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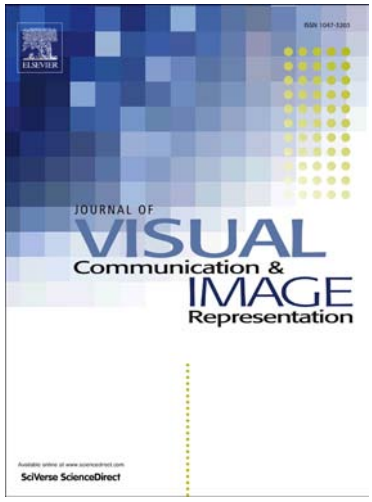

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A Polygonal Approximation of Shape Boundaries of Marine Plankton Based-on Genetic Algorithms

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Abstract: Polygonal approximation of a shape boundary can provide a minimalistic representation of the shape. It can also accelerate the processing speed of feature extraction. Our interest is in applying such a method to approximate the boundaries of plankton shapes. A polygonal approximation method based on genetic algorithms has been designed to compactly describe the plankton shapes by polygons. Firstly, two artificial digital curves are used to test the performance of our algorithm. Results are compared with other existing algorithms which show that our algorithm has efficient performance for solving the problem of the polygonal approximation. Secondly, the proposed method is applied to a selection of plankton images under three different approximation levels to a polygonal fit and then five evaluation criteria are applied to determine which approximation level of a particular image is most suitable for describing the shape. The stability and robustness of three approximation levels are also tested.

Key Words: Image processing; Polygonal approximation; Genetic algorithm; Marine plankton

1 Introduction

Shape is one of the basic features used to describe an object, and representation of a shape is a key step prior to many image analysis tasks, such as pattern recognition, image matching, target tracking, etc. Shape representation generally aims to look for effective and perceptually important shape features based on either the shape contour or the whole shape region. The polygon approximation is one type of the contour-based structural shape descriptions [1] which not only provides compact shape representation, but also accelerates the speed of the future feature extraction of the shape. For example, a good approximation description of a shape by a polygon will be beneficial for rapid identification and classification of marine plankton recorded in the North Sea [2, 3].