Abstract

Metadata are machine-processable data for describing and managing other data, normally as digital objects or resources, such as learning objects, photographs, and digitized heritages. A metadata application profile (MAP) specifies a set of metadata elements, taken from one or more metadata standards, e.g. Dublin Core (DC) element set and IEEE standard for Learning Object Metadata (LOM), for annotation of metadata, and constrains their usage within a particular domain. With the rapid growth of digital information resources the importance of metadata and MAP is increasingly recognized. Not only do metadata need to be reused, MAPs also require interoperability in terms of accessibility, processability, and interpretability. This work analyzes the key requirements for MAPs and current MAPs representation languages, then proposes an interoperable, expressive, language-independent and machine-processable framework, namely IMAP, for modeling, representing, and reasoning with MAPs based on the OWL and OWL/XDD languages. The former is a standard Web ontology language, while the latter is a definite-clause-style rule language that employs XML expressions as its underlying data structure. Semantic constraints of MAPs are defined in terms of rules, which are represented as OWL/XDD clauses. An application of the constructed IMAP framework to model an interoperable MAP with fine-grained semantic constraints, involving implicit properties of metadata elements, is illustrated. A prototype MAP development environment equipped with metadata validation features, implemented based on the proposed framework, reinforces the framework’s usability and validity.

Keywords: Metadata application profile
Metadata schema
Data model
Metadata data interoperability
OWL/XDD
IMAP