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A Review on Super Resolution Techniques

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Abstract: Image super resolution use for which require increasing resolution of image through noisy, blurred and low resolution. In this paper, we summary about the different research papers that applicable to our topic of dissertation which mentioned above. Image Super Resolution is a most important subject of research in the area of Image Processing. The "super resolution image" refers as technique to produce the high resolution of image from single or multiple low resolution image. Image resolution describe as information amount contained by images. The basically idea for Super-Resolution (SR) is that the fusion of a sequence of low-resolution (LR) which are noisy and blurred images that create a higher resolution(HR) image. For super resolution which is process of restoring and denoising of image.

Key word: super resolution, high resolution, low resolution.

I. INTRODUCTION

Super Resolution is a technique that creates the high resolution of image form single and several low resolution image. Image can get from the physical devices which are the capture digital images and camera, satellite, magnetic resonance imaging machine and microscope etc are use for that. There for demand is increase so performance of personal computing digital image processing is widely used in varies applications field. The high resolution can get through applying the suitable transformations and the overlapped regions that warped the images, interpolation. It may be possible to generate a single image with high resolution. There for increasing the high frequency parameter and remove the degradations and some limitations part of low-resolution imaging device as well as system. The requirement of high resolution is common and in computer vision application for better performance in pattern recognition and analysis of images. High resolution is of importance in medical field. In many applications require for zoom the specific area in the image for interest where in high resolution essential.

II. LITERATURE REVIEW

In review paper [1], authors Deepa K Davis and Rajesh Cherian Roy have reached to conclusion that method use have advantage with higher PSRN ratio without using any filters as compared to the existing method for super resolution.

In review paper [2], authors Sapan Naik1, Nikunj Patel have shown that in wavelet and spatial domain with effective PSRN ratio and visual quality. Also give faster algorithm for super resolution.

In review paper [3], authors Gaurav G. Bhosale, Ajinkya S. Deshmukh, Swarup S. Medasani have proposed approach with reduce noise while preserving detail. They improve the qualitative and analytical performance with less computational time.

In review paper [4], authors Huahua Chen, Baolin Jiang, Weiqiang Chen have demonstrated that a super-resolution based on image patches structure. This method have not only has better quality but less consuming time than Yang [11] method.

In review paper [5], authors Fei Zhou, Tingrong Yuan, Wenming Yang, and Qingmin Liao has presented the literature review on new learning-based SR method. Instead of linearly related dictionary, we train HR dictionary via kernel PCA, which are important for recovering image details. A compact solution is proposed for the preparation of KPCA dictionary, and leads to real time SR application.

In review paper [6], authors Lingfeng Wang, Shiming Xiang, Gaofeng Meng, Huaiyu Wu, and Chunhong Pan have established a new method for an edge-directed single-image super-resolution algorithm through using a new adaptive gradient magnitude self-interpolation. The proposed constraint HR with preserve image details or sharp edges, while suppressing the ringing, blocking, and blurring artifacts, especially along salient edges.

In review paper [7], authors Michael Elad and Arie Feuer have provided hybrid algorithm that combines the benefits of the simple ML estimator and the ability of the POCS to incorporate non ellipsoids constraints convex minimization problem We demonstrate there is an ability to restore an image with improved resolution, based on several motionless blurred, decimated, and noisy images. This model enabled the direct generalization of classic tools from restoration

In review paper [8], authors Kaibing Zhang, Dacheng Tao, Xinbo Gao that present a efficient single image SR method for images based on learning a cluster of mapping relationships between the LR and HR. The learned mapping functions is effectively and efficiently transform the input image into the expected HR image. The effective NLM-based SR enhancement algorithm for reducing edge through exploiting similarity structures in the resultant image. This approach have quantitatively and qualitatively superior to other application oriented SR methods, while maintaining relatively low time and space complexity.

In review paper [9], authors Seokhwa Jeong, Inhye Yoon, Jaehwan Jeon, Joonki Paik have established a method for multi-frame example-based super resolution algorithm by generating the dictionary based on local self-similarity and the directional similarity The proposed method removed the interpolation artifacts using the patch pairs based on the image degraded model. Also is suitable for hardware implementation in consumer imaging devices. The proposed SR algorithm produces better quality in the sense of both preserving edges and removing undesired artifacts such as ringing and noise.

In review paper [10], authors Elham Khodadadi, Hamidreza Rashidy Kanan have provided a new algorithm for super resolution of Farsi text image sequences. This method registers input LR frames in sub-pixel accuracy by Partial Sub-pixel DFT, and reconstructs a HR image. Applying NLM denoising algorithm, we achieve an image with better quantitative and visual quality results than other methods. Also it provide SR efficient and unfolded dealing with noisy images.

Comparative Analysis based on certain parameters:

- » Table Is below for parameter analysis of different methods.
- » Table II is below for Comparative Analysis based on output image.

