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A Novel Profuse Clustering Technique for Image Denoising

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Abstract

Digital images assume a vital part both in day by day life applications, for example, satellite TV, computed tomography, magnetic resonance imaging and additionally in ranges of research and innovation, for example, cosmology and geographical information systems. An expansive segment of computerized image preparing incorporates image restoration. Image restoration is a technique for removal or decrease of corruption that are caused amid the image catching. Corruption originates from obscuring as well as commotion due to the electronic and photometric sources. Obscuring is the type of data transfer capacity decrease of images caused by flawed image development process, for example, relative movement amongst camera and unique scene or by an optical framework that is out of core interest. Image Denoising is an important pre-processing task before further processing of the image like segmentation, feature extraction, texture analysis, etc. which removes the noise while retaining the edges and other detailed features as much as possible. This noise gets introduced during acquisition, transmission & reception and storage & retrieval processes. This paper presents a novel pre-processing algorithm which is named as Profuse Clustering Technique (PCT) based on the super pixel clustering. K-Means clustering, Simple Linear Iterative Clustering, Fusing Optimization algorithms are involved in this proposed Profuse Clustering Technique and is further used for denoising the Lung Cancer images to get the more accurate result in the decision making process.

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Keywords: Superpixel Clustering, K-Means Clustering, Profuse Clustering Technique, Fusing Optimization algorithm, Simple Linear Iterative Clustering, Denoising.

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1. Introduction

An important stage in the image processing and computer vision is the preprocessing stage. The filtering methods, image denoising methods are involved in the stage of pre-processing of the images. In the recent years, in the pre-processing technique, super pixels clustering algorithms has gained attention among many researchers. By using the normalized cuts (N-Cuts), the uniform regions are created. The sharing of similar features by the cluster of pixels is formally known as super pixels. Most vision problems like Object detection [2], reconstruction [3], tracking [4], classification [18], video/image segmentation [5-9], motion estimation [10] and other applications [11] saliency, it is used to reduce the cost of computation since, it uses a mid-level unit viz. Normalized Cut [12], Simple Linear Integration Clustering (SLIC) [13], Linear Spectral Clustering (LSC) [14], Entropy Rate (ERS) [15].

Each super pixel segmentation has its own pros and cons. With including the properties like regular shapes, decreased computational complexity, better boundary adherence, compact constraints, it is difficult to formulate the real-time and high quality super pixel algorithms. To get the better compress representation of the visual with higher computation rate, the pixels are replaced by means of super pixels. The major issues in the huge quantity of image processing applications, the computation cost is high in the pre-processing step. Without affecting the accuracy of the segmentation, the super pixels are produced quickly by many super pixels algorithm but SLIC becomes more famous. Still there are some improvements needed for super pixel algorithm according to reduce the cost of computation and boundaries adherence.

2. Simple Linear Iterations Clustering Method (SLIC)

In the Simple Linear Iteration Clustering (SLIC) algorithm, the super pixels are evenly sized is represented by k, N is used to depict the image pixels. The weighting distance between the normalizing of spatial proximity and color similarity in a region of 2S× 2S where the coordinates in the region is xy. The similarity measure is done by applying K-Means clustering in the SLIC algorithm. The S value is represented by NK = √(N/K). Among the eight clusters in the adjacent side, the pixels may fall in any of the adjacent side cluster.

The recurrent practical method is the K-Means clustering algorithm. The extensive collection of many applications, in the field of computer vision, to achieve the great processing efficiency and good robustness, an effective clustering exploration tool called K-means algorithm is used. Depend upon the initial cluster, and then the results of clustering are very sensitive. The distribution amount of clustering point is related to the complexity of computation and for a local optimal solution it is suitable ultimately coverage. SLIC takes two parameters: the ostensible size of the locales area measure and the quality of the spatial regularization regularize. The image is first isolated into a lattice with step area estimate. The focal point of every framework tile is then used to introduce a comparing k-means. At last, the k-means focuses and groups are refined by utilizing the Lloyd algorithm, yielding portioning the image. As a further limitation and rearrangements, amid the k-means cycles every pixel can be allotted to just the 2 x 2 focuses relating to framework tiles nearby the pixel. The parameter regularizer sets the exchange off between grouping appearance and spatial regularization.

3. Pre-Processing Profuse Clustering Technique (PCT) for image denoising

In the proposed Profuse Clustering algorithm, the following steps are involved for the image denoising and image segmentation.

Algorithm 1: Profuse Clustering Algorithm

1: Input image X with white Gaussian noise.
2: Set parameters: noise variance φ, superpixles number Ns, cluster number K.
3: **Procedure 1:** This procedure contains the initial super pixel by SLIC algorithm.
4: Utilize K-Means clustering method to group super pixel into K cluster to form sub datasets $\{P_k\}$ $\{P_k\}_{k=1}^{K}$.
5: **Procedure 2**: This procedure contains the Refinement method for super pixels. It fuse the super pixels.
6: Repeat till the entire super pixels end.
7: Reconstruct the image and output the denoised image Y.

Procedure 1: Initial Super pixel by Simple Linear Iteration Clustering (SLIC) algorithm