

WYSIWYG GEOPROCESSING: COUPLING SENSOR WEB AND GEOPROCESSING SERVICES IN VIRTUAL GLOBES

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ABSTRACT:

We propose to advance the scientific understanding and applications of geospatial data by coupling Sensor Web and Geoprocessing Services in Virtual Globes for higher-education teaching and research. The vision is the concept of “What You See is What You Get” geoprocessing, shortly known as WYSIWYG geoprocessing. Virtual Globes offer tremendous opportunities, such as providing a learning tool to help educational users and researchers digest global-scale geospatial information about the world, and acting as WYSIWYG platforms, where domain experts can see what their fingertips act in an interactive three-dimensional virtual environment. In the meantime, Sensor Web and Web Service technologies make a large amount of Earth observing sensors and geoprocessing functionalities easily accessible to educational users and researchers like their local resources. Coupling Sensor Web and geoprocessing Services in Virtual Globes will bring a virtual learning and research environment to the desktops of students and professors, empowering them with WYSIWYG geoprocessing capabilities. The implementation combines the visualization and communication power of Virtual Globes with the on-demand data collection and analysis functionalities of Sensor Web and geoprocessing services, to help students and researchers investigate various scientific problems in an environment with natural and intuitive user experiences. The work will contribute to the scientific and educational activities of geoinformatic communities in that they will have a platform that are easily accessible and help themselves perceive world space and perform live geoscientific processes.

1. INTRODUCTION

With the advancement of Earth observing and sensing technologies, the geospatial data is increasingly rich and accessible in real-time or near-real-time ways. Often, these data have to be transformed into user-specific information and knowledge through geoprocessing methods. In order to help geospatial users analysis these data in an environment with natural and intuitive user experiences, this work proposes the concept of “What You See is What You Get” geoprocessing, shortly known as WYSIWYG geoprocessing, by coupling Sensor Web and geoprocessing Services in Virtual Globes.

Virtual Globes bring the globe-scale geospatial information into our desktop. They fuse heterogeneous geospatial data from multiple sources, and allow users to add annotations and share data with others. The wide popularity of Virtual Globe software such as Google Earth, Microsoft Virtual Earth, and NASA World Wind offers tremendous opportunities, such as providing a learning tool to help educational users digest global-scale geospatial information about the world, and acting as WYSIWYG platforms, where domain experts can see what their fingertips act in an interactive three-dimensional (3D) virtual environment.

While educational and scientific users enjoy the three dimensional visualization provided by Virtual Globes, they also need geoprocessing functions to help investigate geospatial problems beyond the straightforward visualization. Geoprocessing services make a large amount of geoprocessing functionalities easily accessible to users. The integration of Virtual Globes

and interoperable geospatial Web Services extends the current capabilities of Virtual Globes, by focusing primarily on enabling higher-education teaching and scientific research with its heavy analysis demands, as opposed to focusing initially on visualization and annotation (Yue et al., 2010).

The emergence of Sensor Web technologies allows on-demand provision of real-time or near-real-time geospatial data, and enables the discovery of sensor observations and tasking of sensor systems (Botts et al., 2006). To support the interoperability in the Sensor Web, the Open Geospatial Consortium (OGC) has developed a series of standard specifications, such as Sensor Observation Service (SOS) and Sensor Planning Service (SPS). Using data published by the Sensor Web, geoprocessing services can provide live decision support (ISW, 2011).

Although we have seen some preliminary work on the combination of Virtual Globe and geoprocessing services (Yue et al., 2010), the integration of Sensor Web and geoprocessing services (ISW, 2011), and the visualization of sensor data in Virtual Globe (52north, 2011), an integration of all three technologies is not available yet. Coupling Sensor Web and geoprocessing Services in Virtual Globes will bring a virtual learning and research environment to the desktops of students and professors, empowering them with WYSIWYG geoprocessing capabilities.

The term WYSIWYG was used originally in the computer science domain. It describes a software system, in which you see what you edit (Wikipedia, 2011). In the context of this

