Lecture 24

-Some more concepts and terms in ontological knowledge representation

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Description logics (3rd method for ontological knowledge representation)

- Alternative to FOL and semantic networks

- Maintains the taxonomic structure in semantic networks

- Better definition and properties of categories than in semantic networks

- Description logics syntax easily converted to FOL

- Circumscription: including exceptions in FOL (normal term in LHS)

- Inferencing (decision-making in Description Logics) by Subsumption and Classification

- Subsumption: Is this small category a subset of this category?

- Classification: does this object belong to this category?

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Example of description logics

- CLASSIC language (Borgida et al., 1989)

- CLASSIC description for the FACT : Bachelors are unmarried, adult males

$$Bachelor = And(Unmarried, Adult, Male)$$

- Corresponding FOL

$$\forall x \; Bachelor(x) \Leftrightarrow Unmarried(x) \wedge Adult(x) \wedge Male(x)$$

$Concept \longrightarrow$ **Thing** $|$ $ConceptName$
$| \;$ **And**$(Concept, \ldots)$
$| \;$ **All**$(RoleName, Concept)$
$| \;$ **AtLeast**$(Integer, RoleName)$
$| \;$ **AtMost**$(Integer, RoleName)$
$| \;$ $Fills \, (Role \, Name, IndividualName, \ldots)$
$| \;$ **SameAs**$(Path, Path)$
$| \;$ **OneOf** $(IndividualName, \ldots)$
$Path \longrightarrow [RoleName, \ldots]$

Figure 10.11 The syntax of descriptions in a subset of the CLASSIC language.

Some terms

- Ontology: Objects and categories (Reification)
- Taxonomy: Hierarchical categorization of objects and categories using a tree like structure
- Inheritance and overriding of defaults (semantic networks)
- Taxonomies exist in every branch of science so knowledge representation and KB (AI topics) affect every field
- How to store in KB [TELL(.)]; How to Query from KB [ASK(.)]
- Monotonic deductions: obvious answers (except when new evidence is presented)
- Nonmonotonic reasoning: If new evidence→old rule has to be retracted→new rule added (belief revision) [TRUTH MAINTAINANCE SYSTEM or TMC]

Example of ontological knowledge representation and inferencing

(wherever a hierarchy of concepts exist- simple on the top and specifics on the bottom)

Tasks: How to store in KB; How to query from KB and find answers

Examples are:

- Internet shopping world

- Grocery shopping

- Circuits and their working (electronics) [No ontology involved here]

- Refer Ch. 8 of old edition or Ch. 12 of new edition for these examples