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# **CONCEPTOOL: ontology (re)presentation and reasoning beyond frames and slots**

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## ***Talk structure***

- Are ontologies an “IT market success story”?  
... A few issues about ontology management
- CONCEPTOOL: modelling and analysis with  
a core Inferential Ontology Management System
- Ontology modelling, reasoning, combination, and  
versioning: current research & road ahead



# ***Ontology issue 1: knowledge model***

- Frame/concept/class & slot/role/attribute  
— are we missing something?
- In many “conceptual” models (EER, UML, ARIS)  
one generic type of frame & slot is not enough
- EER and UML declarative KBs are what the IT  
industry would like to use as the basis for their  
application ontologies...



# ***Ontologies ... which model(s)?***

- Knowledge models for representing application ontologies should capture different kinds of concepts and properties ... hence
- Different categories of frames & slots are needed:
- Entities, Associations, Goals, Functions, ...
- Instances and Individuals ...
- Attributive, associative, and partonomic links; dependencies of any kind ...



## ***Ontology issue 2: focus***

- Current focus is on ontology editing & use  
... which are just two management challenges
- What about the other challenges, i.e. ontology modelling, analysis (V&V), maintenance, reuse?
- How to create and link different ontology views?
- How to verify and validate an ontology?
- How to manage different ontology versions?
- How to establish mappings between ontologies?



## *Ontologies ... which focus?*

- Focus on heterogeneous semantic reasoning can ease complex ontology management challenges
- Core reasoning should be mainly deductive reasoning (based on DLs, F-Logic, FOL)
- ... complemented using heuristic reasoning (based on NLP, CSP, lexical databases)
- ... integrated in an *inference fusion* framework



## ***Ontology issue 3: tools***

- Most ontology tools are editors with very limited semantic reasoning support [Denny, 2002]
- Ontology editors only show “explicit knowledge”
- ... but explicit knowledge could be wrong
- ... or it could hide “implicit knowledge”  
( implicitly told or implicitly derivable knowledge)
- Ontologies should only contain explicit knowledge  
— except while being created, modified or mapped



# ***Ontologies ... which tools?***

- Inferential Ontology Management Systems (IOMSs) are needed with these core requirements:
- Model different categories of concepts and roles, separately managing each category
- “Extract” implicitly told and derivable knowledge
- Separately present explicit and implicit knowledge
- Provide a core of deductive V&V services, plus individual classification and query answering



## ***And now CONCEPTOOL...***

- Satisfies the core IOMS requirements
- Expressive power captures Protégé (no PAL), OO, EER, (static) UML knowledge models
- Propagates & shows implicitly told knowledge
- Extracts & presents implicitly derivable knowledge
- Checks KB consistency and detects contradictions
- Provides an environment for ontology modelling, V&V, combination, versioning, and reuse



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# ***A guided tour of CONCEPTOOL***

- Panels and windows
- Expressive power
- Propagation of implicitly told knowledge
- Extraction of implicitly derivable knowledge
- Consistency check and contradiction detection



## ***Current research and road ahead***

- New: KR&R feature: concrete (primitive) types
- Working: model generation from meta-model
- Working: Support to ontology versioning
- Starting: support to ontology learning from text
- Next: Inference fusion — combining reasoning
- Next: A platform for ontology combination



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***To know more***

- Ask questions now ...
- ... or go to the CONCEPTOOL web site

<http://www.csd.abdn.ac.uk/research/IKM/ConceptTool/>