Introduction to the Semantic Web Technologies

Michael Zakharyaschev

Department of Computer Science and Information Systems, Birkbeck, University of London

http://www.dcs.bbk.ac.uk/~michael
The World Wide Web and Society

15th century: industrial society, knowledge-based economy

J. Gutenberg developed a *moveable type* in 1447

21st century: information society, digital economy

T. Berners-Lee invented the *World Wide Web* in 1989

- social contacts (social networking platforms, blogging, . . .)
- economics (buying, selling, advertising, . . .)
- administration (e-government)
- education (e-learning, . . .)
- etc.
WWW: humans only!

Can we answer the queries:

Where does MZ work?
  What is his research area?
Did he publish a book?
  What is his position?
...
Can we answer the queries:

Where does MZ work?
What is his research area?
Did he publish a book?
What is his position?
...

Google ‘Michael Zakharyaschev’

The Web page contains **enough information** to answer the queries

- but this information is **implicit**
- we understand it because we ‘know’ the **context**
- while machines cannot make sense of it

**can we make the data on the Web explicit and machine readable?**
How can we liberate the Web data?

- some **extra information** must be added to links and data
- this information links data to other data and gives meaning to (characterises) links & data
- this information must be **machine readable**
- this should be done in a **standard way**
Linked Data!
What is the Semantic Web?

The Semantic Web can be thought of as a collection of standard technologies to realise a Web of Data

1. formal, machine understandable **languages** to describe (query, etc.) the data and their connections

2. **ontologies** in those languages that describe various types of data

3. formal **rules** that allow the machines to extract information from the data (classify, query, etc.)

4. corresponding **technologies** and efficient **tools**

Aim of the course: to (gently) introduce you to both theory and practice of SW
Example Semantic Web Applications: Healthcare

**SNOMED CT** is a formal ontology of medical terms, synonyms and definitions used in clinical documentation and reporting.

- most comprehensive, multilingual clinical healthcare terminology in the world
- electronic record systems
- catalogues of services
- clinical decision support
- laboratory reporting
- genetic databases
- . . .

used in most developed countries in the world
Example Semantic Web Applications: Media

**BBC** website for the Football World Cup 2010: 32 teams, 8 groups, 776 players
too many pages to create, too few journalists

Semantic Web technologies used:

- ontology describes the interrelation between facts of the World Cup
- such metadata stored as RDF triples

- e-governments
- libraries
- news papers
- dbpedia
- . . .
Example Semantic Web Applications: Industry

Statoil, Siemens, … ontology-based data access
About the lecturer

- graduated from the ‘BMK’ faculty, Moscow State University
- PhD and Habilitation from Novosibirsk State University
- professor of Computer Science at Birkbeck, University of London
- research: ontology-based data access, knowledge representation & reasoning

http://www.dcs.bbk.ac.uk/~michael/ for details

About the course

- Semantic Web course material of 2015 is available at

http://www.dcs.bbk.ac.uk/~michael/sw15/sw15.html

- no prerequisites (apart from a bit of English:-)
  some knowledge of databases or discrete maths or logic will make the course pure fun
All are welcome !