A Framework for Segmentation of Inhomogeneous Live Cell Images using Fractional Derivatives and Level Set Method

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Abstract

Cell segmentation has gained significant importance in modern biological image processing applications. The commonly used image segmentation algorithms are region based and depend on the homogeneity of the intensities of the pixels in the region of interest. But due to the highly inhomogeneous behavior of cell nuclei and background, feature overlapping between the two regions lead to misclassification and poor segmentation results. This paper proposes a method to segment the cell images taking into consideration the intensity inhomogeneity issue. A fractional differential term has been introduced in the clustering criteria for bias correction for improving the homogeneity of the cell images. A method to optimize the fractional order for images has also been proposed. Further an improved narrow band level set method using Chan Vese model has been proposed to improve the computational speed of the algorithm. The proposed method is evaluated on datasets of 2D microscopy images and images with improved homogeneity have been obtained. The results also show improved segmentation results and the time efficient bahaviour of the proposed method.
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References

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