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Object Tracking in Wireless Sensor Networks Using Data Mining Techniques

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Abstract: *Wireless sensor networks changed the future technology. The Object tracking in sensornetworks became a prominent issue. Due to data mining is an interdisciplinary concept, which can be identified and solved by using data mining mechanisms. In this paper we used the features of data mining algorithms to find object locations in wireless sensor networks. The objective of this paper is to track object based on its previous frequent pattern movements. We also focused on the issues of energy efficiency and accuracy ofthe tracking. The association rules also used for excavated other ingredients of object tracking application such as locations, paths etc. Finally, we have used apriori algorithm for mining association rules then applied to object tracking in sensor networks. Finally our work may show good results than the existing in terms of efficient usage of energy and accuracy of tracking.*

Key words: *Data mining, Apriorialgorithm, wireless sensor networks, objects tracking,K-mean clustering technique.*

I. INTRODUCTION

Wireless Sensor Networks:

Wireless Sensor Networks have proven theirsuccess in a variety of areas for monitoring physical andcritical environments.Wireless Sensor Networks have been employedin variety of wide-area environmental continuous monitoringapplications, such as continuous monitoring of waterdistribution systems, real-time applications of maritimezones, and drinking water quality monitoring. These applicationsrequire either continuous, real-time monitoring orperiodical-based and conditional-based online analytical resultsabout the monitored environment.

Wireless sensor network consists of a huge amount of static or mobilesensors. The sensors collaborate to sense, collect, and process the information of thesensing area (in-network), and transmit the processed information to theobservers. In this many tiny sensors will be deployed randomly to monitor the data movements through nodes.A major application of this domain is spread over in military, environmental,health and object tracking applications.

Data Mining:

Data mining (sometimes called data or knowledge discovery) is the process of extracting knowledge from large volumes of data that can be used to increase income and cost reduction. Data mining software contains number of tools for analyzing data. Technically, data mining is the process of finding new or patterns among many fields in large relational databases.

Data mining is used today by companies with a strong consumer focus - retail, financial, communication, and marketing organizations. It enables these companies to determine relationships among "internal" and "external" factors such as and, it enables them to determine the impact on sales, customer satisfaction, and corporate profits. Finally, it enables them to "drill down" into summary information to view detail transactional data.

The working of data mining in while large-scale information technology has been evolving separate transaction and analytical systems. Data mining software analyzes relationships and patterns in stored transaction data based on open-ended user queries. Many analytical software are available such as: statistical, machine learning, and neural networks. Generally, any of the above types of relationships are sought.

The main objective this paper is how to track object in wireless network by using data mining mechanisms. The main issue of it is identifying the sensor and its events. Finally energy, power and performance issues. Power decides the life time of network.

II. RELATED WORK

The power may be saved with the sleeping nodes which are sleeping when there is no object. We are concentrating the on the moving patterns of the objects among sensor nodes. Many recent works havefocused on application of data mining technology for object discovering then form useful association rules from past movement information of the object finally predict the next location. Once we get the location we can track information easily about object for track. For this purpose we used the data mining algorithm namely Apriroi and K-means clustering for finding frequent patterns of items and identify them with the localization.The conducted study tells that the process of object tracking can be including in node and regions of wireless sensor networks.

Network Architecture:

The network architecture consists of a large number ofsensor nodes deployed in the monitoring region and each nodeis equipped with sensor memory to record the object movementinformation as shown in the following figures.

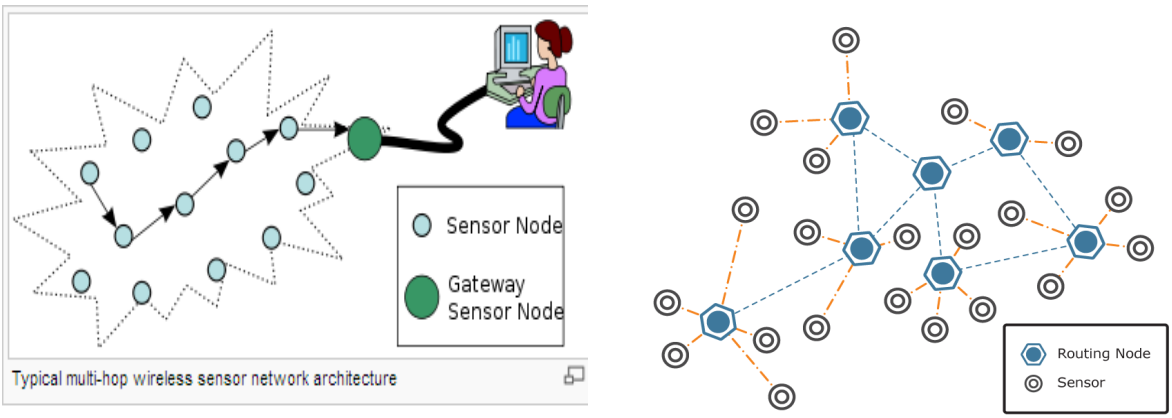


Fig .1.Sample wireless sensor network Topologies (http://en.wikipedia.org/wiki/Wireless sensor network)

