



Querying Data through Ontologies

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Ontologies: What, how and why ?

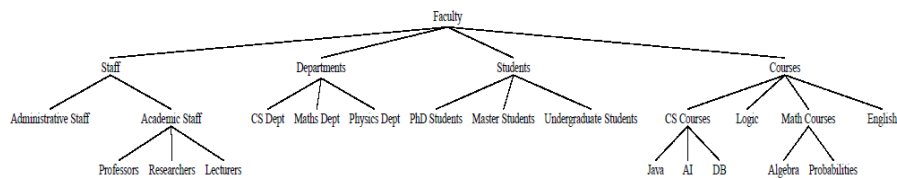
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- A formal description of a domain of interest
 - a vocabulary (classes and properties)
 - enriched with statements that constrain the meaning of the terms used in the vocabulary
 - *java* can be a *dance*, an *island*, a *programming language* or a *course*
 - the statement *java* is a subclass of *CS Courses* makes clear the corresponding meaning for *java*: it is a course
- With a logical semantics
 - The statements constraining the vocabulary are in fact axioms in logic
 - Description Logics are used as fragments of first-order logic for enabling decidability
- Thus enabling reasoning

An example of ontology

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■ A taxonomy (graphical representation of subclass constraints)



+ set of properties with constraints on their domain and range (RDFS)

Teaches (Academic Staff, Courses)

TeachesTo (Academic Staff, Students)

Manager (Staff, Departments)

+ additional constraints (not expressible in RDFS but in OWL)

Students disjoint from Staff

Only Professors or Lecturers may teach to Undergraduate Students

Reasoning: a central task

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- For query answering in P2P data management systems
 - an answer to a query can be **inferred** from local data and distant data obtained by **query reformulation** from **mappings** between distributed ontologies
 - SOMEWHERE
- For handling contextual data
 - CONTINUUM
- For verifying properties of consistency or of security expressed as logical constraints
 - Atomic, secure and adaptable services coordination (ORCHESTRA)
 - Mashing up web data (E-CLOUDSS, RED-SHINE)

SomeWhere PDMS

Joint work with IASI-Gemo group in Orsay

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- Each peer is free to describe its knowledge and data according to its own point of view

Local query
Papers on Diagnosis ?

Distant answers:
papers on Log Analysis in XML

mappings

Main contributions and ongoing work about SomeWhere

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- Several invited talks (MC Rousset)
 - OODBASE 2006, SOFSEM 2006, BDA 2007, EGC 2010
- Decentralized Reasoning with Inconsistencies in Peer-to-Peer Inference Systems
 - G-H Nguyen PhD work, joint supervised with P. Chatalic (Gemo-IASI Orsay)
 - [ECAI 2006]
- Extension of the model and algorithms of SomeWhere to RDFS and DL-Lite
 - Joint work with F. Goasdoué (Gemo-IASI Orsay)
 - [Journal of Data semantics, 2007], [IJCAI 2009]
- Modeling and reasoning about trust in P2P data networks
 - ANR Dataring project (joint work with J.Euzenat, EXMO)
 - WebDam (ERC Advanced Grant's Serge Abiteboul)

Handling Contextual Data

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- The context is the whole information that characterize the situation of an entity in its environment.
 - context data are dynamic and change continuously
 - requires context modeling and querying capabilities
- Context data is the key in ambient computing application
 - for adapting to dynamic and changing environment
- Main issues in context data management
 - context data acquisition
 - context data interpretation within a context model
 - context data exploitation

Our approach

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- Flexible modeling of context as an ontology
 - for declarativity and reasoning capabilities
 - using standards of Semantic Web (RDFS, OWL)
- Reasoning capabilities exploited for
 - verifying context correctness
 - defining a query language involving inference
 - comparing and ranking results
 - particularly important for retaining the right adaptation strategies
- Supported by CONTINUUM (ANR project, CONTINUITÉ DE SERVICE EN INFORMATIQUE UBIQUITAIRE ET MOBILE)
 - involving IIHM LIG group, Rainbow I3S group and many business groups

Illustration on an industrial scenario

adapted from Lyonnaise des eaux

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Le Fontainier
est d'astreinte
Chez lui

Illustration on an industrial scenario

adapted from Lyonnaise des eaux

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