Why Not Simply Google?

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Abstract
We demonstrate an ontology-based visual query system, namely OptiqueVQS, for end users without any technical background to formulate rather complex information needs into formal queries over databases. It is built on multiple and coordinated representation and interaction paradigms and a flexible widget-based architecture.

Author Keywords
Visual query formulation, ontologies, end-user data access

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General Terms
Design, Human Factors

Introduction
Domain experts in organisations have rather complex *information needs* that go beyond the limits of well-known search approaches, such as keyword search. Usually, an army of *IT experts* mediates between domain experts and databases in an inherently time-consuming fashion, since *end users* often lack necessary technical *skills* and

knowledge and have low tolerance on formal textual query languages (e.g., SQL). Hence, engaging end users directly with data could free up substantial expert time that could be redeployed so as to contribute to *value creation* [6].

Visual query formulation (cf. [3]), as an *end-user development* practice (cf. [7]), is promising to remediate end-user data access problem. It is built on the *direct manipulation* idea [9], in which end users *recognise* and *interact* with the visual representations of domain elements, rather than *recalling* domain and syntax elements and *programatically* combining them. *Ontologies* are suggested to be more natural than *logical models* (e.g., database schemas) for end users (cf. [10]), since ontologies are problem domain artefacts, while models are solution domain artefacts (cf. [8]). Ontologies also help us to seamlessly *federate* distributed data sources and to extract implicit information from data with *reasoning*.

In this demo, we present an ontology-based visual query system, *OptiqueVQS* [12], for end-user database querying.

Related Work

One could categorise well-known approaches for querying structured data into *formal textual languages*, *keyword search*, *natural language interfaces*, *visual query languages*, and *visual query systems*. Formal textual languages are inaccessible to end users, since they demand a sound technical background. Keyword search (e.g., [1]) and natural language interfaces (e.g., [5]) remain insufficient for querying databases, due to their low *accuracy* and *completeness*. Visual query languages (e.g., [11]) rely on visual formalisms and are comparable to formal textual languages, while visual query systems are built on a system of interactions and have potential to offer a good balance between *expressiveness* and *usability*.

Ontology-based visual query formulation tools are either exclusively meant for visual query formulation (e.g., [4, 16]) or for semantic data browsing on the Web, which are inherently meant for less sophisticated information needs (e.g., [2]). The latter are usually built on *faceted search* (cf. [15]) and/or *query by navigation* (cf. [14]) and are well embraced by end users.

Existing tools suffer from one or more of the followings: *(i)* singular *representation* and *interaction paradigms*, *(ii)* inadequate support for *view* and/or *overview*, *(iii)* poor balance between *formulation* and *exploration*, and *(iv) non-modular* architectures.

OptiqueVQS

OptiqueVQS allows users to precisely describe complex information needs that demand joining and constraining information from multiple objects. In Figure 1, we ask for all the "Fields", operated by a "Company" named "Statoil", and the completion dates of its "Wellbores".

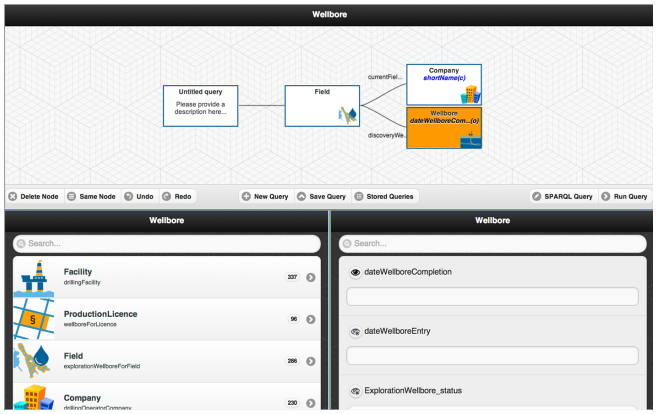

Figure 1: OptiqueVQS with an example query.

OptiqueVQS employs *OWL 2*[1] and *SPARQL*[2], as ontology and query languages respectively. It is designed as a *widget-based user-interface mashup* (i.e., UI mashups) (cf. [13]), which aggregates a set of applications in a common graphical space, in the form of *widgets*, and orchestrates them for common goals. This choice ensures modularity and, in turn, *flexibility* and *extensibility*.

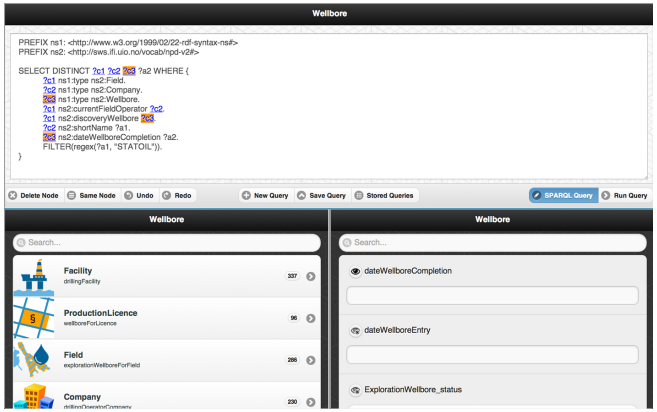

Figure 2: OptiqueVQS in textual mode.

OptiqueVQS (see a demo[3]) currently has three widgets, each employing a different representation and interaction paradigm, cf. Figure 1. A *multi-paradigm* approach offers suitability to a broad range of tasks and users. The first (*W1* – see the bottom-left part) allows users to join concepts through navigating relationships in between. The second (*W2* – see the bottom-right part) presents the attributes of a selected concept for selection and projection. The third (*W3* – see the top part) provides an overview of the constructed query and affordances for manipulation. Events, generated by each widget as a user interacts, are harvested to orchestrate the widgets.

Users can formulate *linear* and *tree-shaped conjunctive* queries, delete nodes, access query catalogue, undo/redo actions, and switch to SPARQL mode and interact with the system in the textual form – see Figure 2.

Holistically, W3 is meant to provide an overview of the active query task, while W1 and W2 are meant to keep the focus (i.e., view) on the active concept. Furthermore, each widget employs the human readable labels of ontology elements rather than their identifiers.

Conclusion and Future Work

Our initial user studies suggest high usability and the future work includes higher expressivity and visual scalability against large ontologies. OptiqueVQS is a part of a large project tackling a range of related questions, such as automated elicitation of ontologies (cf. [6]).

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[3] http://youtu.be/ks5tcPZVHp0

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