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Algebras for Moving Objects and Their Implementation

Systems of spatial data types and operations, or spatial algebras, are a key concept in the modeling and implementation of spatial database systems. The idea can be extended to spatio-temporal databases by introducing spatio-temporal types, or algebras for moving objects. Such an algebra may have data types like moving point or moving region, to represent, for example, animals and forest fires. It may have operations like trajectory to project a moving point into the xy-plane, yielding a curve or line value, or inside, which returns when a moving point was inside a moving region, a time dependent boolean value. Such an algebra may be embedded into a DBMS data model to obtain a complete data model and query language for moving objects.

In the talk, we discuss the issues involved in designing such algebras and give an overview of an algebra for time dependent points, lines, and regions in 2D. We show how the concept can be adapted to deal with objects moving along networks such as vehicles or traffic jams. In this case, static and time dependent positions are defined relative to a network, not the Euclidean space, and we have data types to represent the network as well as static and moving network positions and network regions.

Such algebras can be implemented as data blades, cartridges, etc. in suitable extensible DBMS environments. We give a brief overview of SECONDO, a DBMS environment particularly geared for extensions by algebra modules, and show how moving object algebras can be implemented in this environment.