Ontological Engineering

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Contents

What is Ontology 什么是本体

- Ontology is the philosophical *study of the nature of being, becoming, existence, or reality, as well as the basic categories of being and their relations*.

  本体论是关于生物、生成、存在或现实的本质、以及生物及其关系的基本类别的哲学研究。

- An *ontology* is a formal naming and definition of the types, properties, and interrelationships of the entities, that really or fundamentally exist for a particular domain of discourse.

  一个本体是一种对若干实体的类型、特性和相互关系的形式化命名和定义，它真实的、或根本地存在于一个特定范围的论域。

- An *ontology* provides a common vocabulary of an area and define, with different levels of formality, the meaning of the terms and the relationships between them.

  一个本体提供了一个领域的公共词汇，并且用不同层次的形式定义一些术语的含义和它们之间的关系。

What is Ontology 什么是本体

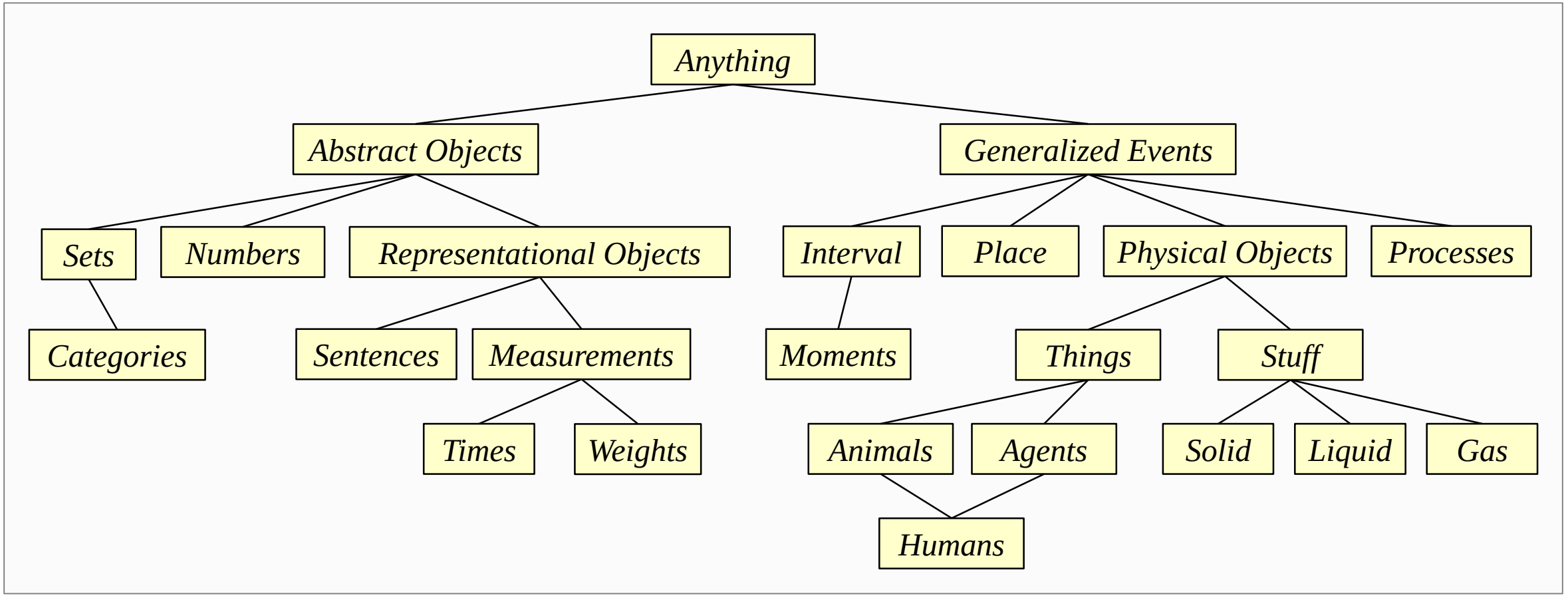
- Some fields create ontologies to organize information, then the ontologies can be applied to *problem solving*, include:
  某些领域创建本体来组织信息，然后再将这些本体用于问题求解，包括：

