A Proposed Framework for Achieving High Level Automation in Cadastral Processing

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SUMMARY

The Land Survey Division of Singapore Land Authority (SLA) has recently embarked on LandXML to replace the existing in-house cadastral submission formats for supporting 3D Cadastres and automation in cadastral processing. LandXML enables the storing of land surveying data, such as traverses, surveyor details, parcels and geometries. LandXML also allows machines to parse information from it and therefore it has been used as national standard under the ePlan Initiative in Australia and New Zealand where registered surveyors are required to submit their cadastral plans in LandXML for automated cadastral processing. In order to achieve a higher level of automation, the paper proposes that LandXML should be supported with formal semantics. Formal semantics allows computer systems to reason about the information and subsequently make inference automatically. Formal semantics can serve as computational knowledge and rules to automatically check for the integrity and consistency of data in LandXML. Unfortunately, representing formal semantics is not part of LandXML. To support formal semantics for LandXML, ontology represented in Web Ontology Language (OWL) is used. Ontology is not novel in the geospatial domain, it has been proven useful in many geospatial applications. Ontology is used to explicitly describe semantics by using formal language OWL. Different from LandXML, OWL is enriched with axioms for semantic definitions to build ontology. The OWL ontology in the paper is created from the formalization of ISO 19152 Land Administration Domain Model (LADM), which defines terminology for land administration. The paper will introduce a conceptual framework on how LandXML is supported with OWL. Each concept in OWL is referred with a unique IRI (Internationalized Resource Identifier). To support LandXML with OWL, the DocFileRef element in LandXML is linked with the corresponding IRI in OWL. When a LandXML is processed, the respective data can be reasoned with respect to the associated OWL ontology. This eventually forms a two-tier framework, which consists of the Data Tier and the Knowledge Tier. The Data Tier stores the surveying data, while the Knowledge Tier captures the ontological knowledge and rules.