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SKYLINE QUERY PROCESSING IN LOCATION BASED APPLICATION

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Abstract*:* With the ever-increasing growth of mobile devices and Smartphone, location based services (LBS) has recently received attention. This paper extends the concept of locational dominance. Skyline query processing is multi-criterion data analysis tool which considers spatial attributes along with non-spatial attributes. Conventional approaches includes both index based and non-index based approaches. This paper propose a efficient approach for location-dependent skyline query processing .In which first we need to compute the skyline scope efficiently and then using algorithm we need to compute the skyline i. e. such tuples which are not dominated by any other tuples. We conduct extensive experiments in a simulated mobile database system, and the experimental results demonstrate the superiority of the proposed approach.

Keywords: Skyline Query, locational dominance, reverse skyline query, subspace skyline query processing

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INTRODUCTION

Skyline query processing for location-based services, which considers both spatial and nonspatial attributes of the objects being queried, has recently received increasing attention. The skyline query is one very important query for users' decision making. A skyline query returns a set of non-dominated data objects in a multi-dimensional dataset. An example of a skyline query is to find hotels with cheaper price and shorter distance to the beach. In this example, two different search criteria (i.e., *price* and *distance to the beach*) are considered, and both of them are static attribute, that is, both *price* and *distance to the beach* are fixed unless the updates to the hotel happen. However, besides static attributes, in many mobile applications dynamic attributes are often considered as search criteria. For example, a car driver wants to find car parks with cheaper *parking fees* and shorter *distance to his current location*. In this case, the distance value is no longer static, but subject to the query points. Motivated by the demand, in this paper we address skyline queries in location-dependent applications. Unlike conventional skyline queries, Location-dependent skyline query (*LDSQ*) takes spatial attribute, i.e., the distance from a data object to the query point, into consideration along with static non-spatial attributes. Specifically, given s set of data objects *DS* with both spatial coordinates and non-spatial attributes, an *LDSQ* returns a set of data objects from *DS* which are not location-dependently dominated by any other data objects in *DS* with respect to a query point *q*. We say that data object *p* location-dependently dominates data object *k* with respect to *q* if *p* dominates *k* and meanwhile *p* is closer to *q* than *k*.

Definition 1 (Locational Dominance). With respect to a query point q, we denote that an object o locationally dominates another object o by $o \vdash_q o',$ which is expressed as follows:

$$o \vdash_q o' = \forall_{a \in \mathcal{A}}\ o[a] \leq o'[a] \wedge |o,q| \leq |o',q| \\ \wedge (\exists_{a \in \mathcal{A}} o[a] < o'[a] \vee |o,q| < |o',q|).$$

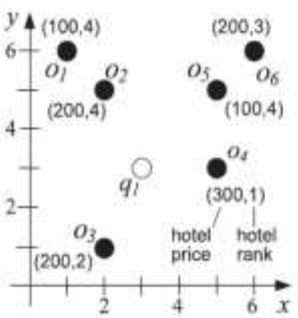
Here O[a] represents the value of a for object o and

|o,q| represents distance between object o and query point q.

Given a set of d-dimensional points, a skyline query returns the subset of points that are not dominated by any other point.A point p1 dominates another point p2, if p1 is not worse than p2 in any dimension and is better than p2 in at least one dimension. In different contexts, "better" can have different meanings like "larger" values or "shorter" distances.

Example 1. Fig. 1 depicts the locations of six example hotels (objects), namely, o1; o2, o3, o4, o5 and o6 along with their prices and ranks, which are nonspatial attributes. The smaller its price (rank) is, the better a hotel is considered to be. The euclidean distances of objects to a point of attraction, q1, (i.e., a query point) are listed in the figure.

With respect to q1, o2, and o6, which cannot offer a lower price, a better rank, or a shorter distance to q1 than o3, are said to be locationally dominated by o3. Likewise, o1 is locationally dominated by o5, since o5 is closer to q1 than o1, despite they have the same price and rank. Because of its best rank, o4 is not dominated. Thus, o3, o4, and o5 are those not locationally dominated objects with respect to q1.



	distance to q_1
o_1	$\sqrt{13}$
o_2	$\sqrt{5}$
o_3	$\sqrt{5}$
o_4	2
o_5	$\sqrt{8}$
o_6	$\sqrt{18}$

1. BACKGROUND

This paper proposes an algorithm for skyline query processing named as Location Dependent Skyline Query Processing Algorithm(LDSQP).This is based on the the extension of R-tree, by maintaining for each index node the minimums of its enclosed objects' nonspatial attribute values.

There is increasing attention towards the Skyline Query Processing.

In this paper we are focusing on the Location Dependent Skyline Queries which responds to the query In the mobile environment, where both the spatial and non-spatial attributes are taken into consideration. Previously there has been a lot of research in this concept. But due to the users need location privacy, we are additionally providing the location privacy of a user.

2. PREVIOUS WORK DONE

Since the introduction of skyline query to retrieve non dominated records or Pareto-optimal tuples from a database, various search techniques have been proposed;

To answer a representative class of skyline queries for location-based applications efficiently, presents two index-based approaches, namely, augmented R-tree and dominance diagram. Augmented R-tree extends R-tree by including aggregated non-spatial attributes in index nodes to enable dominance checks during index traversal. Dominance diagram is a solution-based approach, by which each object is associated with a pre computed nondominance scope wherein query points should have the corresponding object not locationally dominated by any other. Dominance diagram enables skyline queries to be evaluated via parallel and independent comparisons between nondominance scopes and query points, providing very high search efficiency. Two novel algorithms are proposed[1]: one is index-based (I-SKY) and the other is not based on any index (N-SKY). To handle frequent movements of the objects being queried, along with incremental versions of I-SKY and N-SKY, which avoid recomputing the query index and results from scratch. To empowering clients to authenticate query results is imperative for outsourced databases.[3] propose a basic Merkle Skyline R-tree method and a novel Partial S4-tree method to authenticate one-shot LASQs. One of the advantage of this method is to the data-outsourcing model, the service provider can be untrustworthy or compromised, thereby returning incorrect or incomplete query results to clients, intentionally or not.

