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A Novel Approach to Create a Machine Readable Concept Model for Validating SNOMED CT Concept Post-coordination

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Abstract

Post-coordination provides the means to achieve an appropriate content coverage, which is critical in successfully adopting clinical reference terminologies, and thus represent clinical information consistently. However, one of the major problems of post-coordination corresponds with ensuring only clinically sensible concepts can be constructed. In this poster, we present the development of a novel approach to generate a MRCM computationally, in order to facilitate the adherence to the existing guidelines and improve the quality of post-coordination in SNOMED CT.

Keywords:

SNOMED CT; Post-coordination Validation; Standardization.

Introduction

Post-coordination workflow includes 3 steps: a) to select the source-concept being modeled; b) to select an attribute as the relationship type (i.e. laterality, clinical course); and c) to select a target concept for the attribute value (i.e. right/left, acute/chronic). Without an appropriate concept model, this could lead to meaningless relationships (i.e. a PROCEDURE having 'laterality' of ACUTE). SNOMED CT, the most comprehensive and internationally validated clinical terminology, includes guidelines for post-coordination, developed by the International Health Terminology Standards Organization (IHTSDO). However, a lack of adherence has been reported as the most frequent reason for classification failure[1]. We hypothesize that a contributing factor to this lack of adherence corresponds to the difficulties of implementing the current concept model, since it is only available as unstructured text. Previous studies proposed models for representing the concept model, but require a manual data entry[2].

Methods

We present our algorithm that reasons upon actively defining relationships in any given snapshot of SNOMED CT, and systematizes the detection and import of the allowable attributes for specific domains and the allowable ranges for specific attributes, automatically generating the rules. This approach relies on the assumption that pre-coordinated concepts respect the rules in the Editorial Guide of SNOMED CT.

Results

Allowable attribute types by top-level hierarchy. Based on the July 2014 SNOMED CT RF2 snapshot, our algorithm correctly inferred 61 out of the 66 rules. The five missed allowable attributes corresponded to '*Episodicity'* and '*Severity'* for CLINICAL FINDINGS, '*After'* for EVENTS, '*Has dose form'* for PHYSICAL OBJECTS, and '*Time aspect'* for PROCEDURES.

Allowable range by attribute type. Our approach was able to correctly generate 38 of the 40 rules for attributes where the allowable range corresponds to a single sub-hierarchy. The three missed rules correspond to the allowed range for the attributes '*Time Aspect*' (Descendants of TIME FRAME), '*Severity*' (Descendants of SEVERITIES) and '*Episodicity'* (Descendants of EPISODICITIES). When the expected allowable range included more than one sub-hierarchy, it correctly identified only 26 allowed ranges, missing 42, and wrongly stating 11. All wrongly stated ranges were close ancestors of the expected ranges.

Discussion

The high accuracy of our approach for listing the allowable attribute types for specific domains should be interpreted as a successful evaluation of SNOMED CT pre-coordination consistency and adherence to the Guidelines. However, by using the SNOMED CT RF2 as the only source to generate the MRCM, the algorithm misses knowledge concerning attributes reserved for post-coordination (i.e. the case with '*episodicity'* and '*severity*'). This low sensitivity of the generated MRCM jeopardizes the initial intent of completely automatizing the generation of the concept model.

Given the incomplete MRCM, we recommend complementing it by continuously consuming locally post-coordinated concepts. Thus, the newly generated knowledge-base could then be used as a decision support system for terminology coders, warning them whenever a type of attribute is being used for the first time for a given domain, or when a target concept is outside a previously used range. This approach respects locally defined rules and maintains consistency in future post-coordination.

References

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