

02284 Knowledge Based Systems Fall term 2004

Syllabus

The course addresses contemporary theories and methods for organisation and specification of domain knowledge to be dealt with computationally. The course tries to integrate theory and practice by exemplifying concepts and methods with cases from well-known life world domains.

Beginning with traditional conceptual modelling with entities, classes and properties and relations between entities, the course proceeds within the contemporary perspective of formal ontologies emphasizing the classification aspects of the modelling.

The informal ER-diagrams are analysed and specified logically by means of predicate calculus in order to clarify the exact meaning of such diagrams and in order to discuss such notions such as inheritance. Classification with the isa-inclusion relation between classes (taxonomies) beyond hierarchical classification is treated as a partial order. As a next methodological step classifications are conceived as lattices depicted as Hasse diagrams.

This leads to the algebraic view of lattices with operations meet and join and the concomitant notion of distributive lattices which may serve as equational specification language. The relationships between order-based and algebraic notion of lattices are accounted for.

In order to accomodate general binary relations between entities lattice algebras are extended with binary relations leading to the algebraic notion of Boolean module with the crucial so called Peirce product operator. This connects to description logic.

The course also discusses how simpler relational database queries can be restated as expressions in such relational algebras using Peirce product for forming database attributes, and how complex objects may be constructed appealing to lattice notions.

Finally the course briefly touches the complications with the formalisation of parthood (the part-of relation) as discussed in the contemporary research literature.

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