Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 2, Issue. 8, August 2013, pg.252 – 256

RESEARCH ARTICLE

Privacy Protected Query Processing on Spatial Networks

K. SASIKALA[1], REKA.R[2], SASIKALA.K[3]
[1]VMU, India
[2]Assistant Professor, VMKVEC, India
[3]Assistant Professor, VMKVEC, India

[1] sasinivethitha@gmail.com, [2] rekaresearch@gmail.com, [3] sasikalaresearch@gmail.com

Abstract*— Privacy Protected spatial queries refer to spatial queries whose answers rely on the location of the inquirer. Efficient processing of Privacy Protected spatial query is of critical importance with the ever-increasing deployment and use of mobile technologies. We show that Privacy Protected spatial query have certain unique characteristics that the traditional spatial query processing in centralized databases does not address. For example, a significant challenge is presented by wireless broadcasting environments, which have excellent scalability but often exhibit high latency database access. We present a novel query processing technique that, though maintaining high scalability and accuracy, manages to reduce the latency considerably in answering Privacy Protected spatial query. Our approach is based on peer-to-peer sharing, which enables us to process queries without delay at a mobile host by using query results cached in its neighboring mobile peers. We demonstrate the feasibility of our approach through a probabilistic analysis, and we illustrate the appeal of our technique through extensive simulation results.*

Key Terms: - LBSQ; spatial query; peer-to-peer sharing; Mobile Hosts; R-Tree

I. INTRODUCTION

Spatial query processing is becoming an integral part of many new mobile applications. Recently, there has been a growing interest in the use of Location-Based Spatial Queries (LBSQs), which represent a set of spatial queries that retrieve information based on mobile users' current locations. User mobility and data exchange through wireless communication give LBSQs some unique characteristics that the traditional spatial query processing in centralized databases does not address. The wireless environment and the communication constraints play an important role in determining the strategy for processing LBSQs. In the simplest approach, a user establishes a point-to-point communication with the server so that her queries can be answered on demand. However, this approach suffers from several drawbacks. First, it may not scale to very large user populations. Second, to communicate with the server, a client must most likely use a fee-based cellular-type network to achieve a reasonable operating range. Third, users must reveal their current location and send it to the server, which may be undesirable for privacy reasons. A more advanced solution is the wireless broadcast model. It can support an almost-unlimited number of Mobile Hosts (MHs) over a large geographical area with a single transmitter. With the broadcast model, MHs do not submit queries. Instead, they tune in to the broadcast channel for information that they desire. Hence, the user's location is not revealed. One of the limitations of the broadcast model is that it restricts data access to be sequential. Queries can only be fulfilled after all the required on-air data arrives. This is why in some cases; a 5-minute delay to the query "find the top-three nearest hospitals" would not be unusual.

1.1 MOTIVATION

Location based services are popular these days. Shortest-path and nearest neighbor queries are very crucial. Need for real-time execution of these spatial queries.

1.2 QUERY PROCESSING MADE SIMPLE

Major Challenge Spatial networks cannot be easily represented using the relational model. Since network distance is approximated by one value, spatial queries can be formulated using appropriate SQL constructs and a few built-in primitives. Approximate network distance SELECT O:d_ FROM O WHERE O:ZAB =Z Z4(p; q).Region Search SELECT R:pos, O:d_ FROM R, O WHERE O:ZAB =Z Z4(q; R:pos) and R:type = \Italian" and O:d_ _ 10 miles.

