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## Multilevel Color Image Segmentation using Modified Fuzzy Entropy and Cuckoo Search Algorithm

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### Abstract

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To handle the fuzziness and spatial uncertainties among pixels entailed in color images, this paper proposes a novel fuzzy entropy function for multi-threshold image segmentation based on the energy curve concept and minimum fuzzy

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To handle the fuzziness and spatial uncertainties among pixels entailed in color images, this paper proposes a novel fuzzy entropy criterion. The proposed energy curve based new fuzzy entropy function (ECFE) considers intensity distribution and spatial contextual information among the pixels. To improve efficiency and threshold selection process of the method, cuckoo search algorithm is employed. For comparison, backtracking search algorithm, and Lévy flight based firefly algorithm included. Comparison with recent color image multilevel segmentation techniques presented to test the effectiveness of the proposed algorithm. The performance of the proposed technique is evaluated using different satellite and natural color images. Quantitative and qualitative results demonstrate that the proposed algorithm is highly accurate, robust, and efficient for color image multilevel segmentation.

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#### 1 Introduction

Segmentation is a classic example of multichannel information processing. Multichannel information processing is very important owing to evolution of the fields of remote sensing (RS), multispectral data management, geographical

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