Introductory editorial: web-based sensors and geoprocessing services
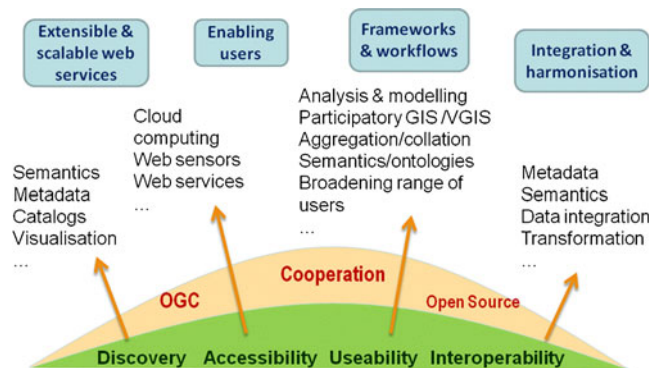
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Primarily driven by current advances in web, web service and sensors technologies, and the expressed needs from geospatial and broader communities, the web-based sensors and geoprocessing service fields have evolved rapidly over the last 10 years. Geoprocessing services greatly facilitate the process of transforming geospatial data to geoinformation, exposing the powerful analytic capability of geographic information system (GIS) and empowering the public in today's "electronic" decision-making over the worldwide web, particularly within spatial data infrastructure frameworks, through service composition, utilization of advanced grid/cloud computing, and well-designed client-side applications. The research topics and issues range from discovery, accessibility, usability to interoperability, which require standards support, and cooperation among academia, industry, government, commercial, and open source communities.

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This special issue builds on the extended version of seven papers selected from the papers submitted to the first International Workshop on Pervasive Web Mapping, Geoprocessing and Services, which was successfully held on the Politecnico di Milano campus in Como, Italy from August 26 to 27, 2010. The workshop was organized by ISPRS WG IV/5 on "Distributed, Web-based Geoinformation Services and Applications" and Politecnico di Milano, and coorganized by ISPRS WG WG IV/1 on "Geospatial Data Infrastructure", WG IV/4 on "Virtual Globes and Context-Aware Visualization", and ICWG IV/II on "Geo-Sensor Networking and GEOGRID". The main theme of the workshop focused on Sensor Web Enablement and Geoprocessing Services. Some of the particular topics and issues addressed in the technical sessions included (full papers are available at http://www.isprs.org/proceedings/XXXVIII/4-W13/):

- Sensor web: integrating Open Geospatial Consortium (OGC) standards and developing interfaces for sensor observation services, developing interface descriptors

for fire/cloud/wind sensing, sensor web frameworks, utilizing citizens as rich sensor data sources.

- Web processing services (WPS): revenue models for services in the cloud, open source server-side platforms, data integration workflows, security and scalability for geoprocessing in a cloud, chaining of web services, agent-based models in web services, ontologies
- Workflows: developing tools and workflows for models and data integration in a geoprocessing services environment, man/machine interfaces.
- Web visualization: developing 3D geospatial web services, frameworks, and architectures for 3D models, DTMs, visibility and visual impact analysis, temporal analysis
- Collaborative GIS: addressing ranges of users and involving them in participatory processes, public participation, traffic sensors and monitoring, smart environments for identifying user behavior and context awareness

This issue begins with the article authored by Schade, Díaz, Ostermann, Spinsanti, Luraschi, Cox, Nuñez, and Longueville, *Citizen-based sensing of crisis events: sensor web enablement for volunteered geographic information*. The article presents an improved workflow for event detection based on volunteered geographic information (VGI) sensing. The authors argue that VGI sensing is a shift from "citizen as sensors", because it senses VGI flows, and VGI sensing complements remote sensing and more "traditional" in situ and ex situ sensors.

The second and third articles, both short and technically oriented, provide readers with insights from technology studies. *ZOO-Project: the open WPS platform* by Fenoy, Bozon and Raghavan, provides a good overview of the Zoo project—an implementation of the OGC's WPS specifications. Ludwig and Coetzee's paper, *Implications of security mechanisms and Service Level Agreements (SLAs) of Platform as a Service (PaaS) clouds for geoprocessing services*, touches on a very important issue related to the security of geoprocessing in a cloud environment. The paper analyzes security mechanisms and PaaS clouds and present results of some experiments run in PaaS clouds.

An agent-based framework for intelligent geocoding by Hutchinson and Veenendaal presents a theoretical framework of agent-based geocoding, which shows that geocoding using autonomous agents representing address elements is feasible and can produce geocoded results that go beyond that of conventional geocoders. The paper suggests that agent-based intelligent geocoding is suitable for a service-oriented geocoding architecture and has several advantages as a web service platform.

Open source has played an active role in developing web-based geoprocessing services. In addition to the above ZOO project article, this special issue also includes two articles that present the use of open source technologies to develop geoprocessing services. The last article, *An example of a tourist location-based service (LBS) with open-source software* by Deidda, Pala and Vacca, develops an OpenLS-compliant, client–server framework for tourist information services. An empirical study on service response time/performance was included. The article authored by Federici, Giacomelli, Sguerso, Vitti and Zatelli, *A web processing service for GNSS realistic planning*, describes a web geoprocessing service developed using Geoserver and PostgreSQL with its spatial extension PostGIS for analyzing satellite visibility and availability by non-GIS specialists. The analysis results, obtained through web services, were verified by comparing the number of visible satellites to the number of satellites actually tracked by eight GPS permanent stations in the Trentino region in Italy.

Finally, Scianna's arcticle, *Experimental studies for the definition of 3D geospatial web services*, moves a step further from 2D geoprocessing services to 3D web services by developing 3D Web Feature Services that allow the extraction of GML 3D and the graphical browsing of urban models in 3D within web browsers. Based on an initial benchmarking, the author suggests that GML3 may be useful to code 3D geographic information from an RDBMS with geographic extensions.

While the objective of this special issue is to offer an introduction to a wide range of topics under "web-based sensors and geoprocessing services", as stated above, the seven selected papers only cover some limited aspects of the whole spectrum. However, we hope that their contribution to this rapidly developing field will provide useful insights and stimulate more focused scientific discussions.

We would like to thank all contributing authors, including those whose papers were not selected for publication in this special issue. Special thanks go to the many anonymous reviewers. Without their contributions, this special issue would not have been published. Finally, we would like to extend our thanks to Prof. Alessandro Capra, the journal editor, for his support and guidance.