Artificial intelligence	人工智能
Semantic Web	语义Web
Systems engineering	系统工程
Software engineering	软件工程
Biomedical informatics	生物医学信息学
Library science	图书馆学
Information architecture	信息架构

Type of Ontology 本体的类型

Types 类型	Concepts 概念
Upper ontology 上层本体	A model of the common objects that are generally applicable across a wide range of domain ontologies. 一种公共对象的模型，通常可应用于广泛的领域本体。
Domain ontology 领域本体	Relevant to a particular topic or area of interest, e.g., information technology, or particular branches of science. 与一个特定的主题或兴趣领域有关，如：信息技术或科学的某个分支。
Hybrid ontology 混合本体	A combination of an upper ontology and a domain ontology. 一个上层本体与一个领域本体的结合。

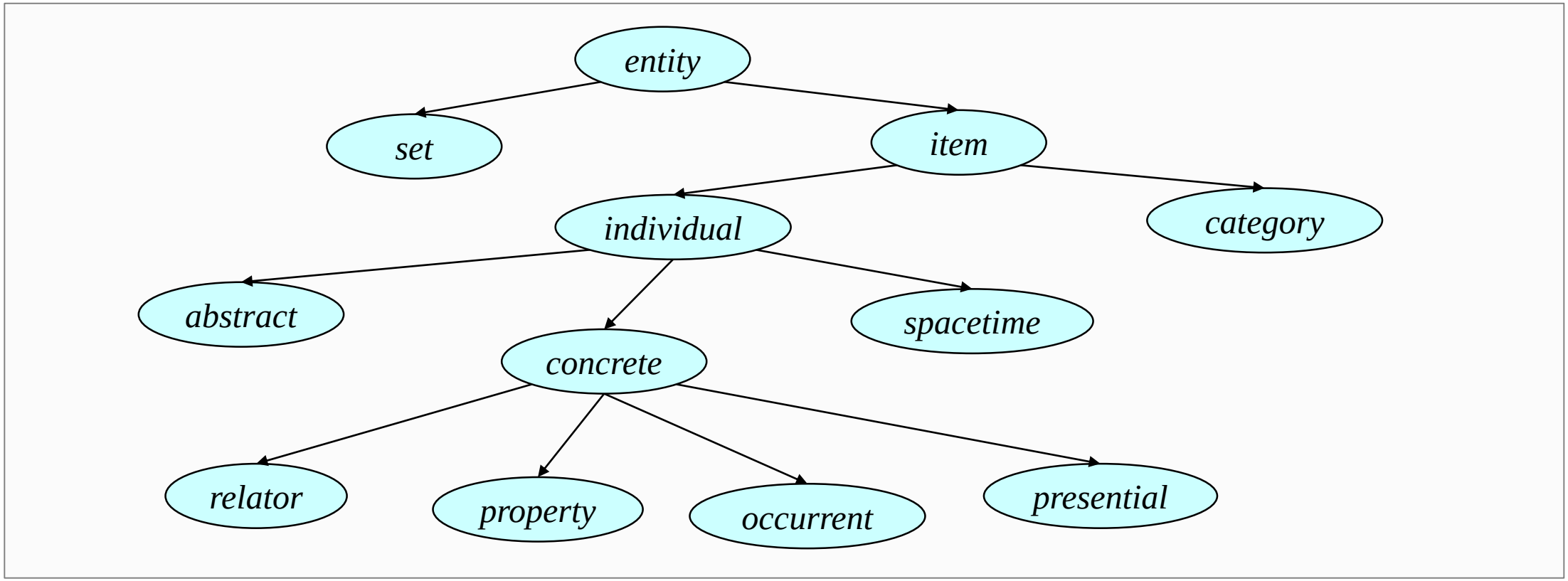
Example: The Upper Ontology of the World



The lower concept is a specialization of the upper one.

其底层的概念是上层概念的一个特化。

Example: A Domain Ontology 一个领域本体



An ontology represents a set of concepts within a domain, and the relationships between those concepts.

