AJAX Widget for Semantic Query Expansion

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Abstract. We introduce the idea of utilizing ontologies as a service for query expansion, based on an AJAX widget. This ONKI Query Expansion Widget can be integrated into the search input field of a traditional keyword-based legacy system by one line of JavaScript code, making the search system semantic. For example, when searching for "tools", also "hammers", "axes" etc. can be found based on the underlying hyponymy. In the same vein, the spatial relations of a geo-ontology or temporal relations can be utilized. Application of the widget in legacy search systems on the web is discussed by examples. The widget makes it possible to utilize the ontologies of the Finnish Ontology Library Service ONKI in a very cost-efficient way.

Query expansion improves information retrieval by expanding the query terms into an union of semantically related terms. To provide a general ontology-based query expansion facility as a ready-to-use service, we took the previously developed ONKI Selector Widget [1] as a starting point. This widget is used for selecting concepts through semantic autocompletion in annotating, but with an extension of less than 100 lines of code it was possible to change the widget into the ONKI Query Expansion Widget.

The ONKI Query Expansion Widget can be integrated into web-based systems providing them on-line expansion service of query terms into semantically related concepts. The widget can utilize tens of ontologies published in the ONKI Ontology Library Service[1] by using its JavaScript API, which is implemented with the Direct Web Remoting library[2]. The idea is to provide the query expansion functionality as an easily integrable mash-up service with no need to change the underlying application system.

The query widget supports both legacy systems using traditional keyword-based search and Semantic Web systems using semantically disambiguated queries based on URIs. Cross-language search can be performed, if the ontology used is multi-lingual. In addition to the AJAX widget, the query expansion service can also be utilized via JavaScript and Web Service APIs.

The widget has been tested with general, domain-specific, and spatio-temporal ontologies. With general and domain-specific ontologies, e.g. the Finnish Collaborative Holistic Ontology KOKO[3], we have used the transitive is-a relation

[1] `http://www.yso.fi/`
[2] `http://directwebremoting.org/`
[3] `http://www.seco.tkk.fi/ontologies/koko/`

(*rdfs:subClassOf*) for expanding the query concepts with their subclasses. In case of the Finnish Spatio-temporal ontology SAPO[4] the place names in the query are expanded to regionally overlapping current and historical places. Also other relations could be used for query expansion by adjusting the ontology-specific configuration files of the ONKI Ontology Service as desired.

To integrate the ONKI widget into an application the following code is added to the HTML source of the web page. First, the ONKI JavaScript library is loaded into the browser:

```
<script type="text/javascript" src="http://www.yso.fi/onki.js"></script>
```

Then the input fields on the HTML page can be changed into ONKI widgets by using a parametrized method call in the onkeyup-attribute:

```
<input id="searchField" onkeyup="onki['koko'].search({'queryExpansion' : true})" />
```

The functionalities of the widget can be customized by parametrizing the method call. By default the selected query concepts and the concepts expanding them are stored in hidden input fields to be sent to the application along with the search form. A JavaScript callback method can be used, too. The form of the query expression can be defined by providing a JavaScript method. For example, in a Google query, disjunctive query terms *term1* and *term2* are expressed in the form "*term1*" OR "*term2*".

For a demonstration we have used the Kantapuu.fi museum collection search form[5], and created a copy of it with three integrated ONKI widgets for the fields *keywords*, *place of use*, and *material*[6]. Also a demonstration page consisting of a Google search field with integrated ONKI widget is available[7].

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References

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