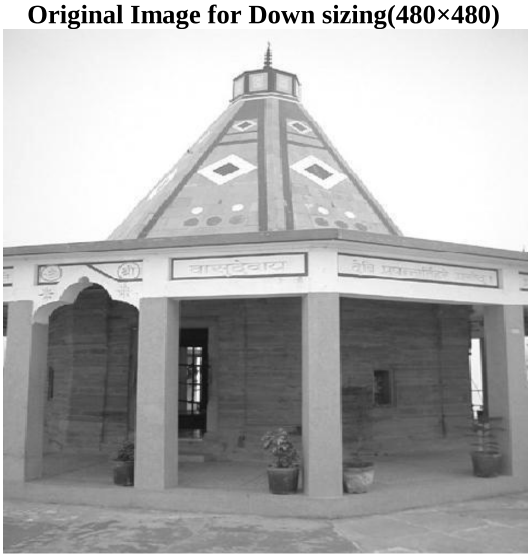
A conceptual diagram of the L/M -fold resizing is shown in fig below:



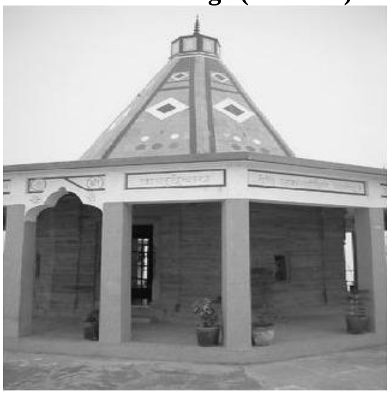
II. Result

Above mentioned technique is implemented in MATLAB. For upsizing, image of 240×240 is taken and upsized to an image of 360×360. For downsizing, image of 480×480 is taken and upsized to an image of 320×320. Results are shown below:

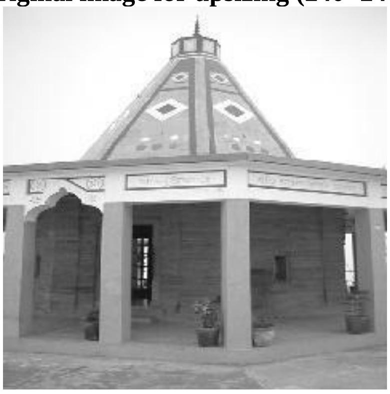
Original Image for Down sizing(480×480)



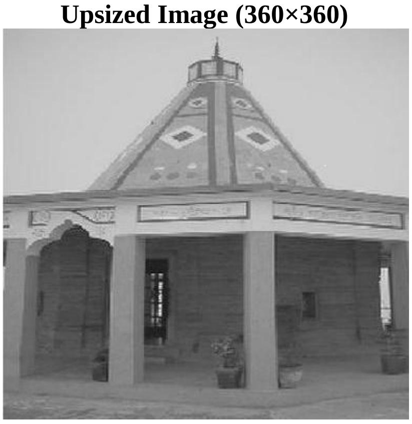
Downsized Image (320×320)



Original image for upsizing (240×240)



Upsized Image (360×360)



III. Future Scope

In this paper, I actually aimed to go through all the new techniques for image resizing mainly in the DCT domain as it is more efficient as stated earlier. Then it can be implemented and analyze them on the basis of performance and computation complexity. It was also planned to find a better scheme for the same using different algorithms. But the results can be achieved accurately after go through with accurate and efficient techniques. We can also analyze the resizing of images with different methods for achievement of better results. These things can be done in future.

IV. Conclusion

As per the literature survey made on image resizing, this method of resizing is found to be very fast as compared to the existing techniques. Also the quality is found to be better than the existing techniques. A comparison is shown in the following table.

For 3/4 fold downsizing:

Method	cations per pixel	Additions per pixel
Bilinear	6.05	13.52
This Scheme	4.05	15.48

For 4/3 fold upsizing:

Method	lications per pixel	itions per pixel
Bilinear	5.61	13.52
This Scheme	4.05	15.48

References

[1]. Young Seo Park and Hyun Wook Park, Arbitrary- Ratio Image Resizing Using Fast DCT of Composite Length for DCT-Based Transcoder, *IEEE TRANSACTIONS ON IMAGE PROCESSING*, VOL. 15, NO. 2, FEBRUARY 2006

[2]. J. Mukherjee and S. K. Mitra, "Image resizing in the compressed domain using sub-band DCT," *IEEE Trans. Circuits Syst. Video Technol.*, vol. 12,no. 7, pp. 620–627, Jul. 2002.

[3]. Sung-Hwan Jung, Sanjit K. Mitra,Subband DCT: Definition, Analysis, and Applications, *IEEETRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY*, VOL. 6, NO. 3, JUNE 1996

[4]. Jayanta Mukherjee and Sanjit K. Mitra,Image Resizing in the Compressed Domain Using Subband DCT, *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY*, VOL. 12, NO. 7, JULY 2002

[5]. H. W. Park, Y. S. Park, and S. K. Oh, "L/M-fold image resizing inblock-DCT domain using symmetric convolution," in *IEEE Trans.Image Process.*, vol. 12, Sep. 2003, pp. 1016–1034.

[6]. R C Gonzalez and R E Woods, Digital image processing, Prentice hall,Pearson.