4. EXISTING METHODOLOGIES

To answer a representative class of skyline queries for location-based applications efficiently, augmented R-tree and dominance diagram, these approaches are proposed.

Augmented R-tree (AR-tree) extends spatial R-tree by maintaining for each index node the minimums of its enclosed objects' nonspatial attribute values. Skyline query processing,subspace skyline query processing are evaluated by using augumented R tree.

Dominance diagram (DD) is a solution-based approach, based on the notion of nondominance scopes. In what follows, we formulate nondominance scope and devise algorithms for 1) nondominance scope computation, 2) SQ, RSQ, SSQ, and TIQ evaluation based on indexed non dominance scopes, and 3) nondominance scope maintenance. All those algorithms can run in parallel.

Another method is proposed to authenticate one-shot LASQ a basic **Merkle Skyline R-tree** method and a novel Partial S4-tree method. With the help of MSR-tree, an LASQ is reduced to a point-location query on the indexed subspace skyline scopes. Specifically, starting from the root and going all the way down to the leaf nodes, the server checks whether any child of a node covers the query point.

Two novel algorithms are proposed: one is index-based (I-SKY) and the other is not based on any index (N-SKY).In index based algorithm first propose a notion of skyline scope for each object. By precomputing and indexing such skyline scopes, the RSQ query can be easily processed. To minimize the cost in computing the skyline scopes, also propose an incremental version of the skyline scope construction algorithm

3. ANALYSIS AND DISCUSSION

Augmented R-tree (AR-tree) extends spatial R-tree by maintaining for each index node the minimums of its enclosed objects' nonspatial attribute values. This augmented R-tree (AR-tree) gives the good performance for skyline query processing.

The precomputation costs of the MSR-tree and Partial-S4-trees on the larger dataset HOU, which appear acceptable as the precomputation is an offline and one-time operation. It is further noted that the construction process of the MSR-tree and Partial-S4-trees is fully parallelizable; the pre-computation costs can thus be linearly reduced by using more servers. I-SKY indexes the skyline scopes, which accelerates the processing of range-based skyline queries. However, the maintenance cost of the skyline scope index would be high if the objects update their locations frequently. To avoid the high update cost of I-SKY for the scenarios where the objects move frequently and fast, in this section we propose a nonindex algorithm N-SKY.

6. PROPOSED METHODOLOGY

The basic approach for computing a skyline scope efficiently and then find out tuples which are not dominated by all other tuples.

I) The basic Skyline Scope computation

II)Computing the Skyline

The following algorithm named as LDSQP Algorithm is proposed in this paper. In this algorithm dataset(DB) and skyline for that database i.e.S(DB) is given as input. This algorithm is responsible for computing $\overbrace{(DB_i - S(DB_i))}$ (i.e., those data objects in (*DBi* *S*(*DBi*)) but not location-dependently dominated by any other data objects in *DBi*) over local database *DBi* and filtering some data objects in $\overbrace{(DB_i - S(DB_i))}$ but not in *LS*(G*DB*, *q*).

Algorithm 1: LDSQPA

Input: $S(DB_i)$, $(DB_i - S(DB_i))$, q, $t_{filter1}$, $t_{filter2}$, $MaxDist$
Output: T_i
$T_i := \varnothing$;
for each data object $t \in (DB_i - S(DB_i))$ ***do***
  if $MaxDist < D(Loc(t), Loc(q))$
    goto 13;
  else
    if $\neg \exists k \in S(DB_i)\ (k \xrightarrow{ld,q} t)$)
      if $\neg\ t_{filter1} \xrightarrow{ld,q} t$ and $\neg\ t_{filter2} \xrightarrow{ld,q} t$
        $T_i := T_i \cup \{t\}$;
      endif;
    endif;
  endif;
endfor;
output T_i;

In this way we have first compute the skyline scope and then processed the tuples by using using the above algorithm.

7. POSSIBLE OUTCOME RESULT

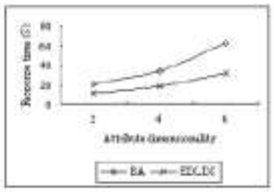


Figure 5. Response time vs. dimensionality

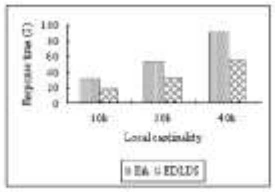


Figure 6. Response time vs. local cardinality

The response time is defined as the elapsed time from the moment that a query is issued at an query point to the moment that it receives the query result. The response time grows as the dimensionality increases.

8. CONCLUSION

In this paper, motivated by the popularity of location-based services and the increased complexity of the queries issued by mobile units, we study location-dependent skyline queries in a distributed mobile environment, where data objects are distributed at multiple database servers which are interconnected through a high-speed wired network, and queries are issued by mobile units which can access the data objects residing in database servers by wireless channels.

9. FUTURE SCOPE

In future, due to privacy concern location based skyline query will be extended as range based skyline query. Also, we will extend this work to road network environments. Since the query distance is defined by network distance in a road network, the skyline scope defined in this paper no longer works, which calls for new authentication methods.

10. REFFERENCES

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