

# Customizing Linked Open Data views

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## ABSTRACT

This paper presents an ongoing research on Linked Open Data customizable visualization. An interactive web-based application called GIG (Generating Interfaces of Graphs) is being developed for this purpose. Preliminary results are promising and show that it is a viable approach towards the exploration of semantic datasets for non-technical audience without Semantic Web domain knowledge requirements.

## KEYWORDS

Semantic Web, Linked Open Data, Data visualization, RDF, SPARQL.

## 1 INTRODUCTION

Linked Data are structured and interlinked data which can be consulted through semantic queries. Data are stored as RDF, which is a labeled graph data format to represent semantic information in the Web. Concepts and relationships in datasets are described by means of one or more ontologies suitable for the application domain. The term Linked Open Data (LOD) refers to Linked Data published on the Web under an open licence and interconnected by RDF links between items from different data sources. Along with the spread of the Semantic Web techniques, the amount of data available as Linked Open Data increased. A lot of rich Linked Open Datasets have been released, therefore browsing large datasets in a simple way has become a major challenge.

Many visualization tools have been developed in order to efficiently navigate and analyze both Linked Open Data content, like GrOWL[2], and ontologies, like LD-VOWL[4]. Unfortunately, most of them are intended for Semantic Web experts. Users have to know how to execute semantic queries over the Web of Linked Data in order to retrieve the desired resources. In addition, existing tools give the user a limited control over output rendering. For example, the web application WebVOWL[3] offers sophisticated views of data, but user can choose among a limited number of graphic objects and properties. Optimal visualizations of LOD may exist, but they are usually designed as task-specific solutions so they are not reusable in other contexts. Users have to create programmatically ad hoc graphical interfaces, so specific technical knowledge and skills are still required. Furthermore, most of the existing visualization tools describe only ontologies and were born as plugin for the well known ontology editor Protégé<sup>1</sup>. Applications that allow the exploration of dataset content are very few[4] [1]. Displaying semantic dataset content in a clear and comprehensible way remains a difficult problem to face.

<sup>1</sup><http://protege.stanford.edu/>

## 2 DESIGN AND IMPLEMENTATION

The purpose of this research is to create an environment that permits users to make customizable visualizations of LODs, facilitating the access to semantic-enriched information for non-expert users and hiding the complexity of the underlying ontological model. The proposed solution is based on three steps:

- **Data selection:** users can demand desired data from knowledge bases, without having to know neither semantic query language nor the dataset structure.
- **Graphic objects customization:** items are rendered as graphic objects. The goal is to make views interactively customizable varying items in shape, color and size.
- **Clustering:** results sets are shown in different graphical interfaces such as force-directed graphs and clusters. To the best of our knowledge, clusters have not been used in combination with graph-based views to display LODs. Having the chance of interactively selecting the properties to cluster items is a further innovative aspect of the proposed solution.

This approach has been implemented in a web application called GIG built with AngularJS framework and D3.js<sup>2</sup> as a proof of concept. Users are enabled to query SPARQL endpoints hosting RDF datasets, including DBpedia<sup>3</sup>, by selecting in a graphical way the desired resources, the graphic objects and their properties. Users can aggregate data into visually distinct groups by selecting certain properties for a quick overview. The web application is an open source<sup>4</sup> project and it is currently under development. A public deployment is available at: <http://eelst.cs.unibo.it:8092/>.

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<sup>2</sup><https://d3js.org/>

<sup>3</sup><http://wiki.dbpedia.org/>, SPARQL endpoint <http://dbpedia.org/sparql>

<sup>4</sup><https://github.com/alicegraziosi/semaphore>