**Progressive Image Denoising Through Hybrid Graph Laplacian Regularization: A Unified Framework**

**ABSTRACT:**

Recovering images from corrupted observations is necessary for many real-world applications. In this paper, we propose a unified framework to perform progressive image recovery based on hybrid graph Laplacian regularized regression. We first construct a multiscale representation of the target image by Laplacian pyramid, then progressively recover the degraded image in the scale space from coarse to fine so that the sharp edges and texture can be eventually recovered. On one hand, within each scale, a graph Laplacian regularization model represented by implicit kernel is learned, which simultaneously minimizes the least square error on the measured samples and preserves the geometrical structure of the image data space. In this procedure, the intrinsic manifold structure is explicitly considered using both measured and unmeasured samples, and the nonlocal self-similarity property is utilized as a fruitful resource for abstracting a priori knowledge of the images. On the other hand, between two successive scales, the proposed model is

extended to a projected high-dimensional feature space through explicit kernel mapping to describe the interscale correlation, in which the local structure regularity is learned and propagated from coarser to finer scales. In this way, the proposed algorithm gradually recovers more and more image details and edges, which could not been recovered in previous scale. We test our algorithm on one typical image recovery task: impulse noise removal. Experimental results on benchmark test images

demonstrate that the proposed method achieves better performance than state-of-the-art algorithms.

**EXISTING SYSTEM:**

A vast variety of impulse noise removal methods are available in the literature, touching different fields of signal processing, mathematics and statistics. From a signal processing perspective, impulse noise removal poses a fundamental challenge for conventional linear methods. They typically achieve the target of noise removal by low-pass filtering which is performed by removing the high-frequency components of images. This is effective for smooth regions in images.

One kind of the most popular and robust nonlinear filters is the so called decision-based filters, which first employ an impulse noise detector to determine which pixels should be filtered and then replace them by using the median filter or its variants, while leaving all other pixels unchanged.

**DISADVANTAGES OF EXISTING SYSTEM:**

* The impulse noise remover algorithm is difficult because edges which can also be modeled as abrupt intensity jumps in a scan line are highly salient features for visual attention.
* For texture and detail regions, the low-pass filtering typically introduces large, spurious oscillations near the edge

**PROPOSED SYSTEM:**

In this paper, we propose a unified framework to perform progressive image recovery based on hybrid graph Laplacian regularized regression.In this framework, image denoising is considered as a variational problem where a restored image is computed by a minimization of some energy functions. Typically, such functions consist of a fidelity term such as the norm difference between the recovered image and the noisy image, and a regularization term which penalizes high frequency noise. We utilize the input space and the mapped high-dimensional feature space as two complementary views to address such an ill-posed inverse problem. The framework we explored is a multi-scale Laplacian pyramid, where the intra-scale relationship can be modeled with the implicit kernel graph Laplacian regularization model in input space, while the inter-scale dependency can be learned and propagated with the explicit kernel extension model in mapped feature space. In this way, both local and nonlocal regularity constrains are exploited to improve the accuracy of noisy image recovery

**ADVANTAGES OF PROPOSED SYSTEM:**

* Both local and nonlocal regularity constrains are exploited to improve the accuracy of noisy image recovery.
* The proposed framework is powerful and general, and can be extended to deal with other ill-posed image restoration tasks.
* Image noise remover as well as image denoising are done to increase the efficieny

**SYSTEM ARCHITECTURE:**

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**SYSTEM REQUIREMENTS:**

**HARDWARE REQUIREMENTS:**

* System : Pentium IV 2.4 GHz.
* Hard Disk : 40 GB.
* Floppy Drive : 1.44 Mb.
* Monitor : 15 VGA Colour.
* Mouse : Logitech.
* Ram : 512 Mb.

**SOFTWARE REQUIREMENTS:**

* Operating system : Windows XP/7.
* Coding Language : MATLAB
* Tool : MATLAB R 2007B

**REFERENCE:**

Xianming Liu, Member, IEEE, Deming Zhai, Member, IEEE, Debin Zhao, Member, IEEE, Guangtao Zhai, Member, IEEE, and Wen Gao, Fellow, IEEE.”**Progressive Image Denoising Through Hybrid Graph Laplacian Regularization: A Unified Framework**”.IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 23, NO. 4, APRIL 2014