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Commentary on Geographic Information System

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Abstract

Geographic Information System (GIS) is a computer-based technology and methodology for collecting, managing, analyzing, modeling, and presenting geospatial data for a wide range of applications.

Keywords: GIS; Earth sciences; Geo-informatics; Hydrology

Introduction

GIS plays a vital role in Earth sciences by providing a powerful means of observing the world and various tools for solving complex problems. The scientific community has used GIS to reveal fascinating details about the Earth and other planets. This paper discuss on recent advances in GIS for Earth sciences includes 12 publications from esteemed research groups worldwide. The research and review papers in this special issue belong to the following broad categories: Earth science informatics (geo-informatics), mining, hydrology, natural hazards, and society.

GIS is an important tool used to solve complex spatial problems in geo-informatics. Several articles dealing with basic algorithms for spatial data analysis is included in this special issue [1] propose an efficient parallel algorithm for polygon overlay analysis. Overlay analysis is a fundamental operator in spatial data analytics and is widely used in Earth science applications. The proposed algorithm includes procedures for active-slave spatial index decomposition for intersection, multi-strategy Hilbert ordering decomposition, and parallel spatial union. The application of their new parallel algorithm to a land-use map of China consisting of multiple polygons with 15,615 elements and 886,547 points shows that the algorithm can perform polygon overlay analysis with high efficiency. Therefore, the study contributes to geo-informatics by allowing the processing of large scale spatial data for spatial data analytics. Vector maps in GIS have been widely used in various fields, including Earth science.

Currently, huge volumes of vector map data can be easily stolen and distributed without permission from the original data providers [2] propose a random encryption algorithm based on multi-scale simplification and the Gaussian distribution to encrypt vector map data before it is stored and transmitted. Their experiment using vector maps of Scotland at different scales shows that the proposed algorithm provides higher security and computational efficiency of storage and transmission of vector map data than previous methods. Therefore, the algorithm can be applied to improve the security of online and offline Earth science map services [3], open-source GIS software, has been utilized in the Earth science community [4] assesses the visual notation of QGIS's Processing Modeler, a graphical editor for workflow design, using the Physics of Notations theory in combination with eye-tracking measurements. The results from this study provide several practical recommendations to improve the effective cognition of the QGIS Processing modeler, including changing the fill colour of symbols, increasing the size and variety of inner icons, removing functional icons, using a straight connector line instead of a curved line, and providing a supplemental preview window for the entire model.

Geo-sensor networks produce large amounts of Earth science data that can be processed using GIS for different purposes and for intelligent decision making [5] propose a geo-sensor framework that can be used by multiple clients to deploy their own geo-sensor networks, bind their sensor objects to desired locations, generate geo-sensor services for the uploaded networks, and manage the services with a geo-sensor composite toolbox. The framework is implemented based on the Restful and SOAP web services. Performance analysis shows that the lightweight Restful web service is the best choice for ease of implementation and access.

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