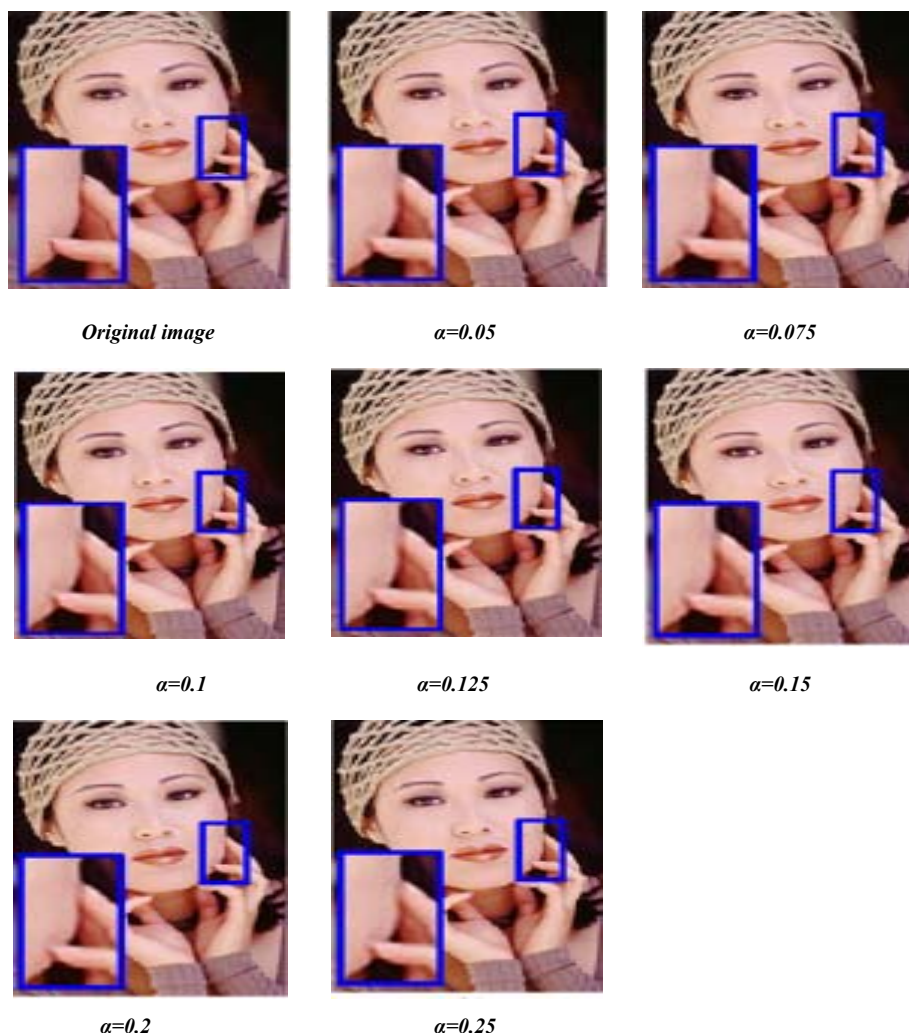
TABLE I

NO	Title of the paper	METHOD	ADVANTAGE	DISADVANTAGE	PROBABLE IMPROVE	RESULT PARAMETER
1	Hybrid Super Resolution using SWT and CT	SWT & CT	High PSNR ration Any filter can't use	Computation time is high.	To make process fast.	PSNR
2	Single Image Super Resolution In Spatial and Wavelet Domain	SPATIAL & WAVELET	Computation time is fast. It use in Wavelet as well as Spatial domain.	PSNR ration and visual quality average	Visual quality increased.	PSNR

3	Image Super Resolution with Direct Mapping and De-noising	DIRECT MAPPING	Computation time is fast. Algorithm complexity less. Reduce noise effect .	Output quality is less.	Improve quality or image.	PSNR
4	Image Super-Resolution based on Patches Structure	PATCHE STRUCTURE	High PSNR ration. Better quality with less time consuming in process.	Efficiency is less.	Performance improve in system.	PSNR-
5	Single-Image Super-Resolution Based on Compact KPCA Coding and Kernel Regression	KPCA	Noise data can recover effectively	Design is complex.	To make a easy system.	PSNR
6	Edge-Directed Single-Image Super-Resolution via Adaptive Gradient Magnitude Self-Interpolation	ADAPTIVE GRADIENT SHARPNING	It provide image detail with shared edges.	Time requirement is high.	To reduces time consumption..	RMS ERMS SSIM
7	Restoration of a Single Super resolution Image from Several Blurred, Noisy, and Under sampled Measured Images	HYBRID	The method is simple and effective	Processing speed is low.	To make fast process.	PSNR
8	Learning Multiple Linear Mappings for Efficient Single Image Super-Resolution	MLM & NLM	Input data can efficiently transform. It reduce the noise effect	The method efficiency is low.	System performance increase.	PSNR
9	Multi-Frame Example-Based Super-Resolution Using Locally Directional Self Similarity	EXAMPLE BASED	It reduce the interpolation artifact. It provide better quality.	PSNR ratio is comparably less.	Qualitative increase.	An image enlarge four time.
10	Which super-resolution algorithm is proper for Farsi text image sequences.	DFT & NLM	It provide better quantitative and quality. It reduce the noise effect.	Time required is more.	Time requirement reduce.	Input frame-250×250. Output frame-500×500.

TABLE II

Parameter \ Criteria	$\alpha=0.05$	$\alpha=0.075$	$\alpha=0.1$	$\alpha=0.125$	$\alpha=0.15$	$\alpha=0.2$	$\alpha=0.25$
RMS	12.84	12.84	12.86	12.84	12.85	12.85	12.85
ERMS	18.76	18.78	18.67	18.82	18.84	18.89	18.94
SSIM	0.767	0.767	0.768	0.767	0.766	0.766	0.765



III. CONCLUSION

In this paper, I have mentioned the basic concepts for super resolution of image. My future work is to apply new or modified some method for better result in super resolution image. Recently there are many methods and techniques providing image super resolution. Therefore, my future work is based on the wavelet domain and will be conducted and comparison will be done to see which algorithm works better for resolution of image.

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