REVIEW ARTICLE

Peer-to-Peer Rectangular Indexing: A Review

Mr. Tusharsaheb G. Patil[1], Dr. M. U. Kharat[2]

¹Department of Computer Engineering, Savitribai Phule Pune University, India

²Department of Computer Engineering, Savitribai Phule Pune University, India

[1] `tushgp@gmail.com,` [2] `mukharat@rediffmail.com`

Abstract— *The major problem with peer-to-peer applications is to find the nodes having desired information and downloading the same by saving the battery power in mobile prevalent computing environment. The past techniques though have produced satisfactory results but none of them addressed this problem. In this paper we have the survey of the systems which are dealing with the above major problem. These system are having some of the algorithm and indexing techniques which will suggest the changes in the current system implementation to make the data access more fast and effective with energy saving. Also these system provides the road map to structure new approaches in indexing to come up with the efficient solution for the above stated problems. We have also proposed an approach here which will improve the way of accessing data and with energy saving techniques from a node of interest.*

Keywords— *Mobile Computing, Mobile object, Wireless Data broadcasting, peer-to-peer, Indexing, Peer-to-Peer*

I. INTRODUCTION

A mobile P2P environment is a set of moving nodes that communicate via short range wireless technologies such as IEEE 802.11, Bluetooth, or Wi-Fi. Basically there are two types of approaches to answer the location alert services [2-3]. Particularly mobile nodes can be furnished with peer-to-peer abilities which will enable them to be a part of self-organizing and controlling and easily be deployed communication equipment [4-6]. Recent advances in wireless networks have led to development of new type of services called as Location Alert Service. These services give the answers to the user's queries not only on the basis of data values but also the location where the query was requested [7-9]. Important classes of problems in Location Alert Services are: A) Span Query: Where client gets the desired data within particular range. B) Closest Neighbour Query: Where clients get the desired data which is closer to query point. Basically there are main two approaches to get the information desired [7-9].

1)Point-to-Point: Here client will seperately send the request message to server and obtains the results via point-point channel.

2)Periodic Broadcast: Here client listens to the broadcast channel and obtains the query result via a broadcast channel.

In wireless environment, broadcasting the most accessed data items saves bandwidth as it cuts down the separate but similar responses to requests. To save the scant power in mobile we should have some technique that will save the access time and ultimately the energy of the device. The basic idea to deal with this scenario is to broadcast the data with index that will be effective for client in listening process. Advantages of using the index will be:

1. It reduces communication cost since client only sends the request to the node having desired data items by accessing air indexing.

2. It reduces the amount of time spent listening on the broadcast channel.

Over past few years many studies have been introduced for periodic data broadcast. However these techniques approached only distribution of reports about resources without considering inadequate resources of

mobile clients. Moreover, none of them considered location based data distribution and indexing for mobile peer-to-peer geographical queries in periodic broadcast systems. So here we are going to discuss about how these previous techniques are and what were their drawbacks due to which they fail to provide the effective solutions. Also we propose as rectangular indexing technique which will provide and effective access of data by saving the scant resources.

II. EXISTING SYSTEMS

This part gives the brief idea about the lots of work done before but still none of them considered the problems stated above. Here we have explained that work below.

A. Distribution of Spatio-Temporal Information using hotspots

It proposed an approach, where a node generates spatiotemporal resource information and obtains new reports in exchange [O. Wolfson et.al. proposed][10].

A moving node constantly receives availability reports from the peers it visits. Since the number of reports saved and communicated by a peer may continuously increase, the authors employ a relevance function that prioritizes the availability reports in order to limit the volume of data exchange. However this technique didn't consider the direct exchange of resources.

B. R-tree Indexing

Most of the existing studies on spatial search are based on indexes that store the locations of the indexed objects. One example of this is R-tree index. A searching algorithms based on R-tree usually explore the search space in vicinity of the query point using branch and bound approach. It requires the backtracking until target leaf node is found. Information is broadcast based on a predefined sequence and it is only available at the moment when it is broadcast. Backtracking tree search causes a serious problem for sequential access media (e.g., wireless data broadcast channel). B. Zeng et.al explained [11]. However this technique is designed only to support traditional geographical databases and can't be deployed in wireless environment as they do not consider time characteristics of air index [11-14].

