Linking Formal ontologies: Issues of Scale and Context

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Two key problems in linking health- and bio-informatics are:

?? *Bridging levels of scale* – between the atomic and molecular scales which are the focus genomics and most bioinformatics and the organ, organism, and even organisational scales typical of clinical medicine and health informatics.

?? *Expressing differences in context* – between the views of different professions, between homologous information in different organisms or stages of development and between normal and abnormal anatomy and physiology.

Logic based, rigorous ontologies – formal explicit specifications of shared conceptualisations – have usually been thought of in health informatics primarily as ways of organising terminologies, *e.g.* SNOMED-RT/CT[1] or the *Open*GALEN[2] resource. However, they also provide powerful means of linking differing ontologies – for example the different scales to integrate health- and bio-informatics – and for expressing contextual information and views – *e.g.* the strict structural view of the anatomist or the more pragmatic view of the clinician.

The fundamental principles for managing scale and context are based on:

?? Composite concepts made up of subconcepts from two or more ontologies can bridge those ontologies.

?? Contextual markers can be included directly in composite concepts.

?? Variant semantic links can be used in different contexts.

?? The reasoner or 'classifiers' which manipulate these ontologies can identify equivalences, subconcept relations (subsumption), and inconsistencies in the resulting structures.

A major advantage of formal ontologies for such tasks is that they are naturally "fractal" – they allow patterns to be repeated at finer and finer levels of detail or smaller and smaller scales. Unlike many database techniques, there is no need to make fixed decisions concerning specific levels of detail or structure. Structures can be elaborated and evolve as required.

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[1] www.snomed.org

[2] www.opengalen.org