ABSTRACT

In medical image analysis for diagnosis of computer-aided, the process of segmentation is often required as a step in medical image diagnosis. Magnetic Resonance Imaging (MRI) is a diagnostic imaging technique that is very useful in detecting early changes in abnormal tissues and organs that does not involve exposure to radiation like a X-ray scanning.

The use of K-Means Clustering and Particle Swarm Optimization algorithm in this study are expected to improve the detection of brain tissue that can be easily distinguished and identified. Segmentation process to separation of brain tissue layer between the White Matter, Gray Matter, and Cerebrospinal Fluid, the grouping is done by measuring the similarity of segment characteristics. As for The characteristics used are (1) the average value of gray image (2) the minimum intensity value of gray image (3) the maximum intensity value of gray image, and (4) the Range value of gray image (5) the Interval of gray image.

In this study, the preliminary data from MRI will be converted from dicom files to tif extension as 30 pieces, in order to further processing, to be analyzed and visualized by Matlab 7 using the proposed method. The resulting output will be compared with the process manually, and the process of verification and validation by using the Jaccard Similarity and Receiver Operating Characteristic analysis, so they can get the value of accuracy, sensitivity, and specificity.

After testing, the brain image of MRI as much as 30 files which has the overall shape and size of different brain, the percentage of accuracy obtained in the area of White Matter and Gray Matter using K-Means Clustering in a row at 77.66% and 75.82%, and for K-Means method with optimized by PSO algorithm in a row at 85.35% and 82.33%. In ROC analysis, the probability value obtained area under curve (AUC) in the area of White Matter and Gray Matter using K-Means Clustering in a row at 0.95 and 0.82, and PSO optimized at 0.66 and 0.81.

Keyword: Medical Imaging, MRI Brain Tissue, Segmentation, K-Means Clustering, Particle Swarm Optimization, Region Growing, Jaccard Similarity, Receiver Operating Characteristic