

Semantic Web (CSC751)

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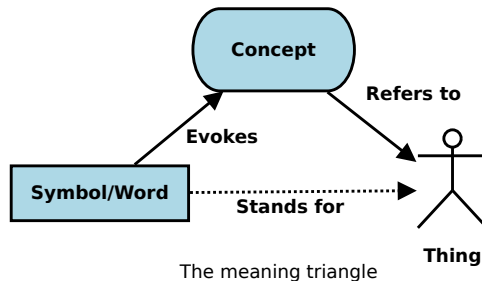
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UNIVERSITY
OF MIAMI



Outline

- 1 About us
- 2 What about you and your expectations
- 3 General Information
- 4 What are Semantic Web and technologies?



Ubbo Visser

Short introduction



Research interest

- Artificial Intelligence with the focus on knowledge representation and reasoning.
- **Application areas:** Semantic Web and Multi-Agent Systems (Games, Robots, RoboCup).

Position

- Associate Professor

Stations

- Münster, Brisbane, Bremen
- Miami

Contact information

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May we know who you are?

Short introduction

- Are you a MS or a PhD student?
- Which area would you like to specialize in?
- Why did you select this course?

*hmm, I am not sure;
my advisor told me so;
fascinating topic;
this is what I want to specialize in;
I see a big future ahead of this field; ...*

Grading & general issues

- **Grading:** Final project 60% and assignments 40% *plus optional extra credits*.
- **Scoring of Homework Assignments:** There will be n mandatory assignments. These assignments are mostly based on the papers, chapters and sections available in the required reading section. Problems will be either theoretical or implementation-based (using ontology tools or API's). In addition to this, there will be an optional extra credit problem for the determine students. Assignments have variable due dates, and the due dates are available in course web site. The score of each homework will be mentioned in it.
- **Class attendance and participation:** Class attendance is not mandatory, although the final project will depend heavily of the lectures. Not all of the material will come from the text. Class participation is also mandatory. However, active interest in lectures is the easiest way to learn.

Keep always these in mind

- **Plagiarism:** The penalty for copied homework of any kind can be immediate failure in the course.
- **My policy on programs is as follows:** There is no reason for two (or more) people handing in identical or nearly identical programs. We will regard such programs as either group-written or simply copied. If we have no hard evidence of copying, such programs will receive NO credit. More serious actions will be taken in cases where there is evidence of cheating.
- **Late programs:** Unless otherwise stated, programs will lose 20% of their value for each weekday (Monday through Friday) that they are late, down to a minimum value of 20%. The due date of a program is the latest date on which it can be run to get full credit.

and also these too ...

- **Dropping the course:** Unless there are extreme extenuating circumstances, we will not allow anyone to drop a course after the drop date. Poor academic performance will never be an acceptable reason for a late drop.
- **Incompletes:** Unless there has been a documentable illness that caused you to miss substantial amounts of class and computer time, we will not give an incomplete grade in this course. Therefore, please do NOT waste our time asking about an incomplete grade unless you have a remarkably good reason.
- **Make-up exams:** We do not give make-up exams. You simply must show up and take them at the specified times.

Topics

Part 1 (Introduction)

- 1 Introduction to Semantic Web/ontologies/applications/research
- 2 Basic introduction to logic
- 3 Fast overview of DL/XML/RDF/RDFS/Ontologies/Reasoning (**to get started with implementation** using *Protégé*, *Jena API*, and *OWLAPI*)

Part 2 (Understanding)

- 1 Description logic basics
- 2 XML/RDF/RDFS/SPARQL
- 3 Ontologies *SROIQ^D*
- 4 Basic reasoning

Part 3 (Design)

- 1 Ontology building/justification/entailment tools
- 2 Project week

Tentative schedule

Lec.	Week(s)	Topic	Required reading	Assignment	Due
1	1 (1)	Introduction to SW; ontologies/app./research	[BLHL01]; Ch. 1, 9 (<i>optional but strongly suggested</i>);	1	-
2	2 (1)	Basic introduction to logic	Appendix C	-	1
3	3-4 (2)	Overview of DL, XML, RDF, RDFS, ont., and reasoning	[Pol10]; Appendix A; Sec. 2.1, 3.1	2	-
4	5 (1)	Description logic basics	[BHS03]; Ch. 8	Project proposal	-
5	6-8 (3)	XML, RDF, RDFS, and SPARQL	Assigned parts of [PS08]; Ch. 2, 3, 7.1	3	2
6	9 (1)	Ont. \mathcal{SROIQ}^D	[HKS06]; Ch. 4	4	3
7	10 (1)	Basic reasoning	Ch. 5	Project progress report	-
8	11 (1)	Ont. building, justification, and entailment tools	OwSight; [KPHS08]	-	4
	12 (1)	Project week	-	Project presentations	-

More information ...

- **Required book:** We use the *Foundations of Semantic Web Technologies, Chapman & Hall/CRC, 2009* [HKR09] as the official text book of the course.
- **Final project:** Every participants is expected to present a final project at the end of the semester. We strongly recommend that the project is chosen related to your research interests.

We have listed several projects con the course web page. In order to keep track on the progress of the project, students are asked to present the current state of the project in two successive intervals. This includes the proposal, and the mid-term progress. More details will be provided during the lectures, and on blackboard.

What is Semantic Web?

WWW

- is a distributed, and a collection of heterogeneous systems.
- contains a huge amount of data with standards to transfer structured data.
- contents are most of the time human readable, and all the time machine-processable.
- **But**, it is very difficult to identify the relationships (semantics/conceptualization) among resources on the web without human influence.

