Image Resolution Enhancement by Discrete and Stationary Wavelet Decomposition

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Abstract – This paper proposed a new image resolution enhancement technique by using discrete wavelet transform (DWT) and a stationary wavelet transform (SWT) decomposition. So to increase the resolution of image, the low resolution input image is given to DWT and SWT of technique. The DWT and SWT are divide the input image into four different sub bands i.e. Low-Low (LL), Low-High (LH), High-Low (HL), High-high (HH). These sub bands are then interpolated by using bicubic interpolation technique. The interpolated sub bands and interpolated input image are combine by using Inverse DWT (IDWT) to generate the high resolution image.

Keywords – DWT and SWT Component, Interpolation.

I. INTRODUCTION

Now day’s images are available with the different format. These formats have the different resolution. The resolution of any image is the details information of that image. So to increase the resolutions of there are some few techniques are available. But to increase the resolution of image the best technique in bicubic interpolation. With the help of DWT and SWT decomposition [1]. The interpolation technique has been used in many image processing applications are super resolution [2-3]. Multiple description coding [4] and facial reconstruction [5]. To increase the resolution of image in wavelet domain is relatively a new research topic. The DWT and SWT transforms are used to decompose. An input image into four different sub bands like Low-Low (LL), Low-High (LH), High-Low (HL) and High-High (HH). These high frequency sub bands are interpolated using bicubic interpolation technique and interpolated signals are combining by using the inverse DWT and SWT to achieve the high resolution image.

II. PROPOSE IMAGE RESOLUTION ENHANCEMENT TECHNIQUE

The main laws of image by using interpolation technique on high frequency component is edges, with is due to smoothing. To increase the resolution of image, preserving the edges is important. In this work DWT and SWT are used to preserve the high frequency component of image i.e. Low-High (LH.), High-Low (HL.), High-High (HH.) frequency component.

The output of this interpolation (The high frequency sub-bands of DWT and SWT with the interpolation factor of alpha/2) and the low resolution input image with the interpolation factor of α/2 is combining by using inverse DWT (IDWT) to achieve the high resolution image.

This proposed technique uses the one level DWT to decompose an input image into four different sub bands like LL, LH, HL, and HH. The SWT technique decomposes the input image using same db1 wavelet into four different sub bands i.e. LL, LH, HL, HH. The high frequency output i.e. LH, HI and HH of DWT and SWT technique are interpolated by using the bicubic interpolation technique with the facto of α/2.

The figure 1 shows the block diagram of propose image resolution enhancement technique.

Fig.1. Block diagram of proposed system

Fig.2. Structure of wavelet decomposition

The decomposition of image after applying one level DWT and SWT are shown in figure 2 Low-Low (LL) Low-High (LH), High-Low(HL), High-High (HH) Frequency component.

Fig.3. Structure of DWT decomposition
Fig. 4. Structure of SWT decomposition

The figure 3 and 4 shows the structure of DWT and SWT details coefficient and approximation coefficient of image Low-Low(L.L) Low-High(L.H), High-Low(H.L), High-High(H.H) frequency component

Algorithm:
Step 1: Take the low resolution input image.
Step 2: Apply DWT on Input image.
Step 3: Apply SWT on input image.
Step 4: Take the Interpolation by factor α/2 of DWT & SWT output with the input.
Step 5: Take the IDWT of interpolated signal.
Step 6: Final Output stage.

PSNR
Peak Signal to Noise Ratio (PSNR) is generally used to analyze quality of image, sound and video files in dB (decibels). PSNR calculation of two images, one original and an altered image, describes how far two images are equal.

$$PSNR(dB) = 10 \times \log \left( \frac{255^2}{MSE} \right)$$

### III. RESULTS AND DISCUSSION

Fig. 5 shows the low resolution input image of Baboon Figure 6 shows the output of DWT process. Figure 7 shows the output of SWT process. Figure 8 Shows the output of this propose technique Using DWT & SWT with High PSNR ratio.

### IV. CONCLUSION

This paper proposes image resolution enhancement technique by DWT and SWT decomposition by using bicubic interpolation. By applying DWT and SWT to image taking the interpolation and simultaneously. Interpolated low resolution image are combined by using inverse DWT to achieve the high resolution image. This Technique gives the high PSNR ratio.

### REFERENCES


