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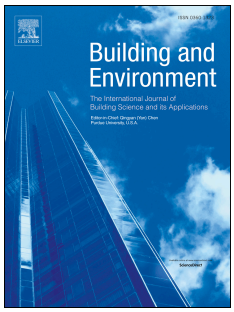

Ontology-based framework for building environmental monitoring and compliance checking under BIM environment

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Ontology-based framework for building environmental monitoring and compliance checking under BIM environment

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Abstract:

Building environmental monitoring and compliance checking are important in ensuring environmental performance. The information required for monitoring and checking is obtained from different data sources in different information systems. In this context, information sharing between stakeholders and the semantic interoperability that prevails with varying information systems are necessary. However, the implementation of information sharing and semantic interoperability can be a challenge. This paper proposes an ontology-based framework to support environmental monitoring and compliance checking under building information modeling (BIM) environment among different information systems. The framework integrates building information from BIM, environmental information provided by sensors, and regulatory information based on building regulations and design requirements. In this framework, four specific ontologies are developed to represent relevant knowledge. Building information is extracted from BIM and then converted, together with environmental information provided by sensors, into resource description framework format as ontology instances. The regulation clauses are transformed into SPARQL (SPARQL Protocol and RDF Query Language) rules. A case study is performed to apply the framework, and environmental monitoring and automated compliance checking are implemented in the context of a real distributed energy station project. The testing results validate the feasibility and effectiveness of the proposed framework.

Keywords: building environmental monitoring; BIM; ontology; compliance checking; semantic web

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