Exploring Changes in Life Science Ontologies with OnEX

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Motivation

Increasing number of evolving life science ontologies:
- Causes: new insights and experimental results, revision of existing knowledge
- Result: ontologies need to incorporate changed knowledge → ontology versions that are only valid in specific time periods

Goals:
- Quantitative evolution analysis of life science ontologies
  - Ontologies in general and their parts, e.g., concepts and relationships
  - Long term evolution analysis (> 2 years)
- Answering of open questions concerning ontology evolution
  - What are the typical changes in ontologies and how often do they occur?
  - How stable (stable?) are ontologies?
  - Which ontologies are currently highly developed or reside in a final state?
  - How does a single ontology evolve over time?

Online system for ad-hoc evolution analysis
- Intuitive and easy-to-use interface for accessing / browsing analysis results


OnEX Application – http://www.izbi.de/onex

Two Main Workflows:
- Evolution Trend Workflow
  - Evolution analysis on ontology level
  - Trend charts for concepts and relationships
  - Evolution details – added, deleted, obsolete and fused concepts per version change
- Concept Evolution Workflow
  - Search in specific or across all ontologies
  - Evolution analysis on concept level – attributes and relationships of a concept

Current Content:
- Ontologies of different life science fields, e.g., proteomics, anatomy, phenotype, biomedical chemistry and cancer research
- Approx. 520 versions of 16 life science ontologies accessible

Future Work
- Measures for assessing ontology stability by utilization of evolution information
- Discovery of “Hot / Cold Topics” in an ontology by
  - Exploring changes in sub graphs of an ontology
  - Studying changes in annotations to ontology concepts
- Inclusion of structural changes
  - Changes in the semantic neighborhood of a concept, e.g., parents and children
  - Changes in paths of a concept

Example:
GO:000705956
“blood coagulation” path changes
[2004.05 ; 2008.12]

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