

# Intelligent Technologies Module: Ontologies and their use in Information Systems Revision lecture

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# Overview of these lectures

1. What is an ontology?
2. How are ontologies developed?
3. Reasoning over ontologies
4. Usage Scenarios for Ontologies in Information Systems:
  - Supporting personalisation
  - Ontology as global schema
  - Enabling interoperability between different systems

## Some revision questions (Part I)

- Describe the main features of an ontology
- How are ontology languages different from data modelling languages?
- What are the main steps involved in developing an ontology?
- What is meant by the three “layers” of a typical ontology?
- How can UML diagrams be used as an ontology representation language? Illustrate your answer by means of a simple example.

## Some revision questions

- Briefly describe the motivation for the SeLeNe project
  - What were the main steps involved in developing the SeLeNe user profile? Do you think this is a typical process that could be followed in other similar projects? If yes, why? If not, why not?
  - What are the two main parts of the SeLeNe user profile?
  - What is the advantage of expressing learners' learning needs using the same terms as are used to describe LOs?
  - How is the SeLeNe user profile used to support personalisation? [you should be able to discuss in outline the personalised querying and personalised notifications aspects that we looked at in the lecture – it is not expected that you will discuss the other personalisation aspects of the SeLeNe project]
  - Briefly describe the role of event-condition-action rules in SeLeNe and how ECA rule evaluation operates in the system

## Some revision questions

- Briefly describe the motivation for the L4A// project
  - What were the main steps involved in extending the L4All ontology to support search for “people like me” facility ? Do you think this is a typical process that could be followed in other similar projects? If yes, why? If not, why not?
  - How is the extended L4All ontology used to support this facility? [you should be able to discuss in outline the functionality itself, the way that timelines are encoded and the timeline similarity matching; you do not need to describe in detail the operation of the NeedlemanWunsch algorithm]

## **Homework Question 1** : What are some of the similarities and some of the dissimilarities between these two systems?

- Think about:
  - possible dimensions of comparison
  - features of each of the systems along these dimensions

# Some dimensions of comparison for Question 1

- software architecture (e.g. monolithic, client-server, service-oriented, centralised, distributed?)
- who are the users
- extent of user involvement in (i) requirements, (ii) design, (iii) evaluation
- ontology development process
- support for ontology-based matching?
- does the system gather information about users and automatically update their user profile?
- if so, what technology (or technologies) are used to achieve this?
- is there support for personalised queries? What kinds of user queries are supported? How are they “personalised”?
- how are query results returned?
- is there support for personalised notifications? If so what technology (or technologies) are used to achieve this?

## Some revision questions (Part II)

- What are the challenges faced in integrating heterogeneous data?
- What are the two main approaches to heterogeneous data integration? What are their respective advantages and disadvantages?
- Describe three possible ways in which heterogeneous databases may be integrated under an ontology  
[the main principles; I wouldn't expect you to remember details of each of the three example systems we looked at, such as the specific ontology languages, query languages, or mapping approach that they each employ]
- Describe how querying the data sources through the ontology is supported in each case [similarly, the main principles, not the specific details of the three example systems we looked at]

**Homework Question 2** : What are the similarities and dissimilarities of the three ways of accessing heterogeneous databases through an ontology that we studied in the course?

- Think about:
  - possible dimensions of comparison
  - features of each of the architectures along these dimensions

## Dimensions of comparison for Question 2

- integration architecture
  - how many “layers” of schemas are involved?
- mappings between schema “layers”
  - how are they expressed?
- processing queries expressed on the global ontology
  - how are queries evaluated?
- maintainability of the integrated resource
  - what happens if the global ontology changes?
  - what happens if a local schema changes, or is added or dropped?

## Some revision questions (Part II, cont'd)

- How might ontologies be used to reconcile the inputs and outputs of heterogeneous services, so that such services can be executed in sequence within a workflow? Illustrate your answer with reference to the MyPlan project.
- Optional extra: consider the earlier steps that may occur before the *service reconciliation* process that we discussed on the course in an “open” computing environment such as the Web, namely:
  - *service discovery and service matching*
- What role(s) do you think ontologies and/or ontology representation languages can play in these steps?
  - Look up OWL-S (Semantic Markup for Web Services) and WSMO (Web Service Modelling Ontology); both are W3C submissions.