

The Research on Object-Relational Spatial DBMS

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In nature phenomenon, most types of data have their fixed length, such as people age. No people have lived for 999 years. So the length of age is 3. But spatial data is different from other types of data. Its length is not fixed. One line has 2 points. Another line maybe has millions of points.

Relational DBMS is a kind of mature DBMS and is applied widely. But the lengths of its fields are defined by users and are fixed. When spatial data are managed by relational DBMS, a spatial object is stored in several rows and columns. The data organization is complicated and the efficiency is low. So the spatial data is generally stored in file system other than relational DBMS. New digital systems for the processing of photogrammetry and remote sensing images have led to the quick increasing of spatial data volume. The management of spatial data has some new developing demands and trends, such as distributed issue, multi-user operation, security, data sharing, data interoperability and supporting complicated data types. However system file has not these functions.

Recently, a new class of DBMS has emerged, Object-Relational DBMS. It provides:
user-defined data types and functions which allow to define methods to create, manipulate and access new data types;
user-defined index structures that can speed up the execution of queries;
an extensible optimizer that can determine the most efficient way to execute user queries.

In contrast to traditional DBMS, it provides powerful data modeling and efficient query processing capabilities. User can defines a data type to describe spatial geometry object. So a spatial object is stored in a column of a row. Spatial index is also created on the user-defined geometry type.

In this paper, the fundamental concept and feature of Object-Relational DBMS are introduced. A new geometry user-defined data type and an index structure are defined. The relation between data sharing, interoperability and object-relational spatial DBMS is described. A model that uses Oracle Object-Relational Spatial to realize distributed issue, multi-user operation, security is given. A test that uses Object-Relational DBMS to manage China 1:50000 spatial data has done.