

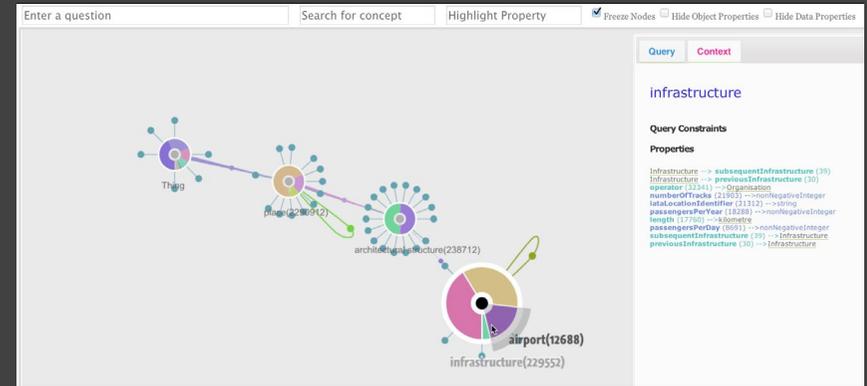
This paper is part of Petrelli's enquiry into the human interaction with extra-large data sets and the design of visual mechanisms to support the user in the task of meaning making of millions of entities. For this piece of research, the challenge was to find a strategy for the automatic visualisation of any dataset that could come from any source and can be dynamically linked to any other datasets in a web of data known as Linked Data.

Because of the automatic aggregation, naturalistic dimensions such as a timeline or a geographical map cannot be used as the type of data is unknown. The research goal was then to define a set of abstract visual features to automatically generate an easy-to-use and pleasing interactive visualisation of any unknown dataset. Given the huge size of the dataset, Petrelli sought to design an interactive visual summary that enabled the user to understand, at a glance, an unknown dataset and invite the interactive exploration of millions of entries via visual query.

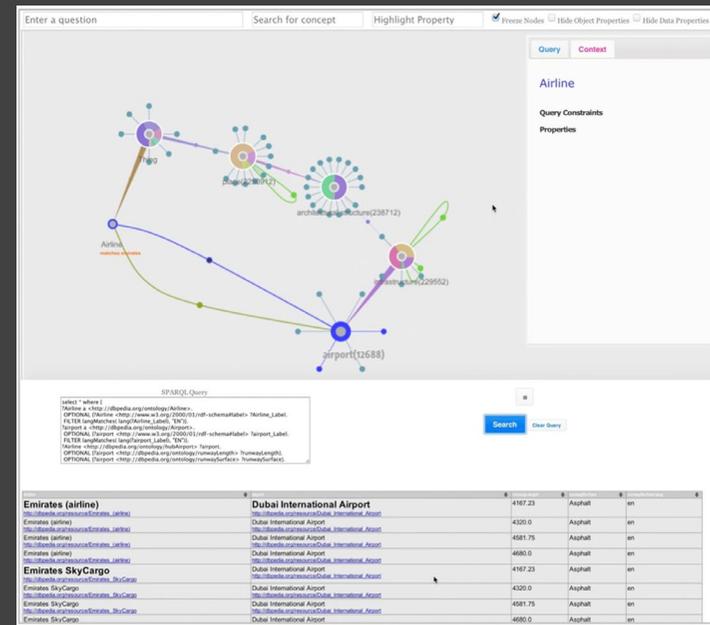
To address such visualisation complexity and to support extended exploration, aesthetic principles of graphic design were included in the algorithm to proof the statement that a pleasing user interface is more usable. The proposal was a clear departure from the visualisations developed by the Semantic Web community and resulted superior to other 4 different systems in a

comparative evaluation. By describing in detail the process followed in implementing the design rationale, the paper enabled other researchers in the Semantic Web community to adopt clear and effective principles for the visualisation of and user interaction with linked-data addressing open issues of usability, as noted in the reviews.

This paper was selected by the journal editorial board to be presented at the International Semantic Web Conference in 2016.



Above: The screenshot (from the video in [METHODS](#)) shows a user exploring the dataset following a chain of links from “things” to “infrastructure”. Each node is a visual summary of its properties: “airport” is one of the 4 subsets of “Infrastructure”, the third in size with 12,688 entities. The text on the right-hand side provides the textual description and details.



