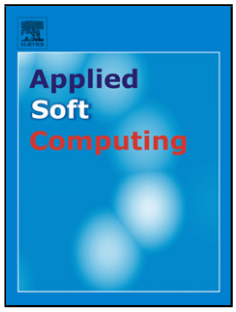

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Uncertainty Representation using Fuzzy-Entropy Approach: Special Application in Remotely Sensed High-Resolution Satellite Images (RSHRSIs)

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Abstract

Remotely sensed high-resolution satellite images contain various information in context of changes. By analyzing this information very minutely, changes occurred in various atmospheric phenomena can be identified. Therefore, in this study, a novel change detection method is proposed using the fuzzy set theory. The proposed method represents the uncertain changes in the form of a fuzzy set using the corresponding degree of membership values. By using the fuzzy set operators, such as max and min functions, this study derives very useful information from the images. This study also proposes a new function to identify the boundary of uncertain changes. Further, this study is propagated to identify the similarity or dissimilarity between different images of the same event that contain various uncertain changes. To recognize the changes in a fine-grained level, this study introduces a way to represent the fuzzy information in a granular way. The utilization of the proposed method is shown by recognizing changes and retrieving information from the remotely sensed high-resolution satellite images. Various experimental results exhibit the robustness of the study.

Index Terms

Fuzzy sets; Change Recognition; Entropy; Probability; Granularization; Convex Set; Remotely Sensed High-Resolution Satellite Images (RSHRSIs).

I. Introduction

In the universe, changes always take place due to the occurrence of various uncertain events in the atmosphere. The intensity of these events may be moderate or severe. For example, earthquake, cyclone, flood, etc., always make the changes in the earth's surface [1]. By simply monitoring, these changes can't be observed. Therefore, researchers use the spatio-temporal images to detect temporal effects in these uncertain events. Hence, change detection is a technique to find out any changes in the surface of the universe by analyzing remotely-sensed digital images, which are captured at different time stamps. Identifying the changes are one of the most challenging tasks in the domain of pattern recognition and