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A Novel Approach to Balance the Load in Distributed Mobile Environment

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Abstract: A recent topic in mobility management research field is mobility prediction. Mobility prediction can be defined as the prediction of a mobile user's next movement where the mobile user is traveling between the cells. The predicted movement can then be used to increase the efficiency of Personal Communication Systems. In mobile web environment, it is often desirable to effectively mine multilevel and location-aware associated service patterns. However, the computational complexity of the underlying problems that locations and services are of hierarchical structures and if the source logs are very large, the overhead in integrating the data source log will be too high, essentially render sequential algorithms useless. Under this circumstance the more efficient approach will be mining all the logs in distributed way. That is, the distributed mining algorithm such as two dimensional multilevel methods should be executed on each server concurrently and the records of service request by the same mobile user will be interchanged via networks that can be efficiently used to discover the mobile user's associated service request patterns. But this approach is based on dynamic load balancing in the sense that load varies during the execution of the processes. Due to the limitations of static load balancing, a peer-to-peer communication framework and a novel receiver-initiated dynamic load balancing algorithm is adopted. The effectiveness of the distributed method has been evaluated based on the dataset from the mobile web environment.

Key words: Distributed Mining Algorithm · Load balancing · Mobility Management

INTRODUCTION

Mobile phones and other mobile devices are fast becoming in dispensable in our modern society. Mobile phones, unlike computers connected to wired networks, are highly personalizable. Unlike other personalized accessories such as watches, walkmans, etc., many of the mobile phones are tractable, because they have to maintain regular contacts with the mobile telecommunication networks in order to receive and make calls. With these tractability and personalization features, one can conceive many unique and interesting mobile applications for end users. The presented approach effectively discovers the associated service request pattern by taking into account the multilevel properties of locations and services. This method can discover associated service patterns like "If a user requests service A at location L1, then he/she will also request service B at location L2". The discovered patterns can be effectively utilized in real applications like location-based and personalized service. Through empirical evaluation the effectiveness of the distributed method has been shown close-to-linear speedup in a network of workstations and also allows for dynamic resource aggregation in a non- dedicated computational environment .Also this presented system shown that the distributed mining algorithm such as two- dimensional multilevel location will be deliver good performance in terms of efficiency and scalability under various system conditions.

Related Work and Problem Formulation: For the past years, many systems had been developed using the concepts of mobility data management and data mining. In recent years, some studies have been made on using data mining techniques for the WWW. The problem of making predictions about user navigation using time as an environmental factor is studied in [1]. Although some work applied data mining techniques on mobile systems they were mainly focused on issues like location tracking

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strategy called behavior-based strategy (BSS) based on each mobile's moving behavior and the issue of discovering location-aware service pattern of mobile users has not been explored. Addresses secure mining of association rules over horizontally partitioned data. The methods incorporate cryptographic techniques to minimize the information shared, while adding little overhead to the mining task. To build a load balancing architecture on decentralized policies based on CORBA and enhanced by predictive algorithm.

Proposed Model

Association Rule: An association rule is of the form X => Y where X and Y are disjoint conjunctions of attribute-value pairs. The *confidence* of the rule is the conditional probability of Y given X, Pr(Y|X) and the *support* of the rule is the prior probability of X and Y, Pr(X and Y). Here probability is taken to be the observed frequency in the data set. The traditional association rule mining problem can be described as follows. Given a database of transactions, a minimal confidence threshold and a minimal support threshold, find all association rules whose confidence and support are above the corresponding thresholds. Consider the following Fig. 1. that gives the hierarchy of location areas in a mobile system. An association rule like "La1-->La2" may be discovered in the user's moving behavior if the data items in the lowest level are consider only. However, if the whole location hierarchy is taken into account, more association rules like "City1-->La2" or "North-->City2" can be obtained. This idea can be extended into mobile systems.

System Architecture: The usage of mobile phones increases rapidly and the source logs are very large. The overhead in integrating the data source log will be too high. So, here distributed mining is used. That is, the 2DML association rule mining is executed each server concurrently and the records of service request by the same mobile user will be interchanged via networks that can be efficiently used to discover the mobile user's associated service request patterns.

Location Based Information: Many people are familiar with wireless Internet, but many don't realize the value and potential to make information services highly personalized. One of the best ways to personalize information services is to enable them to be location based. An example would be someone using their

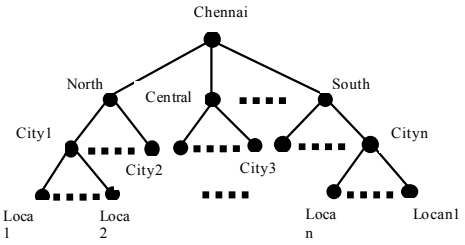

Fig. 1: Example of Location Hierarchy

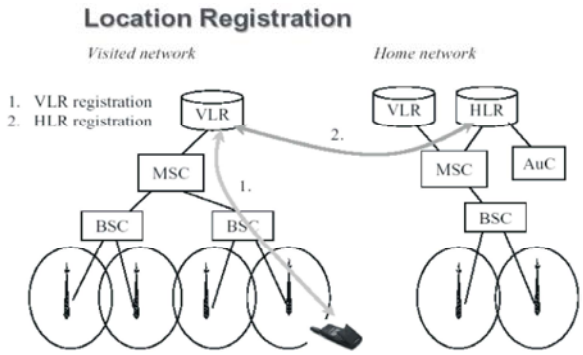

Fig. 2: Shows the overall system architecture

Wireless Application Protocol (WAP) based phone to search for a restaurant. The LBS application would interact with other location technology components to determine the user's location and provide a list of restaurants within a certain proximity to the mobile user.