Above: The screenshot (from the video in [METHODS](#)) shows the composition of the visual query, in bright blue; “length and surface of runways at the airport that serves as hub for the ‘Emirates’ airline”; the corresponding SPARQL query is automatically composed while the user interacts.

Affective Graphs: The Visual Appeal of Linked Data

Editor(s): Roberto Garcia, Universitat de Lleida, Spain; Heiko Paulheim, University of Mannheim, Germany; Paola Di Maio, Universal Interfaces Research Lab, ISTCS, Edinburgh.
Solicited review(s): Ian Dickinson, Epimorphic, UK; Lloyd Rutledge, Open Universiteit, The Netherlands; Ghislain Hachey, Nuzusys

Suvodeep Mazumdar ^{a,*}, Daniela Petrelli ^b Khadija Elbedweihy ^a Vitaveska Lanfranchi ^a and Fabio Ciravegna ^a

^a *OAK Group, Department of Computer Science, University of Sheffield, Regent Court, 211 Portobello Street, S1 4DP, Sheffield, United Kingdom.*

Email: {F.Lastname}@sheffield.ac.uk

^b *Art & Design Research Centre, Sheffield Hallam University, Sheffield, United Kingdom*
E-mail: D.Petrelli@shu.ac.uk

Abstract. The essence and value of Linked Data lies in the ability of humans and machines to query, access and reason upon highly structured and formalised data. Ontology structures provide an unambiguous description of the structure and content of data. While a multitude of software applications and visualisation systems have been developed over the past years for Linked Data, there is still a significant gap that exists between applications that consume Linked Data and interfaces that have been designed with significant focus on aesthetics. Though the importance of aesthetics in affecting the usability, effectiveness and acceptability of user interfaces have long been recognised, little or no explicit attention has been paid to the aesthetics of Linked Data applications. In this paper, we introduce a formalised approach to developing aesthetically pleasing Semantic Web interfaces by following aesthetic principles and guidelines identified from literature. We apply such principles to design and develop a generic approach of using visualisations to support exploration of Linked Data, in an interface that is pleasing to users. This provides users with means to browse ontology structures, enriched with statistics of the underlying data, facilitating exploratory activities and enabling visual query for highly precise information needs. We evaluated our approach in three ways: an initial objective evaluation comparing our approach with other well-known interfaces for the Semantic Web and two user evaluations with Semantic Web researchers.

Keywords: Linked Data, Information Visualisation, Aesthetics, Visual Analytics, Semantic Web

1. Introduction

The human response to aesthetics has been a subject of study and experimentation for a long time in cognitive psychology, art and industrial design. Aesthetics, or the “*pleasure attained from sensory percep-*

tion” [35] plays a significant part in any product design. Norman [63] describes that beautifully designed products make users feel positive and good, thereby putting them in a state of mind that makes them more receptive and open. Semantic Web and Linked Data Interfaces have traditionally been designed and evaluated performance and reliability, with few evaluations focussing on usability [43,52]. In addition to a greater

*Corresponding author. E-mail: S.Mazumdar@sheffield.ac.uk.

Above: Affective graphs: The visual appeal of Linked Data, research article
Official link to article: <http://shura.shu.ac.uk/7956/1/SWJ-Affective-graphs.pdf>

<https://content.iospress.com/articles/semantic-web/sw162>

METHODS 1/1

The research methods used for the design process and the user evaluation are explained in detail in the paper. This video intends to complement the textual description in the paper by showing how the user interacts with the system when working on a task assigned during the evaluation

The clip exemplifies how the 13,5 millions entities in the dataset “thing” can be interactively explored while, at the same time, composing a complex query to retrieve the subset that satisfies the request “length and surface of runways at the airport that serves as hub for the ‘Emirates’ airline”; the clip finishes with the display of the list of the entities that match the SPARQL automatically composed via the user interaction.

The screenshot displays a user interface for exploring linked data. At the top, there are input fields for "Enter a question", "Search for concept", and "Highlight Property", along with checkboxes for "Freeze Nodes", "Hide Object Properties", and "Hide Data Properties". The main area shows a graph of nodes and relationships. The nodes are labeled "Thing", "place(2290912)", "architectural structure(238712)", "airport(12688)", and "infrastructure(229552)". A play button is overlaid on the graph. The sidebar on the right shows the "Query" and "Context" for "infrastructure".

