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Recent Advancements in Fuzzy C-means Based Techniques for Brain MRI Segmentation

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Abstract

Background: Variations of image segmentation techniques, particularly those used for Brain MRI segmentation, vary in complexity from basic standard Fuzzy C-means (FCM) to more complex and enhanced FCM techniques.

Objective: In this paper, a comprehensive review is presented on all thirteen variations of FCM segmentation techniques. In the review process, the concentration is on the use of FCM segmentation techniques for brain tumors. Brain tumor segmentation is a vital step in the process of automatically diagnosing brain tumors. Unlike segmentation of other types of images, brain tumor segmentation is a very challenging task due to the variations in brain anatomy. The low contrast of brain images further complicates this process. Early diagnosis of brain tumors is indeed beneficial to patients, doctors, and medical providers.

Results: FCM segmentation works on images obtained from magnetic resonance imaging (MRI) scanners, requiring minor modifications to hospital operations to early diagnose tumors as most, if not all, hospitals rely on MRI machines for brain imaging.

Conclusion: In this paper, we critically review and summarize FCM based techniques for brain MRI segmentation.

Keywords: FCM; brain MRI; brain tumor; fuzzy C-Means; magnetic resonance imaging.; tumor segmentation.

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