一个本体用来表示一个领域中概念的集合，以及这些概念之间的关系。

Components of Ontology 本体的成分

Components 成分	Instances 实例
Individuals 个体	instances or objects 实例或对象
Classes 类	sets, collections, concepts, classes in programming, types of objects, or kinds of things 集、集合、概念、编程中的类、对象的类型、或者事物的种类
Attributes 属性	aspects, properties, features, characteristics, or parameters that objects (and classes) can have 对象（以及类）所能够具有的方面、属性、特性、特征、或者参数
Relations 关系	ways in which classes and individuals can be related to one another 类和个体可以相互关联的方式
Function terms 功能项	complex structures formed from certain relations that can be used in place of an individual term in a statement 从某些关系所形成的复杂结构，可以用来替代某个陈述中的独立项。

Components of Ontology 本体的成分

Components 成分	Instances 实例
Restrictions 限定	formally stated descriptions of what must be true in order for some assertion to be accepted as input 正式规定的必须为真的描述，为了使某些断言被接受为输入
Rules 规则	statements in the form of an if-then (antecedent-consequent) sentence that describe the logical inferences that can be drawn from an assertion in a particular form 采用if-then（前因–后果）语句形式的陈述，描述从一个特定形式的断言得到的逻辑推理
Axioms 公理	assertions (including rules) in a logical form that together comprise the overall theory that the ontology describes in its domain of application. 逻辑形式的断言（包括规则），共同构成本体在它的应用领域描述的全部理论
Events 事件	the changing of attributes or relations 属性或关系的改变

What is Ontological Engineering 什么是本体工程

- A field which studies the methods and methodologies for building ontologies:
  一个研究构建本体的方法和方法学的领域：
  - The formal representations of a set of concepts within a domain, and
    一组某个领域概念的形式化表示，以及
  - The relationships between those concepts.
    这些概念之间的关系。
- The general concepts to represent, i.e.:
  要表示的一般概念，即：
  - Event, 事件、
  - Time, 时间、
  - Physical objects, and 物理对象、以及
  - Beliefs. 置信度。

What is Ontological Engineering 什么是本体工程

- Ontological engineering is to study

  本体工程研究：

  - the ontology development process,

    本体开发过程，
  - the ontology life cycle,

    本体生命周期，
  - the methods and methodologies for building ontologies,

    构建本体的方法和方法学，
  - the tool suites and languages to support ontologies.

    支持本体的工具套件和语言的新领域。

Two Classes of Ontology Languages 两类本体语言

- 1) Traditional syntax ontology languages
  传统语法的本体语言
  - Common Logic
  - DOGMA (Developing Ontology-Grounded Methods and Applications)
  - F-Logic (Frame Logic)
  - KIF (Knowledge Interchange Format)
  - KM programming language
  - LOOM (ontology)
  - OCML (Operational Conceptual Modelling Language)
  - OKBC (Open Knowledge Base Connectivity)

Two Classes of Ontology Languages 两类本体语言

- 2) Markup ontology languages

  标记式本体语言

  These languages use a markup scheme to encode knowledge, most commonly with XML.

  这些语言使用标记方案对知识进行编码，最常用的是XML。

  - DAML+OIL
  - OIL (Ontology Inference Layer)
  - OWL (Web Ontology Language)
  - RDF (Resource Description Framework)
  - RDFS (RDF Schema)
  - SHOE

Typical Ontology Languages 典型的本体语言

Common logic

- ISO standard 24707, a specification for a family of ontology languages that can be accurately translated into each other.
  已成为ISO 24707标准，是一套本体语言的规范，这些语言彼此之间可以被精确地转换。

