Continuous Spatio-temporal Database Query Processing

Thuy Thi Thu Le and Bradford G. Nickerson

Faculty of Computer Science
University of New Brunswick, Fredericton, NB, Canada
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Abstract

One of the biggest challenges in spatio-temporal databases is to improve the response time for query processing of moving objects, so-called continuous query processing. An example query of this type is *"how many moving cars are in the center of Boston in the time interval (t1, t2)?"*. An efficient and accurate approach to continuous query processing requires (i) a good data structure for capturing the location history of moving objects on road networks, (ii) an accurate prediction method for locations of moving objects, and (iii) a good query optimization method for continuous queries. Our overall goal is to improve the data structure for capturing moving objects, traffic modeling and prediction with inputs from continuously moving vehicles.

We propose a data structure, called DyNoMo-tree (Dynamic Network Of Moving Objects for moving objects). In particular, we can combine an R*-tree [2] and strip trees [1] for representing moving objects on road networks. The R*-tree will be used as the top tree, whose leaf nodes contain pointers to strip trees. The strip tree contains complete polyline information for each road and can quickly search query rectangles intersect them. We plan to compare search times for this new method with existing index structures (e.g., [5, 3]). We also plan to integrate the DyNoMo-tree with a relational database that currently supports spatio-temporal data. We then evaluate the proposed DyNoMo-tree by using the GCA (Graph of Cellular Automaton) model [4], a seminal model for traffic networks. This GCA model can be used to predict the trajectories of moving objects more accurately.

References

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