Semantic Reconciliation Model for interoperable and shareable knowledge authoring environment

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Abstract—The intelligent recommendations, generated by a Clinical Decision Support System (CDSS), depend on up-to-date knowledge base. An interoperable and a shareable knowledge base reduces the burden of domain experts to transform their heuristics and experiences. The goals of interoperability and shareability of knowledge can be achieved using standard data models and standard terminologies. We proposed a mapping model called "semantic reconciliation model" to provide mappings among standard terminologies, standard data model, and domain clinical model.

Keywords—Clinical decistion support system; interoperable knowledge; shareable knowledge; semantic reconciliation

I. INTRODUCTION

Healthcare standard terminologies, a standard data model, and a standard knowledge representation play a vital role in creating shareable and interoperable knowledge base. HL7 Virtual Medical Record (vMR) provides a standard information model to represent clinical information for scalable and interoperable clinical decision support systems. Likewise, standard terminologies enhance the interoperability of the knowledge base. The shareable knowledge creation in the form of standard representation of HL7 Medical Logic Module (MLM) increases the knowledge acquisition complexity with respect to usability. Therefore, our proposed methodology, is called semantic reconciliation model (SRM), provides multi-model mappings among standard terminologies, a standard data model, and a domain clinical model (DCM) to hide the complexity of standard knowledge creation. The system transforms the plain rules into a shareable MLM representation with the combination of standard terminology (SNOMED CT) and standard data model (vMR) in an automatic manner. Therefore, the standard MLM representation of knowledge achieves the shareability while vMR, SNOMED CT, and DCM combined with MLM enhance the interoperability of knowledge.

II. METHODOLOGY

The proposed system takes DCM, SNOMED CT, and vMR ontologies and specification to generate three mapping files DCM-SNOMED, vMR-SNOMED, and DCM-vMR. In DCM and SNOMED CT mappings we use different mapping algorithms like string matching, synonym matching, labels matching, child matching, and property matching. The proposed system provides choice for a subset of algorithms execution or complete set of algorithms execution. In second mapping, i.e. vMR-SNOMED CT, we use different similarity matching algorithms like Jaccard, Euclidean, and cosine algorithms. At the end of execution of similarity algorithm, the system decides the final matching concept based on maximum similarity technique. Once, we get DCM-SNOMD mapping and vMR-SNOMED mapping then the third mappings of DCM-vMR achieved by transitivity law. The three resultant mapping files are used as an input to the Automatic Shareable Knowledge Creation. This module generates the MLM from the plain rule through the mappings generated by SRM. The MLM is generated on the basis of its standard structures of different slots of "maintenance", "library", and "knowledge". The SRM mappings mainly play role in transformation of "knowledge" slot. The overall methodology of SRM is depicted in Fig.1
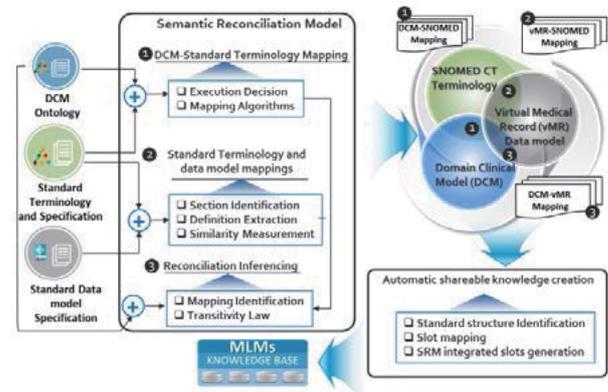

Figure 1: Semantic Reconciliation Model for knowledge creation

III. CONCLUSION

The semantic reconciliation model (SRM) is developed for interoperability and easy integration of shareable knowledge base with clinical workflows. The complexity of shareable knowledge creation is hidden with automatic generation of MLM.