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A Pattern Driven Approach to Knowledge Representation in the Disaster Domain

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Abstract

Access to integrated disaster-related data through querying is still a problem due to associated semantic barriers. The disaster domain largely relies on the top–down approach of ontology development. This limits reuse due to associated commitments and complex alignments within ontologies. Therefore, there is a need to utilize a bottom-up approach that reuses patterns for representing disaster knowledge. To bridge the availability gap of patterns for representing disaster knowledge, this study identifies existing and emerging patterns for reuse while organizing disaster data from multiple sector stakeholders. Based on the eXtreme Design (XD) methodology and key informant interviews, competency questions (CQs) were elicited from domain stakeholders. The CQs are matched with existing patterns from other contexts. Emerging patterns (e.g the Event Classification and Quality Dependence Description for Objects) are also developed for CQs not captured and subsequently tested using SPARQL queries characterising the CQs. It is in this context that this paper presents a characterisation of disaster risk knowledge using CQs and corresponding patterns (reusable and emerging) covering the knowledge. Accordingly, we illustrate a pattern-driven use case to organise drought hazard data for early warning purposes. This provides a powerful use case for adopting a pattern-based approach to knowledge representation in the disaster domain.