ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 4, Issue 1, pp: (305-308), Month: January - March 2016, Available at: www.researchpublish.com

Literature Survey on Super Resolution of Images

[1]Shefna Salam, [2]Surya Surendran, [3]Josmy George

[1, 2] IV[th] year BTech Students, MBCCET Peermade, Idukki, Kerala, India
[3]Assistant Professor, MBCCET Peermade, Idukki, Kerala, India

Abstract: **Super Resolution of images is the construction of a High Resolution (HR) image from a Low Resolution (LR) image input. Super Resolution refers to the task of constructing a high resolution enlargement of a given low resolution image. However, image super-resolution problem is an inherently ill-posed problem, where many HR images may produce the same LR image when down-sampled. As a result, how to generate an HR image with good visual perception and as similar as its ground truth has become the goal of image super-resolution. There has been many research works in this field in recent years, which can be mainly classified into three categories: interpolation based approaches, learning based approaches and reconstruction based approaches.**

Keywords: **single image super resolution, gradient profile sharpness, gradient profile transformation.**

I. INTRODUCTION

One of the most important quality metrics of digital images is super resolution. Despite steady increase of native sensor resolutions of digital cameras and scanners, new applications will always demand higher resolution of images. Image interpolation is an algorithmic means to increase the native resolution of an input image. An obvious application of image interpolation is the reproduction of images captured by digital cameras for high quality prints in magazines, catalogs, wall posters, or even home use. The interpolation based approaches are the basic image super-resolution methods, where currently the bi-linear interpolation and bi-cubic interpolation are still very popular in practice. Interpolation based approaches have high computation speed and tends to blur high frequency details if the up-scaling ratio is large and if the low-resolution image is generated with anti-aliasing operation. The learning-based approaches assume that the lost high frequency details in LR images can be retrieved and hallucinated from a dictionary of image patch pairs.

II. EXISTING SYSTEM

Image Super Resolution using multi-surface fitting [1] is a new interpolation based method of image super-resolution reconstruction. The idea is using multi-surface fitting to take full advantage of spatial structure information. Each site of low-resolution pixels is fitted with one surface, and the final estimation is made by fusing the multisampling values on these surfaces in the maximum *a posteriori* fashion. With this method, the reconstructed high-resolution images preserve image details effectively without any hypothesis on image prior. An image SR reconstruction framework using multi-surface fitting is presented here. It creates one surface for every LR pixel. These surfaces can effectively retain the image details such as image gradients, curvatures, or even higher order information. Each surface has different weights in estimation of the HR intensity values. In the MAP frame, the surfaces with smaller noise and errors tend to have greater contributions.

The multi-scale dictionary [2] based hallucination is based upon the following two observations. First, the local structures in a natural image usually tend to repeat themselves many times, both within the same scale and across different scales. The details missing in a local structure at a smaller scale can be estimated from its similar patches at a larger scale.

Secondly, different images prefer different patch sizes for optimal representation. For instance, the major edges prefer a larger scale while the sophisticated details tend to a smaller one. Therefore, it is important to jointly represent an image at different scales. Considering the above cues, this paper introduces a multi-scale dictionary representation to example-based hallucination. Then reformulate it as a hallucination regularization term for the reconstruction based SR framework to maintain visual details. There are three fundamental stages. Generating training samples from the pyramid images of the LR input, learning multi-scale dictionary, optimizing a unified energy function, in which the HR reconstruction term and finally the local as well as non-local regularization terms, and sparse hallucination regularization term are combined together and the gradient decent method is used to find a local optimal solution to the reconstructed HR image.

Landmark image super-resolution by retrieving web images [3] proposes a new super-resolution scheme for landmark images by retrieving correlated web images. Using correlated web images significantly improves the exemplar based SR. Given a low-resolution image, we extract local descriptors from its up-sampled version and bundle the descriptors according to their spatial relationship to retrieve correlated high-resolution images from the web. Though similar in content, the retrieved images are usually taken with different illumination, focal lengths, and shot perspectives, resulting in uncertainty for the HR detail approximation. To solve this problem, we first propose aligning these images to the up-sampled LR image through a global registration, which identifies the corresponding regions in these images and reduces the mismatching. Second, we propose a structure-aware matching criterion and adaptive block sizes to improve the mapping accuracy between LR and HR patches. Finally, these matched HR patches are blended together by solving an energy minimization problem to recover the desired HR image.

Reconstruction and example based Super Resolution (SR) methods [4] are promising for restoring a High Resolution (HR) image from Low Resolution (LR) images. The interpolation-based schemes that do not use extra assisted information, suffer from blurring artifacts because HR details are difficult to infer given only a single LR image. Multi-image-based methods fuse multiple LR images of the same scene to provide additional information for extracting details. Methods in this category generally perform better than methods that use only a single LR image, but it is still hard to recover high-frequency details when the magnification factor is large. Exemplar-based methods build a training set of HR/LR pair patches to infer HR patches from LR patches. By using external HR images for additional information, exemplar-based methods are able to introduce new and plausible HR details. However, the training set is generally fixed, thus limiting the SR performance.

Image Super-Resolution (SR) has been extensively studied to solve the problem of limited resolution in imaging devices for decades. It has wide applications in video surveillance, remote imaging, medical imaging, etc. The idea of SR is to reconstruct a High-Resolution (HR) image from aliased Low-Resolution (LR) images. There are four main classes of methods to estimate the pixel values in HR grids, i.e., frequency-domain approaches, learning-based approaches, iterative HR image reconstruction techniques and interpolation-based approaches.

