

**Range Queries on Multi-Attribute Trajectories**

**Abstract:**

Motivated by the trend of providing comprehensive knowledge about trajectory data, we study multi-attribute trajectories each of which contains a sequence of time-stamped locations and a set of characteristic attributes. This enriches the data representation by providing a comprehensive description of moving objects and thus enables new types of queries on moving object trajectories. In this paper, we consider answering range queries that return trajectories (i) containing particular attribute values and (ii) passing a certain area during the query time. We integrate standard trajectories and attributes into one unified framework and propose an index structure as well as the query algorithm. The structure is general and flexible in terms of handling both multi-attribute trajectories and standard trajectories, answering a range of queries and supporting update-intensive applications. The evaluation is conducted in a prototype database system and experimental results demonstrate that our method outperforms alternative methods by a factor of 3-10 on a data set of one million real trajectories and synthetic attribute values.

**Existing System:**

Trajectory databases are used to manage the historical data of moving objects, allowing for complex queries and analysis of movements in the past. Although there is an extensive literature on modeling and querying trajectory data, existing research works mainly focus on standard trajectories, i.e., a sequence of timestamped locations. In the real world, typical moving objects such as vehicles and persons are associated with pieces of descriptive information in addition to location and time.

Moving objects databases should expand the capability to have a full representation for handling both standard trajectories and attributes. This allows users to query objects with extensive knowledge and to find particular trajectories by integrating the attribute into the query.

Consequently, users can fully understand the behavior of moving objects, i.e., knowing not only when and where but also which and what. The multi-attribute data representation provides an overview of different aspects of real-world objects and has been recently involved in a number of new applications.

**Proposed System:**

To efficiently process multi-attribute trajectories, an index is essentially required because a sequential scan over the database is prohibitively expensive for large datasets. One can employ two individual indexes (e.g., 3D R-tree and B-tree) on standard trajectories and attributes, respectively. The problem is, when the query evaluates the selective predicate on both parts, an intersection will be performed on two candidate sets that are separately retrieved. The challenge is how to design an integrated structure that simultaneously manages both parts and allows evaluating the AND predicate. Meanwhile, the structure should be general and flexible in order to support a range of queries for multi-attribute trajectories and standard trajectories, and update-intensive applications.

We introduce multi-attribute trajectories, give the data representation and define a new query.

(ii) We propose a hybrid index structure and an efficient algorithm to answer range queries on multi-attribute trajectories together with an efficient updating method for the index.

(iii) Using large real datasets, we conduct an extensive experimental study to demonstrate the superior performance of our method over five alternative methods in terms of efficiency and scalability.