Editorial

For quite some time now we can see how the World Wide Web provides information to its users in a human-readable way. To do so, it typically uses languages like HTML to put the information in pages that are served to the users. Due to the Web's popularity, a lot of information is currently available as Web pages. Realizing the richness of the information published on the Web, there is an increasing number of Web applications that try to capitalize this and use the Web as an input data source. These applications typically exhibit a "screen scraping" nature and experience that they cannot easily extract the data present in Web pages as the data is mixed with presentation elements. An initiative to construct a future Web, i.e., the Semantic Web, attempts to help solving this problem.

The Semantic Web aims at describing information on Web pages in a machine-understandable way. The idea requires a number of research issues to be resolved. First and foremost, the Semantic Web needs to provide the adequate languages to express the Web data. In order to make the data machine-understandable, these languages need to support the representation of the data semantics. Also, for repurposing Web content, one needs languages able to query, process, and transform the semantics of the Web data. A typical application of Semantic Web research is the integration of data using Semantic Web technologies. Making available the semantics of the data that needs to be integrated reduces the data integration effort and helps solving interoperability problems. Another example concerns the presentation of multimedia data on the Semantic Web. The presentation generation process can benefit from the availability of the data semantics and of the presentation design knowledge. On the World Wide Web, this information is typically hidden in the applications' code and thus difficult to be used by other systems.

In this special issue we focus on the topics of integration and presentation generation that play such important roles in the realization of the Semantic Web. We combine researchers from relevant communities in presenting results from research on these topics. Integration is important because it allows the combination of content originating from different providers and the combination of different contexts in a way that is transparent to the user. Presentation generation is an aspect that is sometimes forgotten, but is crucial in making the Semantic Web also a Web that can be accessed by human users. Exploiting the machine-understandable nature of the data on the Semantic Web can also help the data processing required to provide better presentations to Web users.

Part of this new idea asks for a new set of definitions regarding dynamics. Dynamics is certainly one aspect that in the Semantic Web attracts more research attention than in the traditional Web, and effective solutions will certainly benefit the new Web. Web services form a key concept in this respect, and WSMF, the Web Service

Modeling Framework, builds a framework for modeling Semantic Web Services. WSMF is proposed in the first paper by Han et al. and defines a unified approach to describe, discover, and invoke Semantic Web Services. In order to achieve reusability, WSMF have been extended with concepts from UPML, the Unified Problem-solving Method development Language.

The distributed and rather component-based nature of the Semantic Web brings another interesting topic. With all the connections between the many parts of the Semantic Web, there is a need to define rules. These rules enable the specification of the inferences and transformations that are needed on the Semantic Web. The second paper by Wagner et al. describes RuleML as a solution to this problem. RuleML is a framework language that accommodates different rule languages with different semantics.

Integration has for long been studied in different, more traditional settings, and in the third paper by Stuckenschmidt et al. the authors present how they translate work on data integration on the Web to the context of the Semantic Web in terms of an RDF-based data integration framework. The distribution of RDF queries is based on source index hierarchies which store the input sources relevant for path expressions. The paper also proposes heuristics for join ordering inside path expressions in order to support RDF query optimization.

The same topic of integration comes back in the fourth paper by Barrett et al. They present how, for the aspect of the integration of data sources, they applied Semantic Web technologies thus transferring these technologies to business problems. Based on their integration architecture they propose a tool that integrates data from several sources inside a company. The time required for mapping relational databases to a common ontology is relatively small when compared to the time it takes to find information in the original input databases. Based on this application, the authors show how they could do this Semantic Web technology transfer with success.

While the Semantic Web serves machine-processable data, there is still the need to make its content available to human users. There are many researchers that study the transformation of RDF data to formats that are better suited for end-user presentation. The fifth paper by van Ossenbruggen et al. presents a number of projects and research tools that are specifically targeted for this transformation to presentation formats. The authors suggest as a transformation language an extension of XSLT with querying facilities based on an RDF query language.

An important issue on the Semantic Web is how to provide the data semantics in an automatic way. The sixth paper by Hunter and Little presents how one can achieve semantic indexing of multimedia data based on low-level, automatically extracted multimedia features. The automatic semantic indexing is realized by domain-dependent inference rules expressed in RuleML. The semantic relationships in the multimedia annotations can be used to build spatio-temporal multimedia presentations.

As we see in this issue, the Semantic Web poses a large number of challenges for researchers to form the new Web. The common spirit between many of the researchers involved in the papers in this issue is to exploit available results from

related contexts to this new environment with its own characteristic peculiarities. We can observe that the papers share the vision that it is crucial that the Semantic Web, as it is developed today, inherits as many as possible of the advantageous characteristics that brought the current Web its success.

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Guest Editors