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AUTOMATED SEGMENTATION OF BRAIN MR IMAGES BY COMBINING CONTOURLET TRANSFORM AND K-MEANS CLUSTERING TECHNIQUES

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ABSTRACT

Segmentation is usually conceived as a compulsory phase for the analysis and classification to the field of medical imaging. The aim of the paper is to find a means for the segmentation of brain from MR images by technique of combining Contourlet Transform and K-Means Clustering in an automatic way. De-noising is always an exigent problem in magnetic resonance imaging and significant for clinical diagnosis and computerized analysis such as tissue classification and segmentation. In this paper Contourlet transform has been used for noise removal and enhancement for the image superiority. The proposed technique is exclusively based upon the information enclosed within the image. There is no need for human interventions and extra information about the system. This technique has been tested on different types of MR images, and conclusion had been concluded.

Keywords: *Image Segmentation, Silhouette, Laplacian Pyramids (LP), Directional Filter Banks (DFB), Means, SNR (Signal To Noise Ratio), MSE (Mean Squared Error).*

1. INTRODUCTION

Magnetic resonance imaging (MRI) is diagnostic technique which is considered as a powerful in the field of medical imaging. The human brain is concealed from direct view by the protective skull, which not only defends it from injury but also hinders the study of its function in both disease and health. The cells which supplies the brain in the arteries are tightly bound together thereby routine laboratory test are insufficient and inadequate to analyze the chemistry of brain. The medical imaging modalities like computed tomography and magnetic resonance imaging are two mechanisms that allow the researchers, radiologists and doctors to study the brain by looking at the brain non-invasively [1].

Magnetic Resonance Imaging (MRI) is a medical imaging approach which is used in radiology to explore and visualize the internal structure of the human body. MRI provides deep, rich and strong information about human soft tissues anatomy. It uses a magnetic field and radio waves to yield detailed images of the anatomy of an organ.

Image segmentation is the procedure of partitioning a digital image into non-overlapping regions, so that significant, important and meaningful information about the image can be recovered and various analysis can be carried out on that segmented image. There are three classes or groups of tissue of human brain that are Gray Matter (GM), White Matter (WM) and Cerebrospinal Fluid (CSF). Precise segmentation of these tissue groups is an essential, crucial and vital step for brain image processing.

A. K-means clustering

K-means clustering [2] also called hard clustering is an unsupervised method of clustering that has been effectively applied in fields such as geostatistics, agriculture, astronomy, computer vision, image segmentation, classifier designs and feature analysis. Different feature spaces can be designed by an image and the k-means algorithm group similar data points in the feature space into clusters for classifying an image. The dependency of k-means is a cost function which is minimized iteratively that is dependent on the distance of the pixel to the cluster centers in the feature domain for achieving clusters. By using memberships, k-