Oral Presentation

SNOMED CT’s RF2: Is the Future Bright?

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Why RF2?

• greater flexibility

• more explicit and comprehensive version control accommodating evolving requirements without a need for further fundamental change in the foreseeable future.

• the new hierarchy ‘SNOMED CT Model Component’ allows SNOMED CT to be described in terms of its own structure.

Can RF2 resolve SNOMED’s ontology issues?

- underspecification of reasons for change [5],
- inadequacy of SNOMED’s intensional and extensional definitions [6],
- incoherent ontological commitment [7],
- ambiguities and conflations in its conceptual structures [8],
- inadequacy of terms proposed as ‘synonyms’ [8].

References: see full paper
Methods (1)

- We studied all releases from Jan 2002 to Jul 2010
- We generated a tallied graph of relationships used between SNOMED types in each version:
  - ‘*Computerized tomography guided biopsy of brain (procedure)* \(\rightarrow\) **METHOD** \(\rightarrow\) Biopsy – action (qualifier value)’
  
  increments:
  - ‘procedure – (0) \(\rightarrow\) **METHOD** \(\rightarrow\) qualifier value – (0)’

‘0’ indicates the status ‘current’
Methods (2)

• Study the graph paying attention to odd results, eg:
  – *substance* (2) $\rightarrow$ *SAME AS* $\rightarrow$ *procedure* (0)
  – *disorder* (0) $\rightarrow$ *Associated morphology* $\rightarrow$ *disorder* (0)
  – *disorder* (0) $\rightarrow$ *due to* $\rightarrow$ *finding* (0)

• Investigate the new Model Component hierarchy to see whether it could be expanded with additional entries capable of either solving the issues, or if not, making them explicit.
Results (1)

- Three major categories for underlying causes of problems:
  - (1) a mixing of object and meta-language and use-mention confusions,
  - (2) unclarity about what some conceptIDs exactly denote, and
  - (3) use of ambiguous and uninformative codes for the reasons why concepts are inactivated.
What do ‘concept’ and ‘conceptID’ denote? (1)

• Aha !!!
  – ‘Concept’ : ‘an ambiguous term. Depending on the context, it may refer to:
    • a clinical idea to which a unique ConceptId has been assigned;
    • the ConceptId itself, which is the key of the Concepts Table ([…] “concept code”);
    • the real-world referent(s) of the ConceptId, that is, the class of entities in reality which the ConceptId represents ([…] “meaning” or “code meaning”)

What do ‘concept’ and ‘conceptID’ denote? (2)

• Merely pointing the ambiguity out is insufficient:
  – insufficient context for disambiguation in SNOMED documentation leaves doubt:
    • clinical ideas are real-world entities themselves
      – some being such that they are about other real-world entities while others are about nothing at all
    • SNOMED CT authors have not yet made it clear what sorts of real-world entities their concepts represent
  – relying on ‘meaning’ rather than ‘concept’ just pushes the problem forward.
The ambiguity of ‘meaning’ (1)

- SNOMED CT’s ‘concept’ definition suggests the meaning of a concept(Id) to correspond to Frege’s ‘Bedeutung’ (‘reference’, ‘extension’) of a term [15].

- The User Guide says: ‘a “concept” is a clinical meaning identified by a unique numeric identifier (ConceptId) that never changes’ [16]. Here, the word ‘meaning’ corresponds rather to Frege’s ‘Sinn’ (‘sense’, ‘intension’) [15].

- SNOMED-CT Editorial Guide: SNOMED is a ‘terminological resource’ which ‘consists of codes representing meanings expressed as terms, with interrelationships between the codes to provide enhanced representation of the meanings’ [17].
The ambiguity of ‘meaning’ (2)

- ‘The meaning of a Concept does
- ‘The meaning of a Concept does ____ change [emphasis immediately followed by the sentence:
- ‘
- ‘If the Concept’s meaning changes because it is incorrect, the Concept is made inactive [emphasis added]’
Object- and meta-language confusions as result

• Compare:
  – ‘procedure $\rightarrow$ METHOD $\rightarrow$ physical object’

with

  – ‘event $\rightarrow$ MAY BE $\rightarrow$ navigational concept’,
  – ‘person $\rightarrow$ MOVED TO $\rightarrow$ namespace concept’
  – ‘physical object $\rightarrow$ IS A $\rightarrow$ inactive concept’
## Poorly informative change codes

<table>
<thead>
<tr>
<th>ST</th>
<th>Concept Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>active in current use</td>
</tr>
<tr>
<td>6</td>
<td>active with limited clinical value (classification concept or an administrative definition)</td>
</tr>
<tr>
<td>1</td>
<td>inactive: ‘retired’ without a specified reason</td>
</tr>
<tr>
<td>10</td>
<td>inactive because moved elsewhere</td>
</tr>
<tr>
<td>2</td>
<td>inactive: withdrawn because duplication</td>
</tr>
<tr>
<td>3</td>
<td>inactive because no longer recognized as a valid clinical concept (outdated)</td>
</tr>
<tr>
<td>4</td>
<td>inactive because inherently ambiguous.</td>
</tr>
<tr>
<td>5</td>
<td>inactive because found to contain a mistake</td>
</tr>
</tbody>
</table>

### ‘Historical relationships’
- "SAME AS",
- "REPLACED BY",
- "WAS A",
- "MAYBE A",
- "MOVED TO",
- "MOVED FROM"

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Recommendations (1)

- no double use of ConceptID as an identifier for the concept and for the Concept Component
  - concept component: is an information artifact which is about a concept and how it is denoted
    - a concept component ID should reference the component
  - concept: a referent about which some info is in a concept component
    - a concept ID references the concept
- the distinction will solve the object-/meta-language confusion
Recommendations (2)

• specify for each Concept Component the broad category of the intended referent of the concept;
  – solves the problem of what sort of entity in each individual case is referenced by a conceptId.
  – Potential values for the proposed field can be based on
    • the L1/L2/L3 distinction [8] – roughly:
      – first-order entities that are not about anything (e.g. person, scalpel)
      – beliefs, desires, intentions whether about something (e.g. a diagnosis) or about nothing (e.g. some psychotic beliefs)
      – information artifacts such as staging scales, guidelines, and SNOMED CT itself
    • whether a universal or defined class is referenced [18],
    • specify for each Concept Component the broad category
Recommendations (3)

• expand the Concept Inactivation Value sub-hierarchy with concepts that reference whether a change in SNOMED CT is motivated by
  – (1) a change in reality,
  – (2) a change in understanding of reality as reflected in the advance of the state of the art in the biomedical domain, or
  – (3) an editorial mistake
Acknowledgements

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