C. (1.m) Indexing Technique

In traditional client-server broadcast environment reducing the access time[1] and tuning time[2] are the most important issues in terms of power saving and correct answers. (1, m)[T. Imielinski et.al proposed] [15] is the most popular indexing scheme. In this method, the index is broadcast m times during a single broadcast cycle. The broadcast index is broadcast every fraction 1/m of the broadcast cycle. Selective tuning is obtained by multiplexing an index with the data items in the broadcast. In general, the quick access time in a broadcast cycle is obtained when there is no index, since the size of the entire broadcast cycle is minimized but this increases the tuning time. In this case, the average latency time is [(O/2) + t)] where O denotes the number of data objects and t denotes the download time for data objects. Whereas addition of number of index segments in a single broadcast cycle diminishes the average probe wait[3] time but increases the access time because of the additional index information.

A major drawback of this index is the probe wait time may increase the average access time. Also it doesn't consider the linear streaming property of wireless data broadcast.

D. Maple

It is sharing bases nearest neighbor model. Where each node is designed for sharing the results of queries that are cached locally by mobile clients [W.S.Ku et al. proposed] [17].

E. Exponential Sequence Scheme

It is novel broadcast-based geographical data distribution and selective tuning algorithm that provide the clients with the ability to perform selective tuning and assist in reducing the client's tuning time.[17-19]. The basic idea is to use exponential pointers from each data item. Each data object contains pointers that contain the Identifiers, localities and advent times of the data items that will be broadcast accordingly. Each client uses an exponential pointer from each data item to minimize the energy consumption.

However it is suitable for traditional client-server broadcast environments since the server broadcasts all data items of the whole universe.

F. *Query Processing in Broadcasted Spatial Index Trees*

It is technique is used for scheduling a spatial index tree for broadcast in a single and double channel environment. The algorithms executed by the clients aim at minimizing latency and tuning time. However they still supports only for traditional client-server environment.

G. *Range nearest Neighbor Query (RNN)*

This proposed an approach called Range Nearest Neighbor which was an extension o Point Nearest Neighbor with two phases as first the pruning of secondary memory of distant index nodes and in memory computation of nearest neighbor and secondly the calculation of closets index node with the help of PNN technique. As these techniques have given the satisfactory answer for finding the most nearest node having the desired information for the user but not considered the tuning time, access time, probe wait time characteristics. Also major thing characteristic like energy consumption by mobile node in accessing the information of interest they have not considered at all.

III. PROPOSED SYSTEM

Here we propose the energy consumption model according to various approaches for accessing the data from the nodes which geographically separated. All these techniques provides the idea about consumption of energy by mobile nodes and out of which how the particular approach is suitable in order to save the battery power of each node.

A. *Energy Consumption Models:*

Now we will discuss first the energy consumption models for point-to-point and periodic broadcast approaches and will compare them in terms of energy efficiency. Let ε_r and ε_a be the energy consumption for making request and getting acknowledgement. Let ε_d, ε_{ds} and ε_i be the energy required to access the desired data through whole broadcast cycle, receiving the data with selective contacting of nodes and to access the index to get the information of interest. Let ε_d and n be the energy consumption for the sum of downloading all required data item(s) and the number of node contacts until final results obtained by the client, respectively.

These approaches are as described below:

1) Point-to-point: Client obtains the desirable result by contacting each node. In this method, the client submits request and receives acknowledge message from M nodes (e.g., from N1 to N5). Then, the client obtains the final result from the nth node (e.g., N5). Thus, AEC of Point-to-Point is

$$n * (\varepsilon_r + \varepsilon_a) * \varepsilon_d \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Value of n hampers the energy consumption significantly since the client must repeatedly send a query and receive an acknowledgment message.

2) Periodic Data: In this method, the client tunes the broadcast data items from the M nodes. Then, the client obtains the final result from the Nth node. The average energy consumption is given by

$$n * \varepsilon_d + \varepsilon_d \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Here size and no of data items affects the energy consumption since the client must stay in active mode until it receives the desired information of data.

