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Coastline extraction from SAR images and a method for the evaluation of the coastline precision

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Abstract

The coast area is a vital and highly dynamic environment whose multiple geophysical parameters are worth monitoring. At present the current coastline extraction operations made through high-resolution aerial images consist of the visual photo-interpretation. This performance, which mainly finds cartographic applications, is rather slow in comparison to the possibilities of remote sensing and image processing techniques.

The aim of this paper is to describe the development and testing of an innovative algorithm able to extract semi-automatically the coastline by means of remote sensed images.

The approach proposed is based on fuzzy connectivity concepts and takes into account the coherence measure extracted from an InSAR (Interferometric Synthetic Aperture Radar) couple. The method combines uniformity features and the averaged image that represents a simple way of facing textural characteristics. The results are then quantitatively evaluated through the comparison with optical aerial images. An automatic procedure is proposed for the evaluation of results, which makes use of distance measurements between the satellite and the aerial result, even though there is a considerable difference in space resolution.

Keywords: Interferometric synthetic aperture radar (InSAR); Coherence; Coastline detection; Segmentation; Fuzzy connectedness

1. Introduction

Monitoring the evolution of the coastline is an important task in several applications such as cartography and the environmental management of the entire coastal zone. The development of new and reliable algorithms for the automatic and semi-automatic extraction of this parameter is well accepted even if such algorithms are far from a current practical application. Such a task is usually performed manually by experts using photo-interpretation techniques. The paper describes the work performed for the development and testing of an innovative algorithm based on fuzzy connectivity concepts, able to extract semi-automatically the shoreline from remotely sensed images and to compare results derived from two different acquisition modalities. In particular the research

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