K- Nearest Neighbor Queries in Mobile Networks

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Abstract: Wireless Sensor networks play an important role in distributed infrastructure and proposed for various monitoring applications over a wide geographical region. Location Based Service is a typical application in MANET, which retrieves the information on the nearest K nodes from the location specified by the query. All user nodes to simultaneously broadcast safety messages to all their neighbors within transmit range by using beacon-less KNN query processing methods in MANET over high traffic. But it does not perform well in scattered environment. KNN focused on reducing traffic and maintaining high accuracy in sensor networks. In this survey paper, compare various research parameters for reducing traffic and maintaining high accuracy and the techniques used in it. The study papers were effective to understand the techniques and gives ideas to propose an innovative model for achieving high accuracy of the query result in the MANET.

Keywords – Mobile ad hoc networks, beaconless method, global coordinator, neighboring nodes, geo – routing

I.INTRODUCTION

Location Based Service (LBS) is a typical application in Mobile Ad Hoc Networks (MANET). It searches the information on the k nearest neighbors from the specified location. In MANET it is important to minimize the amount of information transmitted due to network bandwidth. If nodes frequently exchange beacon messages, kNN can be achieved high accuracy of the query result, because nodes can accurately know the information on their neighbors but involves more traffic. So it is desirable to retrieve kNN information using beacon-less methods in Mobile Ad Hoc Networks (MANET).

In beacon-less methods, nodes cannot know the neighboring nodes information beforehand [1]. So it should avoid message over the entire network because it is particularly wasteful use of network bandwidth. A node must process a query in a distributed manner using only the information included in the query and its location information and node must cooperate with neighbors to process a query with low traffic. By the use of proposed model, the query processing which focus on search, achieve better efficiency than other methods and avoids all the associated drawbacks [2][5][10]. Using geo-routing method the query issuing node transmits a kNN query to the nearest node from the query point (global coordinator). Implement two different approaches, the Explosion (EXP) and Spiral (SPI) methods. In both methods, nodes cooperate with neighbors to process a query using only the information included in the query and its location information.

In explosion method the nearest node from the query point forwards the query to the other nearest nodes within a specified circular region and corresponding node will receiving the replies. In the spiral method the nearest node from the query point forwards the query to the nearest node in spiral manner, and the node that collects a kNN result transmits the result to the query issuing node. In explosion method the global coordinator floods the kNN query to nodes within a specific circular region centred on the query point. The size of the circular region is determined based on the density of the nodes in the entire area. In spiral method the entire area is dynamically partitioned into a set of hexagonal cells its size is based on the communication range of the mobile nodes. In proposing system, combine the above two methods, it will give better performance in query result and avoid traffic.
DESCRIPTION OF THE PAPER

The layout of the paper is as follows. In section II, address the above mentioned techniques and also give a brief on the literature being reviewed for the same. Section III, presents a comparative study of the various research works explored in the previous section. Section IV, describes about future work. Section V gives the conclusion in and lastly provides references.

II.RELATED WORK

In this paper [1] P2P query processing has attracted a growing interest number of location-aware applications such as answering kNN queries in mobile ad hoc networks. In this research, the authors propose a pure mobile P2P query processing scheme which primarily focuses on the search and validation algorithm for kNN queries. The proposed system is developed for pure mobile P2P environments with the absence of the base station support. The system can reduce energy consumption more than six times by making use of data sharing from peers in a reasonable mean latency of processing time for networks with high density of moving objects. But the main disadvantage is not providing high security.

In this paper [2] the authors propose an efficient and scalable query processing framework for continuous spatial queries in peer-to-peer (P2P) environments has no fixed communication infrastructure. The mobile P2P environment has limited communication range. They design two key features are:

1. Each mobile user can identify the desired Quality of Services (QOS) for query answers in a personalized QOS profile, it consists of two parameters, namely, coverage and accuracy. The both parameter indicates the desired level of completeness and accuracy of the approximate answer. (2) Continuous answer maintenance scheme to enable the user to collaborate with other peers to continuously maintain the query answer. With these two features, the user can obtain a query answer from the local cache if the answer satisfies the QOS requirements. The results show that the framework is efficient and scalable in terms of performance tradeoff between the communication overhead and the quality of query answers.

In this paper [3] sensor networks represent an important component of distributed infrastructure supplying raw data to various applications. The author proposes the use of mobile data collectors that represents K-NN queries as a cost-efficient approach to collect data within the sensor network. They propose a cost-efficient 3D-kNN algorithm that uses minimal energy and communication overheads to compute k-nearest neighbor. Authors propose a cost-efficient kNN boundary estimation algorithm that computes kNN boundary based on network density. They simulate the proposed 3D-kNN algorithm using Glomosim and validate its cost efficiency by evaluating its energy efficiency and query latency.

In this paper [4] wireless sensor networks have been proposed for facilitating various monitoring applications. In these applications, spatial queries that collect data from wireless sensor networks. The important one is k-Nearest Neighbor (kNN) query that gives collection of sensor data samples based on a given query location and the number of samples specified (i.e., K). The itinerary-based kNN query processing algorithms are able to achieve better energy efficiency than other existing algorithms developed in network infrastructures. A Parallel Concentric-circle Itinerary-based KNN (PCIKNN) query processing technique that derives different itineraries by optimizing either query latency or energy consumption.