Given a generic LR image, to reconstruct a photo-realistic SR image and to suppress artifacts in the reconstructed SR image, in this paper it tells about a multi-scale dictionary to a novel SR method that simultaneously integrates local and non-local priors. The local prior suppresses artifacts by using steering kernel regression to predict the target pixel from a small local area. The non-local prior enriches visual details by taking a weighted average of a large neighborhood as an estimate of the target pixel. Essentially, these two priors are complementary to each other. Experimental results demonstrate that the proposed method can produce high quality SR recovery both quantitatively and perceptually.

III. PROPOSED SYSTEM

The main goal of single image super-resolution is to construct a high resolution (HR) image from a low image. There has many research works done in this field it can be classified into three categories: interpolation-based approaches, learning-based approaches and reconstruction-based approaches. More sophisticated interpolation models have also been proposed, like auto regression model, multi-surface fitting model, edge directed models, sparse representation models and ICBI (Interactive Curvature Based Interpolation) algorithm. Interpolation-based approaches always have fast computation speed compared to other methods.HR images are used in many application fields such as remote sensing, biometrics identification, medical imaging, and so on.

A novel edge sharpness metric GPS (gradient profile sharpness) is extracted as the eccentricity of gradient profile description models, which considers both the gradient magnitude and the spatial scattering of a gradient profile. To describe gradient profile shapes here propose two models such as triangle model and mixed Gaussian model [5]. The Triangle Model describes that, when the edges are sharp with small intensities the extracted gradient profiles are always short with no tails. Mixed Gaussian Model describes that, when edges are smooth, gradient profiles become longer and profile shapes become complicated with heavy tails. And these two methods describe gradient profiles with different lengths and complicated asymmetric shapes, which are more flexible to produce better fitting performance. The proposed metric GPS consider both gradient profile's magnitude and spatial scattering, which emphasis the impact of illumination contrast on human visual perception. GPS can represent edge sharpness perceptually well. Experiments are conducted to evaluate the SR approach, and they generate superior HR images with better visual similarity and lower reconstruction error.

The gradient profiles are transformed under the constraint [5] that the sum of gradient magnitude and the shape of gradient profile should be consistent during transformation. Based on these constraints, gradient profiles are enhanced according to their original shapes, which makes the generated HR image more close to ground truth. And also propose a method of merging of two or more images. And in this merging method crop a part from one image and also crop a part from other image and then we can merge these two images into one. For the evaluation of gradient profile fitting performance, for each gradient profile if there is less than eight extracted profile points, the triangular model is used. Else both the triangle model and mixed Gaussian model. GPS is a method that is proposed to estimate the parameter of GPS transformation relationship automatically.

The proposed approach has a linear GPS transformation relationship between different image resolutions, where its validity is proved by PPCC values. Moreover, the parameter of GPS transformation model can be estimated automatically for each specific image super-resolution application. During gradient profile transformation three constraints are proposed to preserve the total energy and shape of original gradient profile, sum of profile gradient must be unchanged and the profile gradient magnitude sum represent the integration of the first derivation of image luminance and it implies the luminance difference around edges and it should consistent during gradient profile transformation, the shape of the gradient profile should be consistent with its original profile, to avoid edge shifting, the transformed gradient profile must keep its peak position unchanged. Based on these three constraints gradient profile transformation models can be proposed for triangular model and mixed Gaussian model.

The framework of the proposed algorithm can be divided into four parts: Extract GPS from the two gradient profile description models, Estimate GPS transformation and their relationship in different image resolutions, Transform gradient profile to generate the target gradient in HR image, Solve the HR reconstruction model based on target gradient field.

IV. CONCLUSION

The gradient constraint helps to sharpen the details and suppress ringing or jaggy artifacts along edges. Two gradient profile description models are proposed for representing gradient profiles with different lengths and different complicated shapes. The reconstruction-based method produces sharper edges and suppresses unwanted artifacts by taking local and non-local priors as regularization terms. Based on the transformed GPS, two gradient profiles transformation models are proposed, which can keep the profile magnitude sum and profile shape consistent during the transformation. The advantages of the gradient profile prior is both small scale and large details can be well recovered in the HR image.. Two gradient profile description models are proposed for representing gradient profiles with different lengths and different complicated shapes. Then, GPS is defined, and a method is proposed to estimate the parameter of GPS transformation relationship automatically. Based on the transformed GPS, two gradient profiles transformation models are proposed, which can keep the profile magnitude sum and profile shape consistent during the transformation. Finally, the transformed gradients are utilized as priors in the high resolution image reconstruction.

REFERENCES

[1] F. Zhou, W. Yang, and Q. Liao, "Interpolation-based image super resolution using multisurface fitting," IEEE Transactions on Image Processing, vol. 21, no. 7, pp. 3312–3318, 2012.

[2] K. Zhang, X. Gao, D. Tao, and X. Li, "Multi-scale dictionary for single image super-resolution," in IEEE Conference on Computer Vision and Pattern Recognition. IEEE, 2012, pp. 1114–1121.

[3] Yue, X. Sun, J. Yang, and F. Wu, "Landmark image super-resolution by retrieving web images," IEEE Transactions on Image Processing, vol. 22, no. 12, pp. 4865–4878, 2013.

[4] S. Yang, M. Wang, Y. Chen, and Y. Sun, "Single-image super-resolution reconstruction via learned geometric dictionaries and clustered sparse coding," IEEE Transactions on Image Processing, vol.21, no.9 pp 4016–4028, 2012.

[5] Single Image Super-Resolution Based on Gradient Profile Sharpness Qing Yan, Student Member, Yi Xu, Member, Xiaokang Yang, Senior Member, and Truong Nguyen Fellow, IEEE.

.