Genetic Algorithm Based Hybrid Clustering Technique for the Retinal Blood Vessels Segmentation

Dulshani Dasanayake[1], Nirmani Athuraliya[1], Hashini De Silva[1], Kavindi Fernando[1], Prasanna S. Haddela[1], and Adeepa Gunarathne[1]

[1]Department of Information Technology, Sri Lanka Institute of Information Technology, Sri Lanka.
dulshanisd@gmail.com, deeshaniathuraliya2@gmail.com, desilva.hashini27@gmail.com, kavindifernando999@gmail.com, prasanna.s@sliit.lk, dimuth.a@sliit.lk

Abstract

Important details about the visual anomaly can be found in the retinal fundus imaging. The segmentation of the blood vessels is crucial and necessary for diagnosing different ocular fundus. The primary and most common causes of blindness are diabetic retinopathy and its effects on the retinal vascular structures. The study suggested a genetic algorithm combined with the K-means clustering technique for unsupervised retinal segmentation. An essential pre-processing step for vessel identification applications is vessel enhancement. The CLAHE filter method is employed in this work as a pre-processing step for vessel improvement. The improved vessels were grouped together using a genetic approach, and K-means clustering was applied for superior clustering outcomes. DRIVE and IOSTAR databases that are accessible to the public are used to evaluate the suggested strategy. According to the experimental findings, the proposed algorithm successfully separates clusters that are more dense and well-separated than those of other previous findings. Both the Calinski-Harabasz Index Score and the Silhouette Index Score are used to validate the proposed algorithm.

Keywords

Retinal Vascular, Image Segmentation, K-Means Clustering, Genetic Algorithm