Query Constraints

Properties

- Infrastructure --> [subsequentInfrastructure](#) (39)
- Infrastructure --> [previousInfrastructure](#) (30)
- [operator](#) (32341) --> [Organisation](#)
- [numberOfTracks](#) (21903) --> [nonNegativeInteger](#)
- [iataLocationIdentifier](#) (21312) --> [string](#)
- [passengersPerYear](#) (18288) --> [nonNegativeInteger](#)
- [length](#) (17760) --> [kilometre](#)
- [passengersPerDay](#) (8691) --> [nonNegativeInteger](#)
- [subsequentInfrastructure](#) (39) --> [Infrastructure](#)
- [previousInfrastructure](#) (30) --> [Infrastructure](#)

Above: the video clip shows the user interaction with the system from the initial node will over 13.5M entries to the formulation of a query and the retrieval of relevant entries.

[Press play to watch](#)

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Affective Graphs: The Visual Appeal of Linked Data

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Authors:
 Suvodeep Mazumdar
 Daniela Petrelli
 Khadija Elbedweihy
 Vitaveska Lanfranchi
 Fabio Ciravegna

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SWJ Papers for the ISWC 2016 Journals Track

Submitted by Pascal Hitzler on 08/17/2016 - 20:59

The 15th International Semantic Web Conference (ISWC 2016), which will be held in Kobe, Japan, in October 2016, will feature a Journals Track with the presentation of 12 papers, half of which will be from the Semantic Web Journal. The papers have been selected from among all papers which have been published in a print issue in January 2015 or later, or which were awaiting print publication in May 2016. Authors could self-nominate their papers for the track, the only requirement was that they would be willing to present their work at the conference. The editorial board then selected by vote which papers were to be presented.

The ISWC 2016 Journals Track papers from the Semantic Web Journal are as follows, listed in no particular order:

- Andrea Giovanni Nuzzolese, Valentina Presutti, Aldo Gangemi, Silvio Peroni, Paolo Clancaranini, Aemoo: Linked Data exploration based on Knowledge Patterns. Semantic Web, to appear.
- Suvodeep Mazumdar, Daniela Petrelli, Khadija Elbedweihy, Vitaveska Lanfranchi, Fabio Ciravegna, Affective Graphs: The Visual Appeal of Linked Data. Semantic Web 6 (3), 2015, 277-312.
- Pierre-Yves Vandembussche, Ghislain A. Atemezing, Maria Poveda, Bernard Vatant, Linked Open Vocabularies (LOV): a gateway to reusable semantic vocabularies on the Web. Semantic Web, to appear.
- Diego Calvanese, Benjamin Cogrel, Sarah Komla-Ebri, Roman Kontchakov, Davide Lanti, Martin Rezk, Mariano Rodriguez-Muro, Guohui Xiao, Ontop: Answering SPARQL queries over relational databases. Semantic Web, to appear.
- Amrapali Zaveri, Anisa Rula, Andrea Maurino, Ricardo Pietrobbon, Jens Lehmann, Sören Auer, Quality Assessment for Linked Data: A Survey. Semantic Web 7 (1), 2016, 63-93.
- Muhammad Saleem, Yasar Khan, Ali Hasnain, Ivan Ermilov, Axel-Cyrille Ngonga Ngomo, A Fine-Grained Evaluation of SPARQL Endpoint Federation Systems. Semantic Web 7 (5), 2016, 493-518.

We're looking forward to the presentations!

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The reviewers point out the paper's originality, significance, relevance, and contribution. Reviews and paper were assessed by the journal editorial board and selected to be presented at the International Semantic Web Conference in 2016 as one of the 6 best papers out of the 60 published in the Semantic Web journal from January 2015 to May 2016, please [go to this link](#) to see the original page online as shown above and as PDF.

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The Semantic Web Journal operates an open review policy meaning that both reviewers and reviews are public. Reviews can be read in full via the above PDF or on the original web pages by going to [this link](#).