Chapter 8
Semantic Annotation of Geospatial RESTful Services Using External Resources

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ABSTRACT

RESTful services are increasingly gaining traction over Web Services (WS-*). As with WS-* services, their semantic annotation can provide benefits in tasks related to their discovery, composition, and mediation. In this chapter, the authors present an approach to automate the semantic annotation of geospatial RESTful services using a cross-domain ontology like DBpedia, domain ontologies like GeoNames, and additional external resources (suggestion and synonym services). They use combinations of these resources to discover meanings for each of the parameters of the geospatial RESTful services and perform semantic annotations of them.

INTRODUCTION

In recent years, since the advent of Web 2.0 applications and given some of the limitations of “classical” Web services (WS-*) based on SOAP, WSDL, and Open Geospatial Consortium (OGC) services, Representational State Transfer (REST) services have become an increasing phenomenon. Machine-oriented Web applications and APIs that are conformant to the REST architectural style (Fielding, 2000), normally referred to as RESTful Web services, have started appearing mainly due to their relative simplicity and their natural suitability for the Web. Nowadays the largest online repository of information about Web 2.0 mashups and APIs is ProgrammableWeb.com. This aggregator site provides information on 5,465 mashups and 2,647 APIs that were registered be-
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tween September 2005 and December 2010, as of
the time of the writing of this chapter. Mashups
tagged as “mapping” represent a 34% mashups
(2,411 mashups) of the listed ones, what represents
the importance of geospatial information in the
generation of these applications. With respect to
APIs, GoogleMaps is the most used with a 42%,
that is, this API is used on 2,149 mashups. These
data show the importance of geospatial informa-
tion in the context of the REST world.

However, using geospatial RESTful services
still requires much human intervention since the
majority of their description pages are given in the
form of unstructured text in a Web page (HTML),
which contains a list of the available operations,
their Uniform Resource Identifiers (URIs) and
parameters (also called attributes), expected
output, error messages, and a set of examples
of their execution. This hampers the discovery,
composition and mediation between services,
which may be required in the development of
applications, and which are also important tasks
in WS-* approaches.

An approach in order to solve this difficulty
is to think of semantic annotation activities of
these services.

Besides, it can also play an important role in
the Semantic Web by providing data to semantic
software agents, as can be seen in (Ferreira, et
al.,2009; Alarcon, et al., 2010).

Semantic annotation refers to the task of at-
taching meaningful descriptions to the service and
the served geospatial data or processes (Maué,
et al., 2009). Traditionally, semantic annotation
approaches for services have focused on defining
formalisms to describe services, and have been
normally applied to WS-* service description
formalisms and middleware. More recently, these
(usually heavyweight) approaches have started
to be adapted in a more lightweight manner for
the semantic description of RESTful services
(Maleshkova, et al., 2009a; Kopecký, et al., 2008;
Lathem, et al., 2007). However, most of the
processes related to the annotation of RESTful
services (Maleshkova, et al., 2009b; Alowisheq,
et al., 2009) still require a large amount of human
intervention. First, humans have to understand
the informal descriptions provided in the RESTful
service description pages, and then the semantic
annotation of RESTful services has to be auto-
mated as much as possible.

In this chapter, we address these two main
challenges by: (1) providing syntactic descrip-
tions of geospatial RESTful services that allow
their automatic registration and invocation, and
(2) interpreting and enriching the geospatial
RESTful services’ parameters, by means of their
semantic annotation.

The main contribution of our work is an ap-
proach to perform an automatic lightweight se-
mic annotation process of RESTful services.
This process is implemented in a system, which
takes into account a cross-domain and a geospatial
ontology (DBpedia ontology combined with Geo-
Names ontology), its SPARQL Endpoint, as well
as different external resources such as synonyms
and suggestion services. We use combinations
of these resources to discover meanings for each of
the parameter of the RESTful services and perform
semantic annotations of them. These semantic an-
notations might provide benefits in tasks related
to discovery, composition, and mediation of these
services. Furthermore, semantic annotations of
RESTful services might help to developers and
users in the creation of mashups.

The remainder of this paper is structured as fol-
lops: Next, we present background in the context
of semantic annotation of WS-* and RESTful ser-
dices (from a general and geographical viewpoint).
Later, we introduce our approach for automating
the annotation of RESTful services, including
explanations on how we derive their syntactic
description and semantic annotation. Finally,
we present some conclusions of this chapter and
identify future lines of work.
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