4) Periodic Index: In this method client tunes indexes and from M nodes. Then client submit the request and obtains final result from N^{th} node. Therefor the average energy consumption is given by

$$n * \varepsilon_i + \varepsilon_r + \varepsilon_d \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Here the size and the number of data items do not affect more the energy consumption since the client sends a request message only to the node with the desired information.

5) Periodic Index with Selective Data: Here client tunes the indexes from N nodes. Then client obtains the final result from N^{th} node. Therefore the average energy consumption is given by

$$n * \varepsilon_i + \varepsilon_{ds} + \varepsilon_d \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Since the client can also selectively contact the data items without sending a request message to other nodes, it is efficient in terms of power and resource consumption, especially when many users request the same data at the same time.

In summary we can say that these results obtained above march us towards the conclusion that Periodic Index and Periodic index with selective data are suitable for resource-constrained mobile P2P networks.

B. Mobile Peer-to-Peer Environment

We consider or peer-to-peer model as a geometric model and going to represent it using 2D coordinates. Where these coordinates will specify the locations and each node will be having limited range of transmission so that it can contact to nearest neighbours. Also we are going to use the decentralized environment instead of centralized server as it will provide a powerful access to the data over the network. The said network will typically look like shown in below fig. We assume that the size of data items is same and only one client is allowed to contact to the single broadcast channel at a time
.

Also to provide efficient access to information we are going to classify the clients in two types as:

1) SRD (Sufficient Resource Devices): The devices will be mainly those which can be provided with external electrical source to get power so client does not have to worry about power consumption. These client will broadcast the data items with PMBR indexes periodically. Example includes: hotels, malls information centers etc.

2) IRD (Insufficient Resource Devices): These are devices which are having limited power resources. So power consumption should be reduced. Therefore in this case clients will only broadcast PMBR index periodically.

C. Peer-to-Peer Rectangular Indexing Structure:

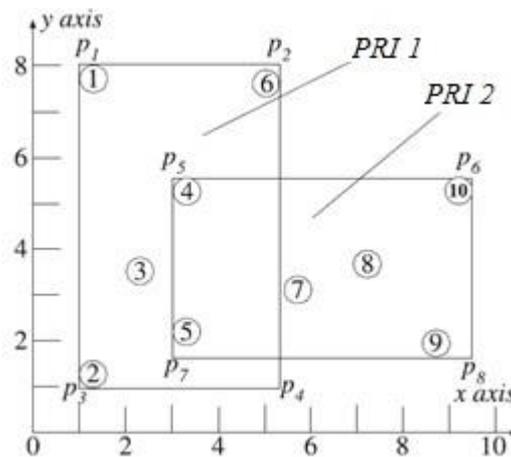Basically our PRI index can be shown graphically as given below

Fig 1. Peer-to-Peer Rectangular Indexing Structure

- Here there are total 2 PRIs i.e. PRI1 which contains the bounded object as O1,O2,O3,O4,O5,O6 and PRI2 which contains the bounded objects as O4,O5,O7,O8,O9,O10.

- Let us consider the above fig.1 where SRD clients broadcast PRI's as 1) PRI1 : P1(x:1y:8), P2(x:5.3,y:8), P3(x:1,y:1), P4(x:5.3,y:1). And likewise will be PRI2

- The IRD client will only broadcast the PMBRs but SRD client will broadcasts a)PMBR, b) Ordering of broadcast: Horizontal or Vertical and c) IDs and 2D coordinates of data objects via wireless channel.

IV. CONCLUSIONS

We have discussed all the strategies which had helped for developing various techniques to provide the fast access of geographical data within short time but these techniques had failed to provide the efficient technique in terms of saving the energy of the mobile nodes. So we have proposed a rectangular indexing scheme which we will definitely provide an effective access of data from geographically located nodes. To implement this scheme we are going to propose some algorithms in future base on the above mentioned two main methods of access of data and combining this methods with our rectangular indexing which may provide the faster and effective access of information of data and will save the scare energy resources.

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