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WORKING PAPER

Conceptual modelling using domain ontologies: Improving the domain-specific quality of conceptual schemas

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Abstract

Conceptual modelling languages have been evaluated using ontologies as reference theories. Reference ontologies for conceptual modelling are top-level ontologies that specify conceptualizations of the real-world in general and are not restricted to any particular material domain (i.e. part of the real-world). Ontological evaluation clarifies the real-world semantics of modelling language constructs and suggests guidelines for the proper use of language constructs when modelling particular real-world situations. The guidance provided helps modellers developing conceptual schemas that can be understood as intended by schema users. In this paper an additional step is taken towards true ontology-based conceptual modelling by using more specialized ontologies, in particular ontologies that specify conceptualizations of material domains, directly during the development of conceptual schemas. Using domain ontologies instead of top-level ontologies for ontology-based conceptual modelling, enables the reuse of domain-specific knowledge. The application of domain ontologies to conceptual schema development instead of conceptual modelling language evaluation, ensures the domain-specific quality of the schemas, i.e. the satisfaction of domain-specific axioms in schemas that intend to represent particular situations within the domain of interest. This new approach to ontology-based conceptual modelling is implemented by extending existing conceptual modelling languages with domain-specific language profiles that are defined by domain ontologies. The approach is illustrated for enterprise modelling using UML and the Resource Event Agent (REA) enterprise ontology. The usefulness of the approach for the quality assurance of conceptual schemas is demonstrated by evaluating the domain-specific quality of a sample of UML class diagrams intended as enterprise models.

Keywords: ontology-based conceptual modelling; domain ontology; UML profile; OCL; domain-specific quality

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