A Portrait of the Semantic Web in Action

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Contents

- Introduction
- Overview of Semantic Web Language
- Producing Semantic Markup
- Integrating Resources
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World Wide Web: More enormous quantity of data.

Need to hand off portion of these tasks to machines.

But, machine cannot understand web pages.

Alternative

: Change the web to make it more understandable by machine.

Solution: Semantic Web
Introduction

- The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation. by Tim Berners-Lee.

- The Semantic Web is an evolving development of the World Wide Web in which the meaning semantics of information and services on the web is defined, making it possible for the web to "understand" and satisfy the requests of people and machines to use the web contents.
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Overview of Semantic Web Language

- A Semantic Web Language must describe meaning in a machine readable way.

- Therefore, the language needs:
  - Ability to specify a vocabulary.
  - Ability to formally define the vocabulary.

- Semantic Web Language is different from traditional KR.
  (KR : Knowledge Representation - Subfield of AI)
Overview of Semantic Web Language

- Differences from traditional KR (1/2)
  - The most obvious difference is syntactical.
    - The syntaxes of Semantic Web Languages are based on existing standards such as HTML of XML, so that integration with other Web technologies is possible.

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<th>Semantic Web Language</th>
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</table>
Differences from traditional KR (2/2)
- Other differences depend on the very nature of the Web. Since the Web is decentralized, the language must allow for the definition of diverse, and potentially conflicting vocabularies.
Overview of Semantic Web Language

- A Semantic Web vocabulary can be formally specified using an ontology or schema.

- Ontology
  - formal, explicit specification of a shared conceptualisation.
  - Typically sharable & extensible.
  - Expressivity of language for building the Semantic Web.
    # First step for building the Semantic Web.
    # Define class taxonomies, properties, relationship, axioms.
    # Database for communication between web agents.
Overview of Semantic Web Language

- Semantic Web Language
  - RDF (Resource Description Framework)
  - SHOE (Simple HTML Ontology Extension)
  - OIL (Ontology Interchange Language)
  - DAML (DARPA Agent Markup Language)

- Just Standardization and Interpretation
  - Make machine understandable
    - Must contain semantic markup.
    - Terminologies defined in one or more ontologies.
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Producing Semantic Markup

- The task of describing a set of web pages using Semantic Web Language.
  - Consider the domain of the pages and choose an appropriate ontology.

- As Semantic Web Language evolve
  - Huge ontology libraries.
  - Numerous search mechanisms.
Producing Semantic Markup

- Authoring tool
  - Knowledge Annotator
Generating Markup on a Large Scale

- It is tedious to use an authoring tool to generate large amounts of markup.
- So we need to automatically generating semantic markup.
- Regular structure to Semantic markup language.
- In this paper, use Running SHOE tool.

A fundamental problem in distributed systems is knowing when markup authored by different people describes the same entity.

- Need to common identifier (or key).
- URL can often serve as this key. (it has some problems.)
Producin

- Generate semantic markup tool
  - Running SHOE
Producing Semantic Markup

- Select a page to markup.
- Create a wrapper.
  - By Specify a series of delimiters that describe how to extract interesting information.
- After the user has specified the delimiters, Running SHOE can display a table with a row for each record and a column for each field.
- Convert the table into SHOE markup.
  - create a series of SHOE statements from the table.
Producing Semantic Markup

- Using this tool (Running SHOE), we can extract substantial markup from a web page in minutes.

- Furthermore, since Running SHOE allow these templates to be saved and retrieved, it is easy to regenerate new SHOW markup if the content of the page changes.

- There are many tools for generate large quantities of markup. Running SHOE, PSM (Publication SHOE Maker), and so on.

- As XML becomes ubiquitous on the Web, it’ll be become easier to generate wrappers, and stylesheets can be used to transform a simple XML vocabulary into a semantically-enriched one.
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Integrating Resources

- After a number of diverse web sites have been described with semantic markup, the next problem is determining how to integrate this information.

- Exposé
  - Web crawler
  - search for web pages with SHOE markup and interns the knowledge.
  - performs a graph traversal using cost function.
  - Stores SHOE category, relation statement, ontology information in KB.
Integrating Resources

- Knowledge base will determine the query capabilities of the system, thus an appropriate knowledge representation system must be chosen.
  - Parka: High performance frame system.
  - XSB: Deductive database.
  - OKBC: Compliant knowledge bases.

- By changing the backend knowledge representation system, we get varying tradeoffs between query response time and the degree to which inference is used in computing answers.

- The choice of the backend system depends on the expected query needs of the application.
Querying the Semantic Web

- Both general purpose and domain specific query tools can access the SHOE knowledge after it has been loaded into the KB.
- The SHOE Search tool is a general purpose tool that gives users a new way to browse the web by allowing them to submit structured queries and open documents by clicking on the URLs in the results.
Querying the Semantic Web

- General Purpose Query Tools
  - SHOE Search
Querying the Semantic Web

- General Purpose Query Tools – SHOE Search
  - Steps of SHOE Search
    # Choose ontology against which the query should be issued.
    # Choose the class of the desired object.
    # Typing in desired values for properties.
  - Then, user issues a query and receives a set of results in a tabular form.
Querying the Semantic Web

- For not SHOE markup
  - the standard query method of SHOE Search will not be able to return answer.
  - Therefore, we also have a Web Search feature that translates the user’s query into a similar search engine query and submits it to any one of a number of popular search engine.
Querying the Semantic Web

- Advantage of Using SHOE Search over using the search engines directly.
  - By prompting the user for values of properties it increases the chance that the user will provide distinguishing information for desired result.
  - By automatically creating the query it can take advantage of helpful features that are often overlooked by users such as quoting phrases or using the plus sign to indicate a mandatory term.
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How to
- Add markup to web pages.
- Web crawler discovers and stores in repository.
- Query.
The vision of the Semantic Web
- Much easier to locate useful information on the internet.
- Integration of diverse resources will be simplified.

There are still obstacles to overcome
- We need better schemes for ensuring interoperability between independently developed ontologies and approaches for determining who and what to trust.
Conclusion

- Towards the Semantic Web vision.
  - First step, The design of languages that allow semantic markup to be expressed.
  - The next step is to build systems and tools like those described in this paper, so that users can easily provide and receive information on the Semantic Web.