SNOMED CT and IHTSDO

Large scale ontology development and maintenance

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- IHTSDO and SNOMED CT

- Uses of SNOMED CT in health care

- SNOMED CT as an ontology

- IHTSDO tools

- Maintenance and quality assurance

- Development projects

IHTSDO and SNOMED CT

- International Health Terminology Standards Development Organisation
  - www.ihtsdo.org
  - 2007-
  - 15 countries (SE, DK, US, UK, AU, NZ, NL, ES, ...)
- Systematized Nomenclature of Medicine – Clinical Terms
  - Roots in CAP work since 1960ies + NHS work since 1980ies
  - Originally manually maintained

Uses of SNOMED CT

- Clinical coding
  - Clinical findings – symptoms, signs, disorders, …
  - Activities – treatments, diagnostics, …
  - Anatomical structures, Organisms, Substances, Pharmaceutical products, Devices, …
- Aggregation by subsumption hierarchies

SNOMED CT as an ontology

- EL+ ~ OWL2 EL

- 293 000 classes

- Defined w 830 000 role instances

- 765 000 English names

- 279 000 Swedish names

Name	Syntax	Semantics
top	$\top$	$\Delta^{\mathcal{I}}$
bottom	$\bot$	$\emptyset$
nominal	$\{a\}$	$\{a^{\mathcal{I}}\}$
conjunction	$C \sqcap D$	$C^{\mathcal{I}} \cap D^{\mathcal{I}}$
existential restriction	$\exists r.C$	$\{x \in \Delta^{\mathcal{I}} \mid \exists y \in \Delta^{\mathcal{I}} : (x,y) \in r^{\mathcal{I}} \wedge y \in C^{\mathcal{I}}\}$
concrete domain	$p(f_1,\ldots,f_k)$ for $p \in \mathcal{P}^{\mathcal{D}_j}$	$\{x \in \Delta^{\mathcal{I}} \mid \exists y_1,\ldots,y_k \in \Delta^{\mathcal{D}_j} : f_i^{\mathcal{I}}(x) = y_i \text{ for } 1 \le i \le k \wedge (y_1,\ldots,y_k) \in p^{\mathcal{D}_j}\}$
GCI	$C \sqsubseteq D$	$C^{\mathcal{I}} \subseteq D^{\mathcal{I}}$
RI	$r_1 \circ \cdots \circ r_k \sqsubseteq r$	$r_1^{\mathcal{I}} \circ \cdots \circ r_k^{\mathcal{I}} \subseteq r^{\mathcal{I}}$

SNOMED CT as an *ontology*

- Ontology-based error detection in SNOMED-CT. W Ceusters, B Smith, A Kumar… - Medinfo, 2004

- The Semantics of Procedures and Diseases in SNOMED® CT. S Schulz, S Hanser, U Hahn… - Methods of information in …, 2006

- Debugging SNOMED CT using axiom pinpointing in the description logic EL+. F Baader… - Proc. of KR-MED, 2008

- Investigating subsumption in SNOMED CT: An exploration into large description logic-based biomedical terminologies. O Bodenreider, B Smith, A Kumar… - Artificial intelligence in …, 2007

- Would SNOMED CT benefit from Realism-Based Ontology Evolution? WM Ceusters, KA Spackman… - AMIA Annual Symposium …, 2007

- SNOMED reaching its adolescence: Ontologists' and logicians' health check. S Schulz, B Suntisrivaraporn, F Baader… - International Journal of …, 2009

- Why do it the hard way? The case for an expressive description logic for SNOMED. AL Rector… - Journal of the American Medical …, 2008

- Ontological analysis of SNOMED CT. G Héja, G Surján… - BMC Medical Informatics and …, 2008

- ...

IHTSDO tools

- IHTSDO workbench
    - Eclipse- and CollabNet-based infrastructure for ontology and terminology development
    - Open source
- IHTSDO classifier
    - EL+ classifier, based on CEL

Maintenance and Quality assurance

- Organizational structure

  - Four standing committees

- Staff terminologists/ontologists

- Project groups and SIGs

- Internal standards process

Quality assurance

- QA Framework is being implemented
- Content is being check against a set of production rules
- External audits

Development projects

- Current ongoing "ontologization" of SNOMED CT

  - Alignment to e.g. BioTop, BFO, FMA

  - Scalability and Reproducibility!

- Expressivity tests

  - Negation tests, Value restriction

  - Role inclusions, Concrete domains