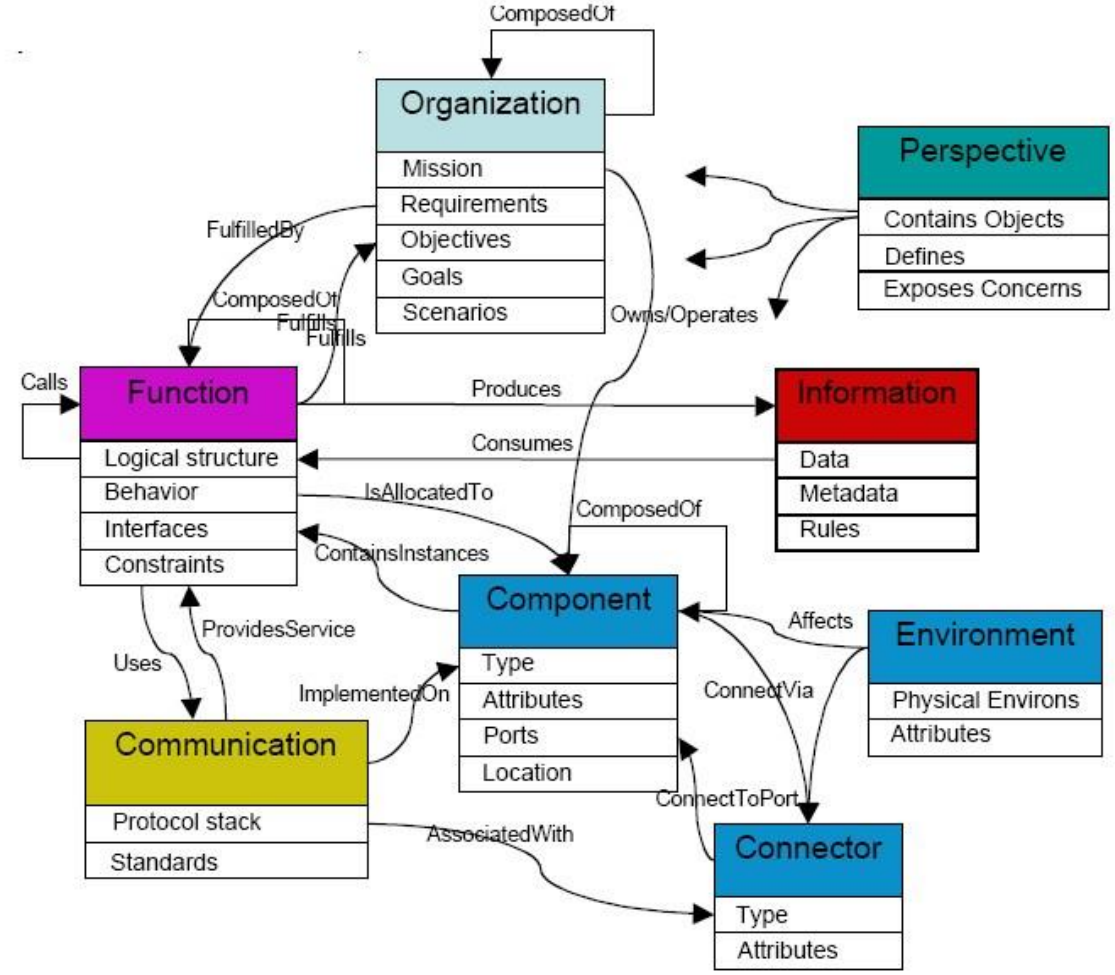
OWL (Web Ontology Language)

- A language for making ontological statements, intended to be used over Web.
  是一种用于本体陈述的语言，目的是在Web上使用。
- All its elements (classes, properties and individuals) are defined as RDF (Resource Description Framework) resources, and identified by URIs (Uniform Resource Identifiers).
  所有的元素（类、特性和个体）都被定义为RDF（资源描述框架）资源，并且通过URIs（统一资源标识）加以识别。

Applications of Ontologies 本体的应用

Knowledge management	知识管理
Natural language processing	自然语言处理
E-commerce	电子商务
Intelligent information integration	智能信息集成
Bio-informatics	生物信息学
Education	教育
Semantic Web	语义Web

Example: A top level ontology 一个顶层本体



A top level ontology based on the nominal set of views.

一个基于views公称集的顶层本体

Thank you for your attention!

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