II. LITERATURE REVIEW

Propose the use of repetitive broadcast as a way of augmenting the memory hierarchy of clients in an asymmetric communication environment. We describe a new technique called "Broadcast Disks" for structuring the broadcast in a way that provides improved performance for non-uniformly accessed data. The Broadcast Disk superimposes multiple disks spinning at different speeds on a single broadcast channel--in effect creating an arbitrarily fine-grained memory hierarchy. [1]We present Bit-Sequences (BS), an adaptive cache invalidation algorithm for client/server mobile environments. The algorithm uses adaptable mechanisms to adjust the size of the invalidation report to optimize the use of a limited communication bandwidth while retaining the effectiveness of cache invalidation. [2]Location-based spatial queries (LBSQs) refer to spatial queries whose answers rely on the location of the inquirer. Efficient processing of LBSQs is of critical importance with the ever-increasing deployment and use of mobile technologies. We show that LBSQs have certain unique characteristics that traditional spatial query processing in centralized databases does not address. [3] Mobile computing and databases - broadcasting has attracted considerable attention as a means of disseminating information to large client populations in both wired and wireless settings.[4]The R-tree, one of the most popular access methods for rectangles, is based on the heuristic optimization of the area of the enclosing rectangle in each inner node. By running numerous experiments in a standardized test bed under highly varying data, queries and operations, we were able to design the R*-tree which incorporates a combined optimization of area, margin and overlap of each enclosing rectangle in the directory [5].

III. RELATED WORK

In this section, we introduce the background information and related research regarding spatial queries, location based services, and location privacy preservation.

3.1 Spatial Queries

We focus on two common types of spatial queries, namely k nearest neighbor queries and range queries. With R-tree [8] based spatial indices, depth-first search (DFS) [14] and best-first search (BFS) [9] have been the prevalent branch-and-bound techniques for processing nearest neighbor (NN) queries. In order to increase the NN query accuracy, recent research proposed solutions based on spatial networks. Kolahdouzan et al. [10] presented a novel approach to efficiently evaluate k NN queries in spatial network databases using a first order Voronoi diagram. Papadias et al. [13] proposed two algorithms, the Incremental Euclidean Restriction (IER) algorithm and the Incremental Network Expansion (INE) algorithm to solve nearest neighbor queries on spatial networks. For range queries that find objects within a specified area, the R-tree families provide efficient access to disk based databases. Basically, an R-tree structure groups objects close to each other into a minimum bounding rectangle (MBR), and a range query only visits the MBRs that overlap with the query area. All the aforementioned spatial query techniques do not take user privacy protection into account.

3.2 Location Privacy Preservation

The popularity of location-based services, privacy protection for mobile users has become an important issue [7] [15]. Gruteser et al. [6] proposed middleware architecture and algorithms for maintaining location K anonymity. Their algorithms adjust the resolution of location information along spatial or temporal dimensions to fulfil the required anonymity constraints. Based on the work in [6], a unified privacy personalization framework is proposed in [5] to support different levels of anonymity according to the requests of users. However, these previous research approaches mainly focused on the system architecture and the location anonymizer design rather than query processing. Mokbel proposed to employ a trusted third party, the location anonymizer, which expands the user location into a spatial region for protecting user privacy [11]. Mokbel et al. also proposed related privacy-aware query processing algorithms [12]. However their query processing solutions are based on Euclidean metrics. In real life, mobile users cannot move freely in space but are usually constrained by underlying networks (e.g., cars on roads, trains on tracks, etc.). Therefore, we need solutions for processing privacy protected queries on spatial networks.

IV. EXISTING SYSTEM

In this Existing System spatial query processing is becoming an integral part of many new mobile applications. The database resides in a centralized server, which typically serves a large mobile user community through wireless communication. So this process cause to single-point-of-failure and high workload. In this system a user establishes a point-to-point communication with the server so that queries can be answered on demand. However, this approach suffers from several drawbacks. First, it may not scale to very large user populations.

4.1 Advantages

- It is especially difficult represent linear features depending on the cell resolution. Accordingly, network linkages are default to establish.
- Processing of associated attribute data may be cumbersome if large amounts of data exist. Raster maps inherently reflect only one attribute or characteristic for an area.
- Most output maps from grid – cell system\ms do not conform to high – quality cartographic needs.
- Data can be represented at its original resolution and form without generalization.

