Knowledge Representation of Semantic Web

UNIT - II

Contd…

- Key idea of Semantic Web - represent information of current web using formal languages that computers can process and reason with

- Recapture info of web- add descriptions (metadata) – to allow machine to perform intelligent task combining from multiple source in automated way

- Representing and reasoning with knowledge are core issues for the Semantic Web

- Already studied extensively in AI for expert system, and separating domain knowledge from task knowledge has emerged

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- Through separation could be reused in different domains by replacing underlying knowledge base

- standard knowledge representation enabled the exchange of knowledge between systems, reduce effort developing new one and increasing reusability

- Task knowledge is general

- Domain knowledge derived from experts and formalized by knowledge engineers into logic-based representations

- Apart from adding domain knowledge (modelling), semantic web connects knowledge bases

- Hence need new languages such as OWL, RDF

Ontology-based Knowledge Representation

- Semantic Web key challenge -   ensure a shared interpretation of information

- Related information sources should use the same concepts to reference the same real world entities, but possibly using different vocabularies

- Achieved using Ontologies and ontology languages

- An ontology definition in AI – "shared, formal conceptualization of a domain. i.e. a description of concepts and their relationships"

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- Ontologies domain models two special characteristics – shared meaning or semantics

- Ontologies expressed in formal languages with a well-defined semantics

- Ontologies build upon a shared understanding within a *community*

- members of community agree over concepts and relationships in a domain and their usage

Example: RDF and OWL – has standardized syntaxes and logic-based formal semantics

- schema of a database or a UML class diagram is not an ontology

- It is a conceptual model of a domain, but it is not shared

Complexity of Ontologies

- ontologies differ greatly in complexity

- Most simple structures - glossaries or controlled vocabularies(an agreement on the meaning of a set of terms)

- Ex. support center for describing incidents reported

- Semantic network graphs showing how terms are related to each other

- It contains at least a hierarchy between the concepts or no explicit hierarchy

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- *Lightweight ontology has distinction* between classes, instances and properties with minimal descriptions

- *Heavyweight ontologies - allow precise description of* classes, their composition, constructs to constrain properties

- Complex knowledge bases that use the full expressivity of first order logic

Complexity of Ontologies

An ontology is a…
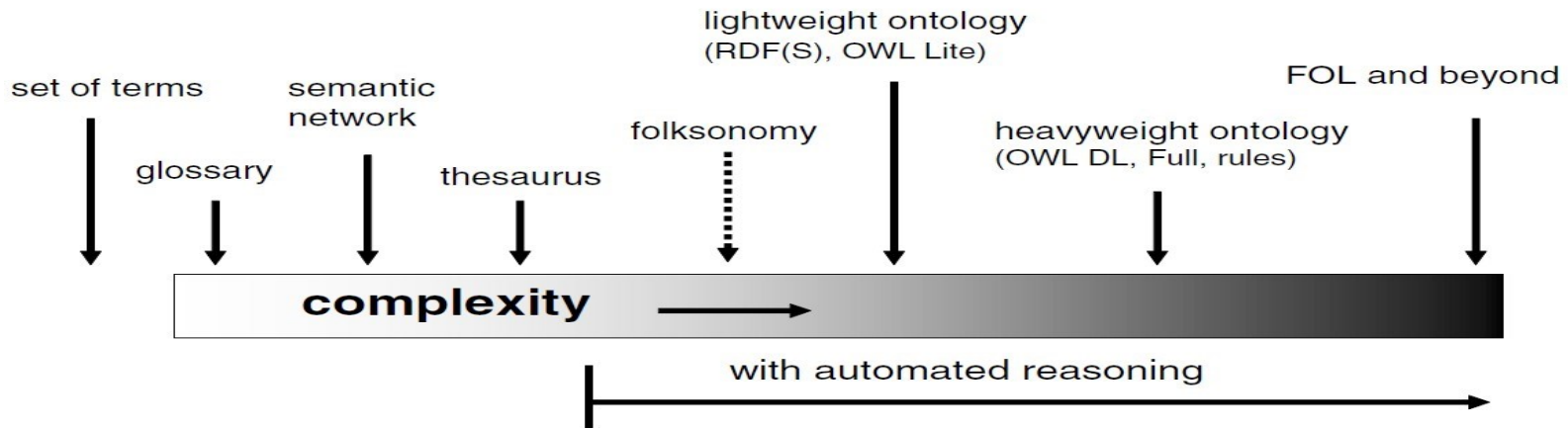
- models capture by less expressive languages also be expressed using more expressive languages

- Ex. describing a semantic network (a graph structure) can also be describe as a classification hierarchy (a tree structure)

Contd...

- Lightweight ontologies serve many applications with divergent goals

- Widely shared Web ontologies are small as they contain only the terms agreed by a broad user base

Synopsis

- Knowledge Representation of Semantic Web

- Ontology based Knowledge Representation

- Complexity of Ontologies