

sos4R - Accessing Sensor Web Data from R

Daniel Nüst^{1,2,*}

1. 52°North Initiative for Geospatial Open Source Software GmbH

2. Institute for Geoinformatics, University of Muenster, Germany

*Contact author: d.nuest@52north.org

Keywords: Sensor Observation Service, Open Geospatial Consortium, Web-service Client, XML, Reproducible Research

The Sensor Web is a collection of standards and software solutions that allows the management of and data retrieval from sensors through the internet. The Open Geospatial Consortium's (OGC) Sensor Observation Service (SOS) is the core web service to provide sensor data in an interoperable, standardized way. Because its goals are so generic, this service is relatively complex, e.g. it needs other standards for request and query markup, and standards for data markup and encoding. This complexity makes it hard for non-Sensor Web specialists to benefit from publishing their data using SOSs, or analyzing data retrieved from other's or even someone's own SOS instances. The recently published **sos4R** CRAN package tries to overcome this hurdle by providing a relatively simple *R* interface to the SOS. The main contribution of the package is a set of *R* functions for the core SOS operations for data retrieval. These suffice for many common use cases by encapsulating the complexity of the SOS interface.

This work presents the technical background of accessing a XML-based web service from *R* using the packages **RCurl** and **XML**. It shows how the generic work flow of request building, encoding, data transfer and data decoding can be modelled in *R* classes and methods. Flexible mechanisms allow users to easily add features and adapt entire processing steps, or just the required parts, to their needs.

We also present example analyses based on publicly available SOS that illustrate the potential and advantages of building analyses and visualizations in *R* directly on SOS. These programmes can be based on near real-time data, but can also be the base for reproducibility of analyses. Reproducible research is already supported well by a variety of *R* packages, and these are now further complemented with open, online data sources such as those found in the Sensor Web.

Finally, we describe future work, especially on the integration of the SOS respectively OGC data models with existing and upcoming endeavours for spatio-temporal data in *R*, like the **spacetime** CRAN package.

References

Botts, M., G. Percivall, C. Reed, and J. Davidson (2008). OGC Sensor Web Enablement: Overview and High Level Architecture. In S. Nittel, A. Labrinidis, and A. Stefanidis (Eds.), *GeoSensor Networks*, Volume 4540 of *Lecture Notes in Computer Science*, pp. 175–190. Springer Berlin / Heidelberg.

Lang, D. T. (2007). *R* as a Web Client the RCurl package. *Journal of Statistical Software*.

Lang, D. T. (2010). XML: Tools for parsing and generating XML within *R* and S-Plus. online. version 3.2-0.

Nüst, D. (2010). sos4R - The OGC Sensor Observation Service Client for the *R* Project.

Open Geospatial Consortium, Inc. (2010). Sensor Observation Service. <http://www.opengeospatial.org/standards/sos>.

Pebesma, E. (2010). *spacetime: classes and methods for spatio-temporal data*. *R* package version 0.1-6.