Temporal support for land information systems in object-oriented modeling

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Abstract

With the development of distributed object technologies and the overwhelming advent of the Web, an object-oriented datamodel for GIS/LIS is proposed, possessing significantly increasing importance and application, when moving from a static position to a distributed and heterogeneous view. The conceptual model of land information hinges on a complex spatio-temporal object model for defining not only collections of land parcel objects but also distributions of them within a four domain framework.

However, harmonizing relationships between time and space are not simple, for temporal ontology is semantically different from that of space. The temporal history of an object makes it possible to trace actor behavior footprints in space. The vestiges of temporal location and extent are important paths in understanding the history of space, attribute and actor.

The basic entities considered are examinations of spatial and temporal objects, highlighted in the light of temporal primitives and temporal relationships with space giving rise to temporal versioning of objects and databases. The development of spatio-temporal data model in GIS/LIS parallels the progress of temporal databases. Temporal components are implemented with the relational model, then with object-oriented data models. Temporal object models and their functions in existing spatio-temporal data models are examined. A conceptual spatio-temporal object model for LIS is illustrated with variants of temporal LIS.

A fundamental challenge in creating next generation GIS/LIS is in supporting interconnectivity and interoperability with distributed and heterogeneous spatio-temporal databases, providing various temporal principles, assisting spatio-temporal analysis and forecast.

A conceptual spatio-temporal object model (STOM) is proposed, illustrating interactions within four domains, facilitating actor domain description impacting on spatial, temporal and attributive behavior in the real world.

Key Words: Object-Orientation, Temporal Object, Database Version, Spatio-Temporal Data Model, WebGIS, XML, STOM