

SUPER RESOLUTION OF IMAGES USING HYBRID APPROACH

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Abstract— Super Resolution is a process of producing a high spatial resolution image from one or more Low Resolution (LR) observation. The resolution of an image is defined as the amount of fine details that are visible. Nowadays Super-resolution image reconstruction is a active area of research, as it is capable of overcoming some resolution limitations of low-cost imaging sensors such as Cell phone cameras. This allows better utilization of the growing capability of high-resolution displays such as high-definition LCDs. Such resolution enhancing technology is important in medical imaging and satellite imaging where diagnosis or analysis from low-quality images can be extremely difficult .We have proposed the approach for enhancing the resolution of images. We exploited the shift and motion based robust super-resolution (SR) algorithm [1] and the diffusion image regularization method proposed in [2] to obtain the alias free and jerk free smooth SR image.

Keywords— Super-resolution, Motion estimation, Regularization, Reconstruction, Pixel.

I. INTRODUCTION

Super-resolution is the most widely and extensive area of research for decades [3] to solve the problem of limited resolution by image acquisition devices. It has wide applications in video surveillance, remote imaging, medical imaging etc. Resolution enhancement or super-resolution is the process of obtaining high resolution images from one or more LR images. Super-resolution has been applied primarily to spatial and temporal resolution enhancement. Increasing the resolution of image sensor is one way of increasing the resolution of the acquired images. This solution, however, may not be feasible due to the increased associated cost of imaging devices and the fact that shot noise increases during acquisition as the pixel size becomes smaller. Furthermore, increasing the chip size to accommodate the larger number of pixels increases the capacitance, which in turn reduces the data transfer rate.

High resolution means that pixel density within an image is high, and therefore a high resolution image can offer more details that may be critical in several applications. The elements of image processing are :

- (i) Image acquisition devices i.e. video camera scanner or a frame capture
- (ii) Data processing and storage module i.e. memory
- (iii) Display device e.g., monitor, printer, etc.

Paper is organized as follows: Section II enumerates description of the system. Section III represent the experimental result. Section IV represent the conclusion.

II. DESCRIPTION

2.1.Motion estimation

Given a sequence of images taken from a moving camera, they are registered with sub-pixel. The sub-pixel registration enables image enhancement with respect to improved resolution and noise cleaning.

The estimation of relative motion parameters between the reference image and each of the other input images is based on the following property: The amplitude of the Fourier transform of an image and the mirrored version of the amplitude of the Fourier transform of a rotated image have a pair of orthogonal zero-crossing lines. The angle that these lines make with the axes is identical to half the rotation angle between the two

images. This algorithm uses a three-stage coarsest to finest procedure for rotation angle estimation with a wide range of degree accuracy.

2.2. Robust Super-resolution

The fundamental image operation such as sampling, convolution and warping are linear operator. This can be represented as metrics operating on image matrix vectors. Robust SR approach proposed by Assaf Zomet et al [4] is robust to outliers caused by model inaccuracies and fast moving object. The resolution of inliers is enhanced in case of if it is presenting at least half of the input images.

The block diagram of our framework is shown in Figure1

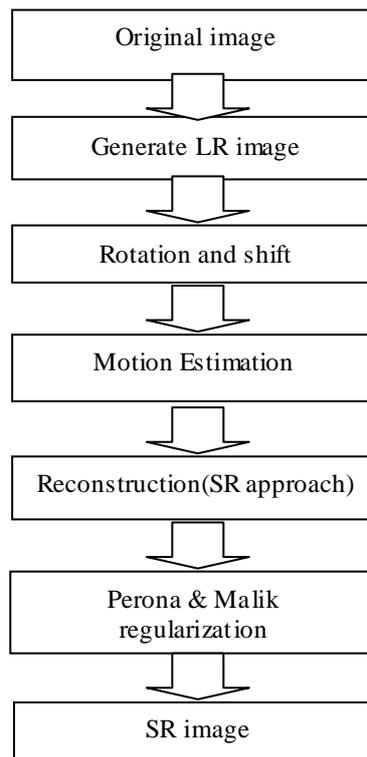


Figure 1 Flow chart for our System

2.3. Regularization

In image recovery, the regularization has been introduced to prevent over fitting between a recovered image and a noisy observation. In the regularization of an image, the smoothness of the image is assumed. The cost function, that is minimized during the regularization, is defined as a sum of the approximation error term and the smoothness penalty of the image. In a typical image regularization problem, one seeks to minimize the sum of two terms. The first is an error metric measuring the error between the signal estimate and a noisy observation, the second is a regularization term measuring the complexity of the estimate. It basically consists of simplifying a signal or an image, in a way that only interesting features are preserved except unimportant data. It is useful to restore images corrupted by noise. There are various regularization techniques have been proposed. The most common regularization technique includes linear regularization and tikhonov regularization (Isotropic diffusion). They have used Euclidean norm to minimize the residual error. But the smoothing process does not only reduce the noise and also blurs important structural features such as the edges and contours, thus making them hard to identify, so regularization via anisotropic Diffusion or (diffusion based regularization) [5] preferably most suitable.

Perona and Mailik [2] proposed the regularization as a diffusion model that depends on the norm of gradient of the image. Isotropic diffusion regularization could dislocate structured information when mapping from finer to coarser grids, such as in the case of inverse problem solvers which use multi grid methods. Spatially Adaptive regularization for alias image based on Constrained Least Squares [6][7] proposed robust approach in the presence of the severe registration error. The condition can be improved by singular value in decomposition of deblurring matrix in TSVD [8] method changed a problem from ill posed to well-posed.

III. EXPERIMENTAL RESULT

In this we present the result analysis of our proposed algorithm. We generate LR images from original image. Then HR images were reconstructed by the proposed methods. We get HR image using Vandewalle et al. (Motion estimation algorithm) and Robust Super-resolution (Reconstruction algorithm) and finally apply regularization (Perona and Malik) approach and get SR image. Here is the image reconstruction results of Ganesha.jpg with interpolation factor upto $k=4$.



Figure 2. Results of Ganesha.jpg (a) LR image (150x200), (b) Robust SR image (600x800), (c) Reconstruct using our hybrid approach (600x800)

IV. CONCLUSIONS AND FUTUREWORK

We present Super smart Resolution technique for alias and shifted images in which mainly use Vandewalle motion estimation with robust super-resolution reconstruction followed by regularization. We have applied the algorithm on image up to resolution factor 4. We refer images with high-resolution to obtain a better classification of regions in the multi spectral image, accurate face recognition and accurate detection of tumour in a medical image. We will work on implementing regularization techniques for regularization step in our technique and comparative analysis can be analysed. So, we will improve video super resolution by motion estimated robust super-resolution with linear regularization in our technique.

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