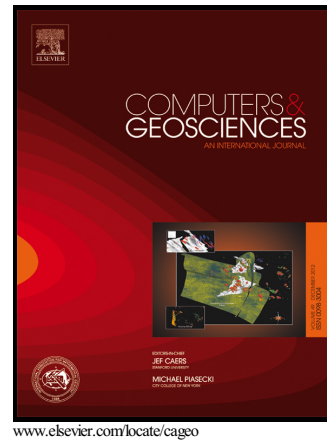


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## **Hierarchical Profiling of Geoprocessing Services**

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### **Abstract**

Analysis workflows in geoinformation systems and geodata infrastructures are built from reusable geoprocessing services. Ideally, these services are well-defined implementations which can be readily understood by clients in order to find and invoke the right service for a particular task. Despite technological advances towards service-oriented architectures, implementation uncertainty is still an issue and most geoprocessing services lack solid and meaningful descriptions of the provided functionality.

This paper reviews previous work in the field of service-oriented geoprocessing and discusses their contributions towards interoperable and well-defined processing services. Based on these findings, a framework is proposed that captures both semantic and syntactic properties of geoprocessing functions at different levels of granularity. Each of the levels is associated with a set of descriptive artifacts that refine the definitions of coarser levels, ultimately leading to well-defined implementations. The utility of the framework is illustrated for task-oriented search and workflow verification. Finally the paper discusses possible limitations of the presented approach and provides suggestions for future work.

### **Keywords**

Geoprocessing services, Interoperability, Profiling, Subtyping

## **1 Introduction**

Reuse, comparability, and task-oriented discovery of geoprocessing services and functions are persisting topics in geoinformation science and application (Anselin, 2012; Lutz *et al.*, 2003; Müller *et al.*, 2013; Yuan and Albrecht, 1995). Instead of having well-defined implementations at hand, users still face a range of software products and libraries that maintain their own set of tools with system-specific documentation and interfaces. Web services for geoprocessing such as the Web Processing Service (WPS; OGC, 2007) or vendor-driven services (e.g. ESRI's ArcGIS Server REST API) have been introduced to overcome these incompatibilities. They eliminate the need to install a range of GIS products and geospatial libraries at the client's computer in order to access a particular geoprocessing tool. However, occasional surveys reveal little progress towards well-defined and interoperable functionality. To understand what a particular geoprocessing Web service actually does to their data, clients must obtain background knowledge about the service's backend systems and libraries (Granell *et al.*, 2010). This contradicts a fundamental assumption in service-oriented design. The source system that runs a service is expected to be hidden from the client. In this sense, Web services have hardly improved semantic interoperability for geoprocessing applications but made existing deficits more

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