The working of Apriori algorithm

TID	List of item_IDs
T100	I1, I2, I5
T200	I2, I4
T300	I2, I3
T400	I1, I2, I4
T500	I1, I3
T600	I2, I3
T700	I1, I3
T800	I1, I2, I3, I5
T900	I1, I2, I3

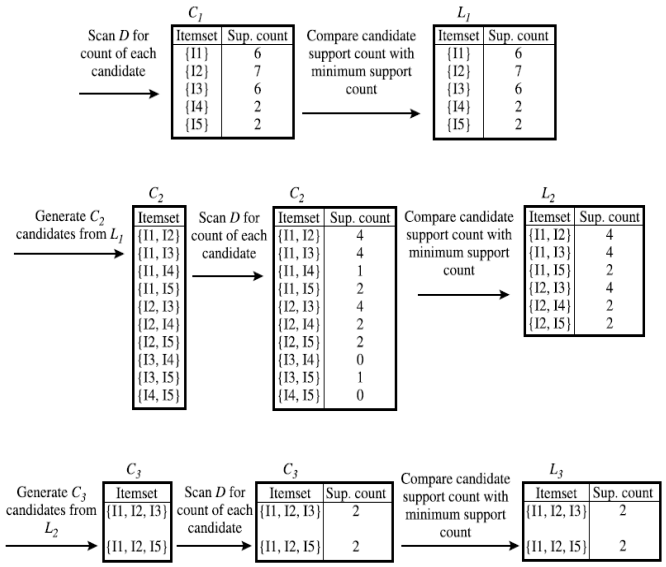


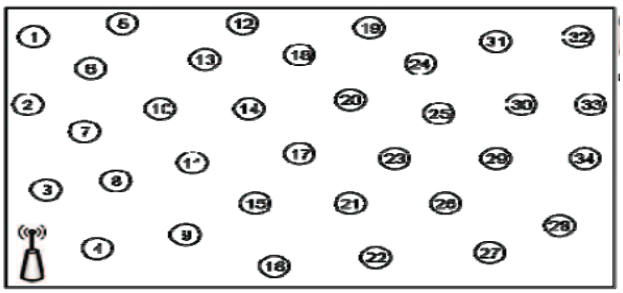
Fig.2. Working of Apriori algorithm (Source: Data Mining Concepts and Techniques 2ed By Jiawei Han and MichelineKamber)

The Apriori Algorithm is used to find frequent Itemsets usingCandidate Generation and it uses prior knowledge of frequent itemset properties with the Apriori property;All nonempty subsets of a frequent itemset must also be frequent. The aim of this paper to integrate data mining algorithm with the wireless sensor network for object tracking.

The algorithm makes several passes over thetransaction database and in each pass it finds the set of items(or itemsets) whose support count is more than the minimumsupport count. Let's consider the transaction database D. In the first iteration of the algorithm, each item is amember of the set of candidate 1-itemsets, C1. Suppose that theminimum support count required is 2. The set of frequent 1itemsets L1 is the sets of items in C1, whose number ofoccurrence in D is more than 2 as shown in table. Innext pass, the algorithm performs a join of L1 on L1 to obtainthe candidate 2-itemsets C2 and the set of frequent 2 itemesetsL2 can be constructed by collecting all the items in C2, whosesupport count is more than 2

Working example:

The sensor network is with the combination of sensor nodeswith sensor memory to record the object movementinformation.Sink is maintaining object information and eachnode also maintains its own record table containing the objectmovement information. Here we are presenting the data of node 14. From the table we can see that the frequencycount of the node 14 is 7, because it has detected seven objectmovements. The object movement sequence table isformed at the sink node which contains the sequence of movement of all the objects and itserves as the transaction database for discovering associationrule to predict the next location of an object.



Object ID	Support Count	Next Node
Object 1	1	Node 11
Object 2	1	Node 18
Object 3	1	Node 23
Object 4	1	Node 21
Object 5	1	Node 18
Object 6	1	Node 23
Object 7	1	Node 21

Fig 3.Network environment

Object	Sequences Of Object
1	1610 14 17 18 20 2223 26
2	3 7 10 14 17 23 26 30
3	2 7 10 14 17 21 22
4	2 6 10 14 17 21 22
5	3 8 11 17 23 26 27
6	1 6 10 14 17 21 22
7	1 6 10 14 17 23 26 27

Sequences of Object Movement

Sensor networks are the key to gathering the information needed by smart environments, whether in buildings, utilities, industrial, home, shipboard, transportation systems automation, or elsewhere. Recent terrorist and guerilla warfare countermeasures require distributed networks of sensors that can be deployed using, e.g. aircraft, and have self-organizing capabilities. In such applications, running wires or cabling is usually impractical. A sensor network is required that is fast and easy to install and maintain.

III. CONCLUSION

In this paper, we tried to have an object tracking schemefor WSNs using data

The Table of Sensor Node 14 mining algorithms. We have improved the Apriori algorithm formining object moving association rules and applied it to thetracking. Data mining algorithm is applied to the frequent nodes movements of the object from which made useful association rulesto have next location with accuracy.Our resultsmay better in both of energy-efficiency andaccuracy of tracking.

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