Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XXXIX-B2, 5-10, 2012
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XXXIX-B2/5/2012/
doi:10.5194/isprsarchives-XXXIX-B2-5-2012

WORKING WITH SPATIO-TEMPORAL DATA TYPE

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Keywords: Databases, Standards, GIS, Object, Spatial, Temporal

Abstract. Several aspects of spatiotemporal databases have been explored in past decades, ranging from basic data structure to query processing and indexing. But today, operational temporal GIS does not exist. The key impediments have been the complexity of integrating space and time and the lack of standards. OpenGIS standards for simple feature access (spatial type) do exist, but unlike the spatial type, standards for spatiotemporal data type do not exist. This paper explores a new approach to modeling space and time to provide the basis for implementing a temporal GIS. This approach is based on the concept of data types in databases. A data type provides constructors, accessors, and operators. Most commercial and open source databases provide data types to deal with the spatial component of a GIS, called spatial type. Oracle Spatial, DB2 Spatial Extender and Informix Spatial DataBlade, ST_Geometry for PostgreSQL and Oracle from Esri, PostGIS for PostgreSQL, etc., are some examples. This new spatiotemporal data type is called spatiotemporal type (STT). This STT is implemented in PostgreSQL, an open source relational database management system. The STT is an extension of Esri's ST_Geometry type for PostgreSQL, in which each spatial object has a life span. Constructors, accessors, and relational functions are provided to create STT and support spatial, spatiotemporal, and temporal queries. Some functions are extended based on OpenGIS standards for the spatial type. Examples are provided to demonstrate the application of these functions. The paper concludes with limitations and challenges of implementing STT.

Conference Paper (PDF, 384 KB)

Citation: Raza, A.: WORKING WITH SPATIO-TEMPORAL DATA TYPE, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XXXIX-B2, 5-10, doi:10.5194/isprsarchives-XXXIX-B2-5-2012, 2012.

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