Moving Object Queries

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Context:

- Basic Queries
  - Nearest neighbor Query
  - Range Query
- Advanced Queries
  - Density Query
  - Continuous Query

Basic Queries:

- Nearest neighbor query:
  - We consider two versions of nearest neighbor queries depending on whether the temporal predicate is a single time instant or an interval.
  - For example: "find the closest object to a given object o after 10 minutes from now", or, "find the object that will be the closest to object o between 10 and 15 minutes from now".

Basic Queries:

- An example of such a spatio-temporal query is:

  "Report the object that will be the closest to an object o after 10 minutes from now". Since object o moves and it's motion information is known, the above query is equivalent to finding the object (except from object o) which will be the closest to position P after 10 minutes from now, where P is the position o will be in 10 minutes.

Basic Queries:

- Range Query:
  - It requires retrieving mobile objects inside a user-defined region and providing continuous updates as the objects move into and out of the region.
  - We also examine nearest neighbor queries where instead of a time instant, an interval predicate in future is given as in: "Report the object that will be the closest to object o between 10 and 15 minutes from now". We will answer this query by reducing it to a combination of range queries and the above simple nearest neighbor queries.

Advanced Queries:

- Density Query:
  - In these type of queries, we study the querying for dense regions, regions with a high concentration of moving objects.
  - The objective is to find regions in space along with associated points in time where the regions have a density that exceeds a given threshold.

Advanced Queries:

- Figure illustrates an example where three square-shaped windows compose the answer to a density query.

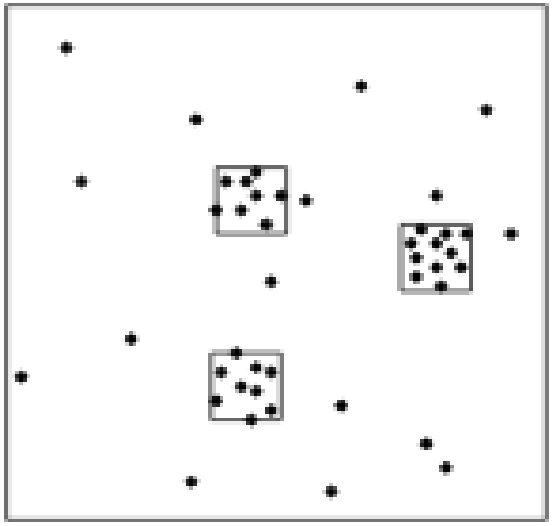

Figure 1. An example of density query results

Advanced Queries:

- The density query may have applications in a range of areas. In traffic management systems, density queries may be used for identifying regions with potential for congestion and traffic jams.

Advanced Queries:

- Continuous Query:
  - Applications which include location-aware services, traffic monitoring, and Data Streaming. Such applications continuously receive data from mobile objects (e.g. moving vehicles in road networks).
  - A continuous query allows users to get changing results from database without having to issue the query repeatedly.

Advanced Queries:

- Assume that a driver is asking a selection of hotels within 5 miles from its position. If this query is submitted as non continuous, then the results (a set of hotels) is sent back immediately after the query has been processed. If the same query is submitted as continuous, then the set of selected hotels varies “continuously” with the movement of the user.

References:

- Nearest Neighbor Queries in a Mobile Environment https://pdfs.semanticscholar.org/b68b/4edc9334f2e2c3efcdf5549613ec99d5ba95.pdf
- Query Processing in Mobile Environment: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1385196
- Effective Density Queries on continuously moving object: https://people.eng.unimelb.edu.au/zr/publications/Icde06_density_query.pdf
- Continuous Query Processing of Spatio temporal Data Streams: http://www-users.cs.umn.edu/~mokbel/papers/GeoInformatica05.pdf
- Continuous Queries for Streaming Data of Mobile Objects: http://www.indjst.org/index.php/indjst/article/viewFile/92298/69868
- Modeling and Querying Moving Objects: https://www.cs.uic.edu/~boxu/domino/most5.pdf

THANK YOU