4.2 Disadvantages

- The location of each vertex needs to be stored explicitly.
- For effective analysis vector data must be converted into a topological structure.
- This is paten processing intensive and usually requires extensive data cleaning.
- As well, topology is static, and any updating or editing of the vector data requires re – building of the topology.
- Most output maps from grid – cell systems do not conform to high – quality cartographic needs.

It is often difficult to compare or rate GIS software that uses different data models. Some personal computer (PC) packages utilize vector structures for data input, editing, and display but convert to raster structures for any analysis. Other more comprehensive GIS offerings provide both integrated raster and vector analysis techniques. They allow users to select the data structure appropriate for the analysis requirements. Integrated raster and vector processing capabilities are most desirable and provide the greatest flexibility for data manipulation and analysis.

V. PROPOSED MODEL

5.1 MODELING MOVING OBJECTS IN SPATIAL NETWORKS

Abstract models allow us to make definitions in terms of infinite sets, without worrying about implementation issues like whether finite representations of these sets exist. This feature benefits us a lot, for example, we could view a moving point as a continuous curve in the 2D space, as an arbitrary mapping from an infinite time domain into an also infinite space domain. All the types that we get by application of 0the type constructor τ are functions over an infinite domain; hence each value is an infinite set.

5.1.1 Definitions of Moving Objects in Spatial Networks

This abstract view is the conceptual model that we are interested in. We consider two basic types m point and m region here for representing the moving objects in road networks. The majority of the moving objects in networks can be represented by a moving-point whose size can be omitted at an abstract level but stored as attributes in the database sticking to this moving point. The other perspective of moving object is the moving-region, which reflects a region that is continuously moving and changing its shape. These two basic types here are enough to express the realities. Let us assume that purely spatial data types called point and region are given that describe a point and a region in the 2D-plane. A point here reflects a simple point ($\in$ R2), and a simple moving object is represented by an mpoint. A region may have holes, and generally, we would use mregion to represent moving object like a traffic jam which consists an area of vehicles. Further, a type time describes the valid time dimension and is isomorphic to the real numbers ($\in$ R). Then we can view the types mpoint and mregion as mappings from time into space as: mpoint = time $\rightarrow$ point mregion = time $\rightarrow$ region and we can use retrieval operator mlocation to retrieve the position of a mpoint and a center point of a mregion at a time instance:

mlocation: mpoint $\times$ time $\rightarrow$ point

mlocation: mregion $\times$ time $\rightarrow$ point

However, since the moving points are restricted by the constrained environment, e.g. road network, the complete definition for moving points in spatial networks is defined as:

M point = time $\rightarrow$ point

(i) $\forall p \in$ point $\in$ R2

(ii) $\forall t \in$ time, $\exists e \in [0, 1]$, r $\in$ routes (network) s.t. n location(r, e) = p

(iii)$\forall \_ > 0$, $\exists \delta > 0$, $\forall t1, t2 \in$ time: $|t1 - t2| < \delta$, s.t.

N distance(m location(m point, t1), m location(m point, t2)) < _ Condition

(i) The ensures that the moving point moves in 2D plane, and condition

(ii) Restricts all the possible locations that a moving point can reach must belong to a certain route, i.e. belongs to the network.

(iii) Often refers to as the continuous restriction, ensures that the movement of the moving point is continuous. Obviously, a moving point should move along a continuous curve, only continuity reflects the real movement. More generally, we can introduce a type constructor τ which transforms any given atomic data type α into a type τ (α) with semantics as $\tau(\alpha)$ = time $\rightarrow \alpha$.

In this proposed system paper presented a novel approach for reducing the spatial query access latency by leveraging results from nearby peers in wireless broadcast environments. Significantly, our scheme allows a mobile client to locally verify whether candidate objects received from peers are indeed part of its own spatial query result set. The Experiment results indicate that our method can reduce the access to the wireless broadcast channel by a significant amount; this is achieved with minimal caching at the peers. By virtue of its P2P architecture, the method exhibits great scalability: the higher the mobile peer density, the more the queries answered by peers. Therefore, the query access latency can be markedly decreased with the increase in clients.