...the basic idea of the Semantic Web

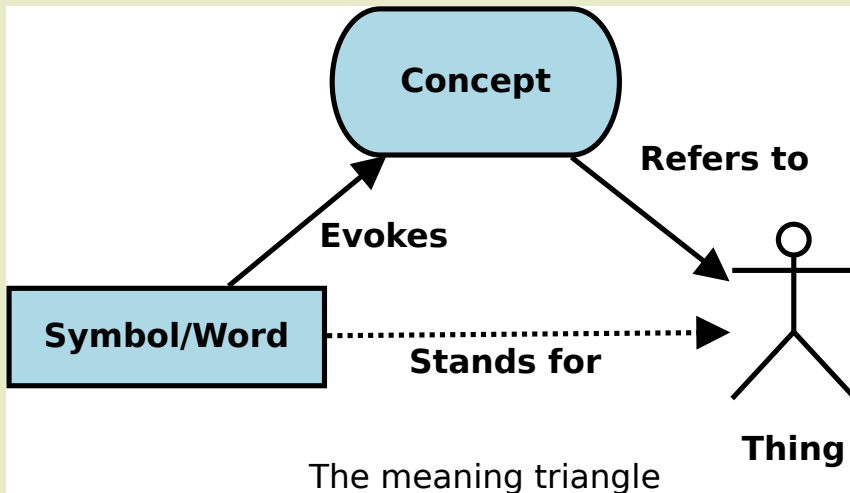
- is to provide a conceptual framework for
 - 1 **Build models** to capture the complexities of the world with simple methods through abstraction.
 - 2 **Compute meaningful conclusions** through a reasoning mechanism.
 - 3 **Communicate** unambiguous complex information through **ontologies**.

Some warm-up examples . . .

- BioAssay ontology project
- Semantic Web Challenge
- dbpedia (e.g., Berlin resource)

Basic ideas ...

Building models [Mae02]



Basic ideas ...

Compute meaningful conclusions^a

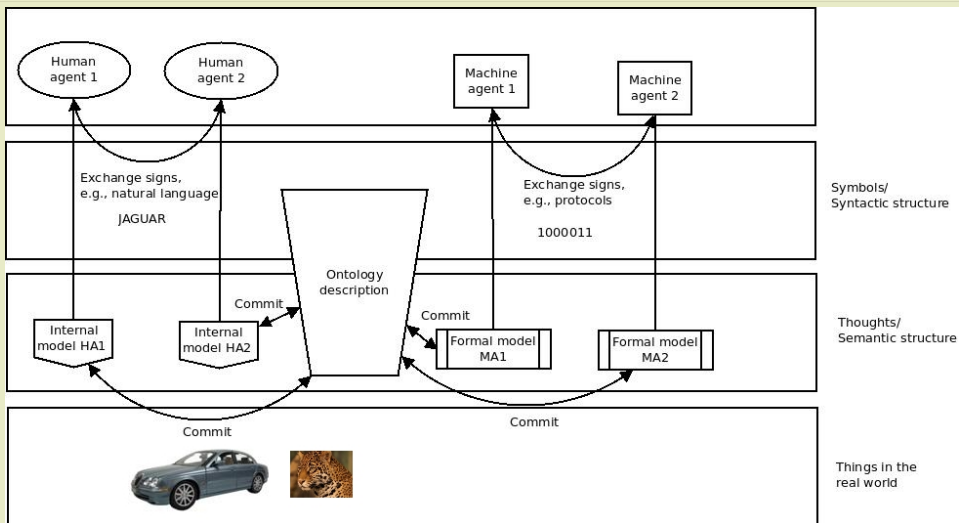
^a<http://owl.man.ac.uk/2003/why/latest/>

- $cat_owner \equiv person \sqcap (\exists has_pet.cat)$ (Cat owners have cats as pets)
- $has_pet \sqsubseteq likes$ (has_pet is a subproperty of $likes$, so anything that has a pet must like that pet)
- $cat_liker \equiv person \sqcap (\exists likes.cat)$ (Cat owners must like a cat)
- Therefore, **Cat owners like cats.** (Justification: The subclass is inferred due to a subproperty assertion)

We will talk about these matters in detail during the course.

Basic ideas ...

Communication [Mae02]



Acknowledgement

Acknowledgement

The majority of the slides for this course have been prepared by Saminda Abeyruwan.



Franz Baader, Ian Horrocks, and Ulrike Sattler.

Description logics as ontology languages for the semantic web.

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Tim Berners-Lee, James Hendler, and Ora Lassila.

The Semantic Web.

Scientific American, 284(5):34–43, May 2001.



Pascal Hitzler, Markus Krötzsch, and Sebastian Rudolph.

Foundations of Semantic Web Technologies.

Chapman & Hall/CRC, 2009.



Ian Horrocks, Oliver Kutz, and Ulrike Sattler.

The even more irresistible SROIQ.

In *In KR*, pages 57–67. AAAI Press, 2006.



Aditya Kalyanpur, Bijan Parsia, Matthew Horridge, and Evren Sirin.

Finding all justifications of OWL DL entailments.

pages 267–280. 2008.



Alexander D. Maedche.

Ontology Learning for the Semantic Web.

Kluwer Academic Publishers, Norwell, MA, USA, 2002.



Axel Polleres.

Semantic web technologies: From theory to standards.

In *21st National Conference on Artificial Intelligence and Cognitive Science (AICS2010)*, Galway, Ireland, August 2010.

Review paper (appeared in the informal conference proceedings).



Eric Prud'hommeaux and Andy Seaborne.

Sparql query language for rdf.

<http://www.w3.org/TR/rdf-sparql-query/>, 2008.