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Simulation and Analysis Of Advanced Transform Based Image Segmentation

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Abstract: **An important task in image processing is to segment the given image into more meaningful regions and to label the individual regions. Texture segmentation is used to mark out the boundary between different textures according to texture cues. Human is sensitive to three texture properties: repetition, directionality and complexity.Image segmentation can be classified into three categories: A) Supervised. – These methods require the interactivity in which the pixels belonging to the same intensity range pointed out manually and segmented. B) Automatic. – This is also known as unsupervised methods, where the algorithms need some priori information, so these methods are more complex, and C) Semi-automatic that is the combination of manual and automatic segmentation.**

I. INTRODUCTION

Image segmentation is often considered to be the most important task in computer vision. However, the segmentation in images is a challenging task due to several reasons: irregular and dispersive lesion borders, low contrast, artifacts in the image and variety of colours within the interest region. Therefore, numerous methods have been developed for image segmentation within applications in the computer vision.

Some of practical applications of image segmentation are: the medical imaging tasks that consist of location of tumours and other pathologies, recognition of the objects in images of remote sensing obtained via satellite or aerial platforms, automated-recognition systems to inspect the electronic assemblies, biometrics, automatic traffic controlling systems, machine vision, separate and track regions appearing in consequent frames of an image sequence, and finally, the real time mobile robot applications employing vision systems. Numerous methods have been developed in the segmentation, among them: Fuzzy C-Means (FCM) clustering; Gradient Vector Flow Snakes (GVF snake), which is distinguished from all previous snake formulations that are near to external forces of ROI. Also, there exist other approaches: the Thresholding algorithm that uses the region growing process determining the threshold surface by interpolating the image grey levels at points where the histogram value is high, and, finally, indicating probable object edges; Mean Shift Clustering algorithm, where the main idea is to treat the points in the D-dimensional feature space as an empirical probability density function with dense regions in the feature space that correspond to the local maxima and the data point associated to the point of interest that are considered as the members of the same cluster; the Statistical Region Merging algorithm, where the reconstruction of regions on the observed image, based on an unknown true image is employed.

II. EXISTING SYSTEM

The idea of the existing approach is consists in employing the feature extraction in WT space before the segmentation process where the main difference with other algorithms presented in literature is in usage the information from three colour channels in WT space gathering the colour channels via a nearest neighbour interpolation (NNI) process.

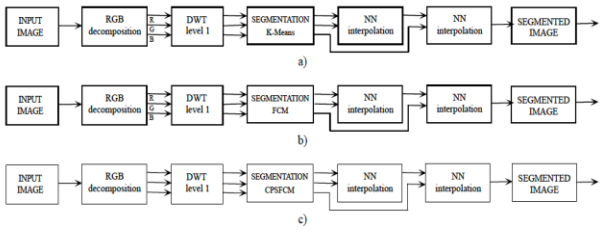

Figure 1: Block diagram of the proposed algorithms a) WK-MEANS b) W-FCM c) W-CPSFCM.

2.1. *Limitations Of The Existing System*

The wavelet has the disadvantages of having higher m term approximation error. And because of that the wavelet transforms needs more number of decomposition to exactly carry the edge details while re building the image. Thus the curve based edges are not prominent during the wavelet decomposition while it is occurring.

As there are disadvantages like the artifacts in the wavelet transform domain and the little higher m term approximation error an alternative to wavelet transform technique is needed to preserve the edge energies. This increases the computational time and the computational cost.

III. PROPOSED METHOD

The different feature extraction techniques are the improvement of the wavelet transform like the curvelet transform is used. The improvement in the clustering based implementation is carried out in the current project.

The Curvelet transform is a higher dimensional generalization of the Wavelet transform designed to represent images at different scales and different angles. Curvelets enjoy two unique mathematical properties, namely:

1. Curved singularities can be well approximated with very few coefficients and in a non-adaptive manner - hence the name "Curvelets".

2. Curvelets remain coherent waveforms under the action of the wave equation in a smooth medium.

The proposed method follows the cluster based image segmentation method. The comparative analysis of the wavelet transform and the curve let transform based segmentation implementation is carried out and the results are analyzed and tabulated. The method would use both the soft and the hard clustering techniques. In the hard clustering methods the K-means clustering and Nearest Neighbor Clustering is used. And in the soft clustering methods Fuzzy C means clustering is used.

The curvelet has the advantages of acquiring the curve energies even when the little number of coefficients occurs. And the curve portions are emphasized by lesser number of decomposition levels. Thus curvelet is used instead of the wavelet transform for its performance having lesser m term approximation error compared to wavelet transform. And also curve let preserves the edge portions of the images better than the wavelet transform platform. The edge artifacts occurring in the wavelet transform is got rid of while preserving the edge in very less decomposition levels.

The block diagrams of the two implementations are carried as shown in the following figure:

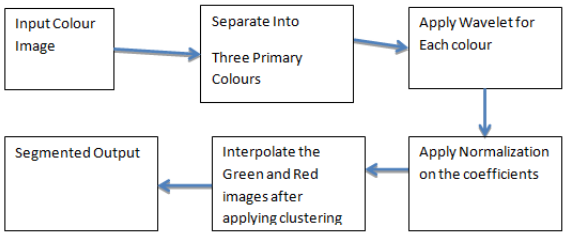

Figure 2: Wavelet Based Implementation

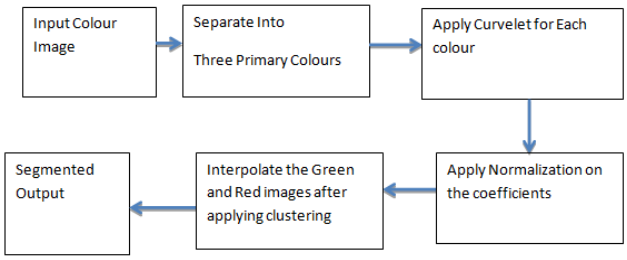

Figure 3: Curve let Based Implementation

3.1. *Assumptions*

The assumptions that are made in the existing system are that the colour images have to be taken as the input image. And the segmented outputs of the each colour portions of the images are combined by nearest neighbour method to obtain the final segmented output. For this we use K-means clustering, Fuzzy C means clustering and Pre-selector fuzzy C means algorithm.

IV. EXPECTED OUTPUT

Matlab Based implementation on the cluster based image segmentation algorithm is carried out with both the wavelet transform and the curvelet transform as the feature extraction technique and the output are tabulated and inferred. The execution time and the accuracy of segmentation are compared for both the methods by the use of both the hard and the soft clustering methods like the K means clustering and the Fuzzy C means clustering. The segmented output is checked for its accuracy manually and the execution time for the complete segmentation is

tabulated for both the wavelet and the curvelet transform methods.

V. CONCLUSION

The idea of the comparative analysis built and the methodology of implementation is finalized. The implementation has to be carried and the results must be compared for different methods and the comparison must be done on the results to find which method would be the best method.

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