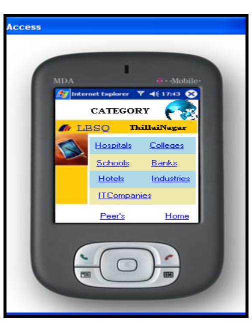
VI. METHODOLOGY

In Location-Based Spatial Query Processing in Wireless Broadcast Environments project we used the following two algorithms,

- Broadcast Channel Data Filtering.
- Approximate Nearest Neighbor.

These technologies presented a novel approach for reducing the spatial query access latency by leveraging results from nearby peers in wireless broadcast environments. Significantly, our scheme allows a mobile client to locally verify whether candidate objects received from peers are indeed part of its own spatial query result set. The Experiment results indicate that our method can reduce the access to the wireless broadcast channel by a significant amount; this is achieved with minimal caching at the peers. By virtue of its P2P architecture, the method exhibits great scalability: the higher the mobile peer density, the more the queries answered by peers. Therefore, the query access latency can be markedly decreased with the increase in clients.

Result



VII. CONCLUSION

This paper presented a novel approach for reducing the spatial query access latency by leveraging results from nearby peers in wireless broadcast environments. Significantly, our scheme allows a mobile client to locally verify whether candidate objects received from peers are indeed part of its own spatial query result set. The experiment results indicate that our method can reduce the access to the wireless broadcast channel by a significant amount, for example, up to 80 percent, in a dense urban area. This is achieved with minimal caching at the peers. By virtue of its P2P architecture, the method exhibits great scalability: the higher the mobile peer density, the more the queries answered by peers. Therefore, the query access latency can be markedly decreased with the increase in clients.

REFERENCES

[1] S. Acharya, R. Alonso, M.J. Franklin, and S.B. Zdonik, “Broadcast Disks: Data Management for Asymmetric Communications Environments,” Proc. ACM SIGMOD ’95, pp. 199-210, 1995.

[2] D. Barbara´ , “Mobile Computing and Databases: A Survey,” IEEE Trans. Knowledge and Data Eng., vol. 11, no. 1, pp. 108-117, Jan./Feb. 1999.

[3] T. Brinkhoff. A Framework for Generating Network-Based Moving Objects. GeoInformatica, 6(2):153–180, 2002.

[4] T. Brinkhoff, H.-P. Kriegel, and B. Seeger. Efficient Processing of Spatial Joins Using R-Trees. In SIGMOD Conference, pages 237–246, 1993.

[5] R. Cheng, D. V. Kalashnikov, and S. Prabhakar. Evaluating Probabilistic Queries over Imprecise Data. In SIGMOD Conference, pages 551–562, 2003.

[6] E. W. Dijkstra. A Note on Two Problems in Connexion with Graphs. Numerische Mathematik, 1:269–271, 1959.

[7] B. Gedik and L. Liu. Location Privacy in Mobile Systems: A Personalized Anonymization Model. In 25th International Conference on Distributed Computing Systems, pages 620–629, 2005.

[8] M. Gruteser and D. Grunwald. Anonymous Usage of Location-Based Services Through Spatial and Temporal Cloaking. In MobiSys, 2003.

[9] M. Gruteser and X. Liu. Protecting Privacy in Continuous Location-Tracking Applications. IEEE Security & Privacy, 2(2):28–34, 2004.

[10] A. Guttman. R-Trees: A Dynamic Index Structure for Spatial Searching. In SIGMOD Conference, pages 47–57, 1984.

[11] G. R. Hjaltason and H. Samet. Distance Browsing in Spatial Databases. ACM Trans. Database Syst., 24(2):265–318, 1999.

[12] M. R. Kolahdouzan and C. Shahabi. Voronoi-Based K Nearest Neighbor Search for Spatial Network Databases. In VLDB, pages 840–851, 2004.

[13] M. F. Mokbel. Towards Privacy-Aware Location-Based Database Servers. In ICDE Workshops, page 93, 2006.

