

Investigation of Performance Analysis and Mobility Management in Wireless Sensor Network

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Abstract

Wireless sensor networks are predictable to be one of the crucial empowering technologies in the subsequent 10 years. Protocols for such networks should be decidedly flexible in order to adapt to topology changes due to node mobility. Dynamic change in the cluster structure leads to performance degradation of the network. Protocols for such networks should be highly flexible because dynamic change in the network may leads to performance degradation of the network. However many recent applications make use of mobile sensor nodes, which pose some unique challenges to WSN researchers. Nodes may move individually or in group with respect to some reference mobility model, thus changing network topology. A mobility management Scheme has remained suggested in this paper to manage the mobility in WSN and investigation has been done in contradiction of basic QoS parameters.

Keywords: Wireless Sensor Network, Cluster, Mobility, AODV

I. INTRODUCTION

In recent years there has been a world-wide interest in Wireless Sensor Networks (WSNs). It will not be an exaggeration to consider WSNs as one of the most researched areas in the last decade. Here is a sampling from the literature as summarized in [11–19]. With several applications and business opportunities arising every day, the WSN market is forecast to rise from \$0.45 billion in 2012 to \$2 billion in 2022 [20,21]. Figure 1 shows the predicted growth in profits from the WSN marketplace for the period of 2010-2014. A WSN can be demarcated as a network of tiny devices, named sensor nodes, which are spatially disseminated and work accommodatingly to communicate information collected from the monitored field through wireless links. The data collected by the different nodes is sent to a sink which whichever uses the data locally or is associated to further networks, for instance, the Internet (through a gateway). Figure 2 exemplifies a typical WSN.

WSN technology comprises several benefits over conventional networking solutions, such as, lower costs, scalability, reliability, accuracy, flexibility, and comfort of deployment that allow

their use in a wide range of varied applications. With progressions in technology and sensors getting smarter, smaller, and cheaper, billions of wireless sensors are being deployed in numerous applications. Some of the potential application domains are military, environment, healthcare, and security. In military, sensor nodes can be used to detect, locate or track enemy movements. In case of natural disasters, sensor nodes can sense and detect the environment to forecast disasters in advance. In healthcare, sensor nodes can help in monitoring a patient’s health. In security, sensors can offer vigilant surveillance and increase alertness to potential terrorist attacks. It will not be farfetched to say that eventually WSNs will enable the automatic monitoring of forest fires, avalanches, hurricanes, failure of country wide utility equipment, traffic, hospitals, etc. The wide range of potential WSN applications make WSN a rapidly growing multi-billion dollar market, but this requires a further major progress in WSN standards and technologies to support new applications [20].

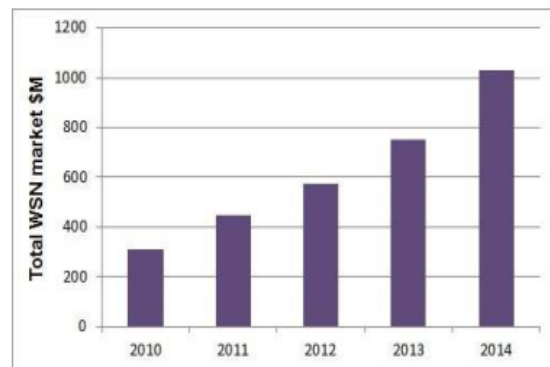


Fig. 1 WSN market 2010-2014 (\$ Millions) [10]

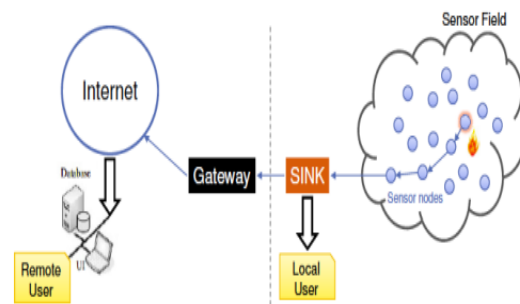


Fig. 2 Wireless Sensor Network (WSN) [22].

II. RELATED WORKS

Researchers have discovered lot of solution to work with the mobile environment. Now we will discuss the solutions provided by them.

Y.Y Shih et al. [1] 2013 proposed a scheme that exploits the regularity to enhance the data delivery ratio in ZigBee wireless sensor networks. The scheme organizes the network nodes and hypothesizes the tree topology by the usage of the mobility regularity forced by way of the physical surroundings. In a ZigBee network, packets are forwarded to mobile end-devices thru routers. The primary objective of the proposed technique is to installation the routers and assemble a tree topology that allows cellular end devices to move with excessive probability in the course of the routing paths. By the use of the ancient movement data of mobile nodes, they construct the tree so that maximum movements are particularly probabilistic to transport closer to the basis i.e. the opposite direction to downlink transmissions. By enabling mobile stop devices to overhear the packets throughout movement, the data delivery may be finished if the destined mobile end-device is placed along the direction of the data delivery. The proposed ZigBee routing tree topology deployment and creation framework includes the mobility data, and algorithms are evolved to put into effect the framework. Compared to present methods, this framework achieves higher data delivery ratios and longer path length with a great deal lower routing overheads in the scenarios wherein the actions of mobile quit devices are with regularity.

