

Knowledge Representation of Semantic Web

UNIT - II

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- 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

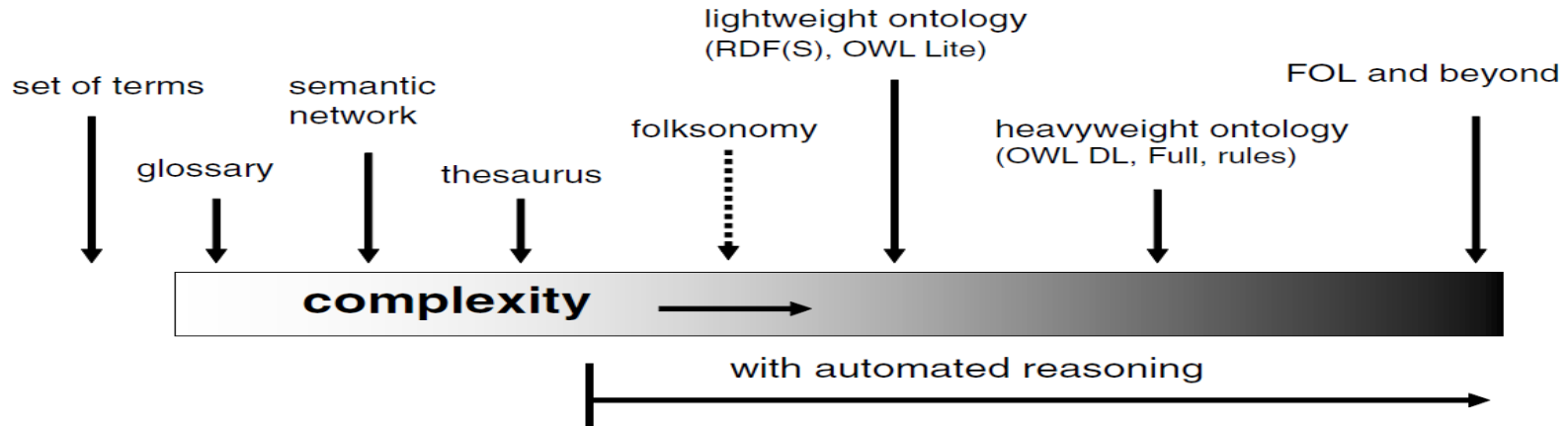
- ontologies differ greatly in complexity
- Most simple structures - glossaries or controlled vocabularies(an agreement on the meaning of a set of terms)
- Ex. support center for describing incidents reported
- Semantic network graphs showing how terms are related to each other
- It contains at least 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)

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- 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