Approach to building ontologies
A high-level view

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Introduction

• Describe key steps in our approach
• Illustrate with a case study
• Not a discussion of project management
• Help inform integration of DL ontology building into wider knowledge base projects
Key steps

- Requirements gathering
- Content scoping
- Reusing existing components
- Construction
- Internal testing
- Delivery
- Evaluation
Requirements gathering

- What can a DL based ontology offer and should I use one?
  - Most people hold misconceptions

- Key functions
  - Organising/ maintaining a large vocabulary within a knowledge base
  - Integrating vocabularies from several knowledge bases
Case study – a Drug Ontology

• Research group builds a knowledge base of prescribing guidelines for specific conditions
  – KB excludes prescribing ‘common sense’ information.
  – E.g. ‘Don’t suggest a drug if it will interact with patient’s medication or other conditions’.
• Need additional knowledge bases to hold
  – General drug interactions
  – General contraindications
Drug Ontology case study - requirements

- Require a **single vocabulary** to integrate the information in each KB in a logically consistent way to support inference.
- Problems which DL ontologies **can** address:
  - Vocabulary will be **large** (1000’s of terms)
    - Hard to maintain consistently by hand.
  - Concepts cover a **wide** range of granularity
    - Need to be organised in a classification.
  - Concepts are **complex**
    - Multiple ways of classifying the same concept.
Content scoping

- *Description* Logic Ontology building is *descriptive*!
  - Focus taken away from enumeration and manual classification

- Determine expected coverage and *complexity* of concept descriptions required.
Drug Ontology case study - scoping

- Sample concepts from each knowledge base.
  - guideline KB–
    - if on anti-anginal …
      - Anti-aginal definition will need to include clinical condition concepts in definition (angina).
      - Angina definitions will need to include anatomy and physiology concepts in definition (heart, blood flow)
Reusing existing components

• Reuse as much as possible especially at the higher levels of the ontology.
  – Standard upper level ontology
  – Previously built domain ontologies

• Make what you build reusable
Drug Ontology case study - components

- Upper level ontology reused
- **Anatomy** and **physiology** domain ontologies reused and amended.
Construction

• Often split into two tasks
  – Terminology knowledge acquisition
    • Interacting with domain experts
  – Terminology knowledge low-level modelling
    • Expressing knowledge in formal and consistent manner
    • Use a suite of design patterns and methodologies
Drug Ontology case study – knowledge acquisition

- Use an **intermediate** representation
  - Simpler, less constrained
  - Customised to a domain
  - Authoring tools
Internal testing

- What does the logic give you?
- Logical consistency checked automatically
- Semantic consistency can be assisted by the DL reasoner
  - By classification – miss-classification
- Additional tools
  - By query and visualisation – missed classification
Case study – internal testing

- **Pain** classed as a nervous system disease
- Incorrect **definition** of pain
Evaluation

- Testing of ontology within final application.
- Case study - evaluation
  - Problem integrating existing vocabularies.
  - Meaning cannot be taken on face value
    - No human to intervene
  - Must also explicitly take into account context is which term is used.
    - Reference material versus Patient record