In this paper [5] the in-network query processing paradigm in sensor network postulates that a query is routed among sensors and collects the answers from the sensor. The authors propose a query processing method that uses cooperative caching, the MARKET algorithm for querying mobile P2P database and includes a novel strategy for a mobile peer to prioritize the reports based on their relevance reports. Simulations based on real-life mobility traces identify the situations in which this approach outperforms a series of existing cooperative caching strategies and an existing mobile sensor network algorithm.

In this paper [6] Wireless sensor networks have been widely used in civilian and military applications. It mainly designed for monitoring purposes, limited power supply is the major problem. So this paper is focusing on continuous kNN query processing in object tracking sensor networks. The authors propose a localized scheme to monitor nearest neighbors to a query point. The main idea is to establish a monitoring area for each query from that updates relevant to the query are collected. They analyze the optimal maintenance of the monitoring area and develop an adaptive algorithm to that desired area. It greatly reduces energy consumption and prolongs network lifetime. The disadvantage is not well in large scale environments.
In this paper [7] the authors propose a maintenance-free itinerary-based approach called Density-aware Itinerary KNN query processing (DIKNN). It divides the search area into multiple cone-shape areas centered at the query point. The design of the DIKNN scheme takes into account several challenging issues between degree of parallelism, network interference and mobility of sensor nodes. This model is validated by extensive simulations. The results show that DIKNN yields better performance and scalability when compared with other methods.

In this paper [8] the authors propose an infrastructure-free window query processing technique for sensor networks and also called itinerary-based window query execution (IWQE). It combines the query propagation and data collection into one single stage and executed along a well-designed itinerary inside a query window. Existing techniques are very vulnerable to network dynamics. The proposal IWQE, conducts query propagation and data collection along a well-designed itinerary in various systems, it does not require the support of a network infrastructure.

III. PROPOSED WORK

In circular region first fix query point form the query issuer and send query to nearest node from the query point, the nearest node send the query to nodes within a circular region.

In spiral region ,the nearest node form the query point forwards the query to other node in spiral manner and the node that collect kNN query result including node details to the query issuing node by using these methods to reduce traffic and achieve high accuracy of the query result.

KNN Query Processing:

The query issuing node first forwards a kNN query using geo-routing to the nearest node from the point specified by the query (query point). Then, the nearest node from the query point forwards the query to the other nodes close to the query point, and each node receiving the query replies.

KNN Query Processing with combination of two methods:

In circular region first fix query point form the query issuer and send query to nearest node from the query point, the nearest node send the query to nodes within a circular region.

In spiral region ,the nearest node form the query point forwards the query to other node in spiral manner and the node that collect kNN query result including node details to the query issuing node by using these methods to reduce traffic and achieve high accuracy of the query result.

K-Nearest Neighbor Algorithm

Definition:

k- Nearest Neighbor Algorithm (kNN) is part of supervised learning that has been used in many applications in the field of data mining, statistical pattern recognition and many others. KNN is a method for classifying objects based on closest training examples in the feature space. An object is classified by a majority vote of its neighbors. k is always a positive integer. The neighbors are taken from a set of objects for which the correct classification is known.
Algorithm:

Principle: Points (Neighbours) that are close in the space belong to the same class.

Input: A set of points in d dimensions

\[ P = \{p_1, p_2, \ldots, p_n\} \]

Steps to compute the k Nearest Neighbor Algorithm

Determine the parameter \( k \) = number of nearest neighbors beforehand. This value is all up to us.

1. Calculate the distance between the query-instance and all the training samples. By using any distance algorithm.
2. Sort the distances for all the training samples and determine the nearest neighbor based on the k-th minimum distance.
3. Since this is supervised learning, get all the Categories of the training data for the sorted value which fall under k.
4. Use the majority of nearest neighbors as the prediction value.

Algorithm NN \( P = [p_1, p_2, \ldots, p_n] \)

for all \( i \in [1, n], j \in [1, n] \)

compute \( d[i,j] = \|p_i - p_j\| \)

for \( i = 1 \) to \( n \)

\( \text{dist}[i] \leftarrow \infty \)

for \( j = 1 \) to \( n \)

if \( i \neq j \) and \( d[i,j] \leq \text{dist}[i] \)

then

\( \text{dist}[i] \leftarrow d[i,j], \text{NN}[i] \leftarrow j \)

return NN, dist

IV. EXPERIMENTAL RESULT

MESSAGE RECEIVED TO NEAREST NEIGHBORS AND REPLY BACK:
V. CONCLUSION:

I understood the techniques used and how to receive information from desired nodes with low traffic in MANET. The fundamental approach is to reduce traffic and achieve high accuracy of the query result by applying any one the mentioned methods, Explosion (EXP) method or Spiral (SPI) method. Case study is helped to implement the proposed model. The proposed method combination of explosion and spiral method is used to broadcast safety messages to all their neighbors within transmit range. The future enhancement of this project can be in skewed node distribution because packet loss due to single path transmission.

VI. REFERENCES