Experimental results show that by avoiding unnecessary location updates, this adaptive location management algorithm considerably reduces the location management cost.

Dynamic Load Balancing: Load Balancing is used to distribute computations fairly across processors in order to obtain the highest possible execution speed. There are two load balancing methods [2].

- Static Load Balancing - Balance load prior to the execution
- Dynamic Load Balancing- Vary load during the execution of the processes.

Dynamic Load Balancing can be classified as,

- Centralized
- Decentralized

In this paper, decentralized dynamic load balancing method is adopted [3-6].

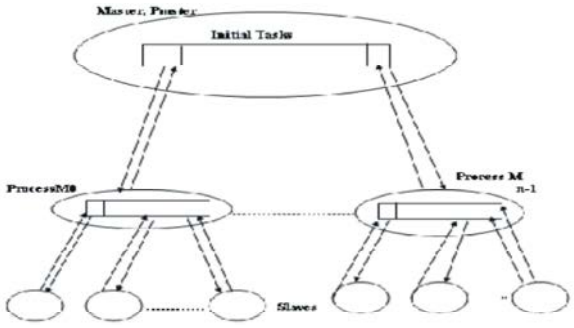

Fig. 3: Decentralized dynamic load balancing

Decentralized Dynamic Load Balancing: Tasks are passed between arbitrary processes. Computation terminates when,

- The task queue is empty and
- Every process has made a request for another task without any new tasks being generated.

XML. And the Mobile Profile variant is a subset that addresses some of the constraints of mobile browsers [7].

Algorithm

Algorithm for 2DML

Output: All large itemstes satisfying s

Initial: l=1,L_up=Min(m,n),L_low=max(m,n)
for (l=1;L[l,l,1]?Ø and l<L_up;l++) do {
L[l,l,1]=get_frequent_1_itemsets(T[l],1);
for (k=2;L[l,l,k-1] ?Ø;k++) do {
C_k=apriori_gen(L[l,l,k-1]);
foreach transaction t _ T do {
C_t=get_subsets(C_k ,t);
foreach candidate c _ C_t do c.support++;
}
L[l,l,k]={c_k|c.support=minsup[l]}
Cross_level_Large=Merge(L[l,l,k],C_k);
}
LL[l]=U_kL[l,l,k];
}
for (l=1;L[L_up,l,1]?Ø and l<L_low;l++)
do {
L[L_up,l,1]=get_frequent_1_itemsets(T,l);
for (k=2;L[L_up,l,k-1] ?Ø;k++) do {
C_k=apriori_gen(L[L_up,l,k-1]);
foreach transaction t _ T do {
C_t=get_subsets(C_k ,t);
foreach candidate c _ C_t do c.support++;
}

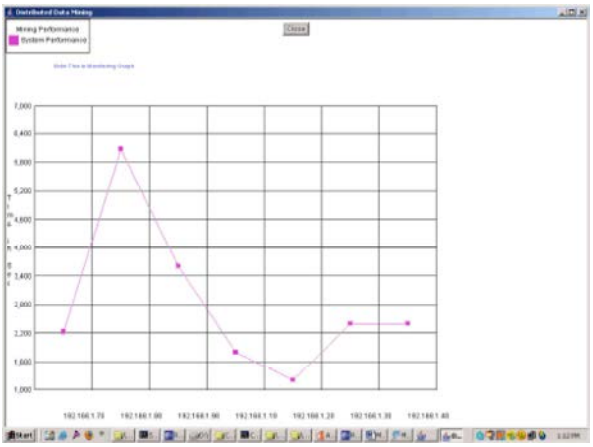

Fig. 4: User Graph for transactions

L[L_up,l,k]={c _ C_k|c.support=minsup[l]}
Cross_level_Large=Merge(L[L_up,l,k],C_k);
}
LL[l]=U_kL[L_up,l,k];
}

Performance Evaluation: The following Fig. 4 shows the user graph, as to the execution time, this algorithm spends more time under larger user scale. This is because that the number of transactions to be processes increases as the number of user rises.

Applications: This project can used to find maximum services made in a particular location. This helps the service provider to increase the bandwidth as per the services requested. It is more beneficial for the end users through the service provider. The data mining concept used here can also be used for predicting presence or absence of a disease, customer satisfaction and fraud detection.

CONCLUSION

In this paper, a distributed two dimensional data mining algorithm for the prediction of user movements in a mobile computing system is presented. Through accurate prediction of mobile user movements, this algorithm will enable the system to allocate resources to users in an efficient manner, thus leading to an improvement in resource utilization and a reduction in the latency in accessing the resources. Another benefit of this algorithm will be to enable the system to produce more accurate answers to location-dependent queries that refer to future positions of mobile users [8-10].

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