ABSTRACT

Image segmentation is a process partitioning an image into separated regions with homogenous properties. Natural images generally contain both of color and texture. Therefore, image segmentation method that uses a combination of both color and texture information would have a better ability to distinguish regions. Image segmentation methods based on either color only or texture only information have been developed. However, researches on image segmentation based on combined color and texture information is still actively carried out.

In neutrosophy theory, every entity does not have only a certain degree of truth, but it also has a falsity degree and an indeterminacy degree. Neutrosophic set (NS) is a generalization of fuzzy sets, which is based on neutrosophy. NS can be used to solve problems involving uncertainty. NS has been used in various applications, such as relational database systems, semantic web services, financial dataset detection, economic growth analysis and image processing.

In this paper, a combination of color information extraction in L*u*v color space and texture information extraction using Gabor wavelet transform is transformed into NS domain. Entropy value of the NS is then used to evaluate uncertainty. $\alpha$-mean and $\beta$-enhancement operations are proposed to reduce indeterminacy. Finally, the new K-means cluster for the NS, $\gamma$-K-means clustering, is applied to image segmentation.

Experiment results show that the proposed method can perform texture color image segmentation with a good result. Validity index is used to determine the selection of optimal number of clusters automatically on $\gamma$-K-means clustering to achieve compliance with the best F-measure value by 70%. Image segmentation using the NS-based clustering method proved to produce a better segmentation performance than clustering methods without NS. Also, image segmentation method that uses a combination of both color and texture information proved to produce a better segmentation performance than based on either color only or texture only information.

Keywords: Gabor Wavelet, L*u*v color space, Neutrosophic Set, $\gamma$-K-Means Clustering