Performance of Extremal Optimization Algorithm in Optimizing Biomedical Image Segmentation

Atieh Gharib [a], Mohammad-R. Akbarzadeh-T [b], Ahad Harati [a]

[a] *Ferdowsi University of Mashhad, Iran;* [b] *Electrical and Computer Engineering, Iran*

Extremal optimization is an evolutionary local search algorithm that has been noted due to its natural inspiration. In this work, we aim to show the role of this algorithm in image segmentation, for segmenting medical images in which MRI brain images are used for testing. In this segmentation, by defining a new energy function for different regions and by using the energy function in Markov Random Field model for pixels, the performance of the algorithm is improved to optimize the energy function and lead to a segmented image containing the required regions. First, by reducing the colors of images, over-segmented images are given to the algorithm as initials and then in each iteration, lower fit regions are selected according to the probability function and merged with similar adjacent regions. Also, lower fit pixels are more likely to be selected and changed since the image lattice is sensitive to the changes and low changes in each pixel will result in changing the whole lattice, a phenomenon known as "avalanche". Visual examination shows that by giving the final number of classes, the algorithm can obtain proper result according to the energy function.