Qian Dong et al. [2] 2013 did a review of mobility estimation and mobility ancillary protocols in wireless sensor networks. They discovered the difficulties caused by mobility at numerous layers, predominantly, at the MAC layer. To proficiently discourse the problem of mobility, a classification of mobility patterns and models was defined and several mobility estimation techniques were deliberated. Finally, they examined six mobility-aware MAC protocols and related their advantages and disadvantages.

F. E. Moukaddem et al. [3] 2013 proposed a complete approach to diminish the total energy expended by both mobility of relays and wireless transmissions. Utmost earlier work overlooked the energy consumed by moving mobile relays. When considered both sources of energy consumption, the optimum position of a node that receives data from one or multiple neighbors and transmits it to a single parent is not the midpoint of its neighbors; in its place, it meets to this position as the amount of data transmitted goes to infinity. They started with the optimal initial routing tree in a static environment where no nodes can move. Nevertheless, the method can work with less optimal initial configurations

including one generated using only local information such as greedy geographic routing. The approach advances the initial configuration using two iterative schemes. The first supplements new nodes into the tree. The second computes the optimal positions of relay nodes in the tree given a fixed topology. This algorithm is appropriate for a variety of data-intensive wireless sensor networks. It allows some nodes to move while others do not because any local improvement for a given mobile relay is a global improvement. This lets us to hypothetically spread our approach to handle supplementary constraints on individual nodes such as low energy levels or mobility restrictions due to application requirements. Their approach can be implemented in a centralized or distributed fashion. Simulations show it substantially reduces the energy consumption by up to 45 percent.

Q. Ren et al. [4] 2012 studied the problem of processing aggregation queries over a large scale MSN with the group mobility model. They presented a distributed clustering algorithm to divide the mobile nodes into several mobile groups. Then, they further presented the distributed Distance-AGG and Probability-AGG algorithms for inter-group aggregation. Distance-AGG chooses the proper forwarding nodes according to the distance to the sink and Probability-AGG takes the transmission probability and nodes' residual energy into consideration. They evaluated the performances of the algorithms in terms of communication cost, query delay, and aggregation result accuracy by varying group velocity and nodes density. The simulation results show that the proposed methods outperform the existing data aggregation algorithms for MSNs.

X.Li et al. [5] 2012 proposed a singular Deterministic Dynamic Beacon Mobility Scheduling (DREAMS) set of rules, without requiring any previous information of the sensory field. In this algorithm, the beacon trajectory is defined because the track of Depth-First Traversal (DFT) of the community graph, as a consequence deterministic. The cellular beacon plays DFT dynamically, underneath the coaching of close by sensors at the fly. It moves from sensor to sensor in a shrewd heuristic way according to Received Signal Strength (RSS)-based distance measurements. They proved that DREAMS guarantees complete localization (every sensor is localized) when the measurements are noise-unfastened, and derive the upper sure of beacon overall transferring distance in this situation. Then, they propose making use of node removal and Local Minimum Spanning Tree (LMST) to shorten beacon tour and reduce postpone. Further, they prolonged DREAMS to multi beacon situations. Beacons with distinctive coordinate structures compete for localizing sensors. Loser beacons agree on winner beacons' coordinate device, and end up cooperative in next localization. All sensors are finally localized in normally agreed coordinate

systems. Simulation display that DREAMS guarantees complete localization in spite of noisy distance measurements. They assessed its overall performance on localization postpone and communication overhead in assessment with a formerly proposed static route-based scheduling approach.

F. Mourad et al. [6] 2012 proposed a technique that includes estimating the contemporary function of a single goal. Estimated positions are then used to expect the following area of the goal. Once an area of interest is defined, the proposed method consists of transferring the mobile nodes so as to cover it in a most advantageous manner. It therefore defines a strategy for deciding on the set of latest sensors locations. Each node is then assigned one function inside the set in the way to decrease the whole traveled distance by using the nodes. While the estimation and the prediction phases are accomplished using the c program language principle, relocating nodes employs the ant colony optimization algorithm. Simulations effects validate the performance of the proposed method compared to the target tracking methods considered for networks with static nodes.

Z. Zhou et al. [9] 2011 proposed a scheme, known as Scalable Localization scheme with Mobility Prediction (SLMP), for underwater sensor networks. In SLMP, localization is performed in a hierarchical manner, and the whole localization method is split into two parts: anchor node localization and everyday node localization. During the localization procedure, every node predicts its destiny mobility pattern in keeping with its past known location information, and it may estimate its destiny place based totally at the anticipated mobility pattern. Anchor nodes with recognized places in the network will manage the localization manner for us to balance the tradeoff among localization accuracy, localization insurance, and communication cost. They carried out good sized simulations, and the consequences display that SLMP can greatly reduce localization communication value even as preserving incredibly excessive localization coverage and localization accuracy.

S. Park et al. [10] 2010 proposed a singular geocasting, referred to as M-Geocasting (Mobile Geocasting). M-Geocasting presents the consultant region data of a sink group to resources. The area data consists of data with recognize to a confined area wherein all member sinks of the institution exist. A supply disseminates statistics to the closest node in the region; then, the node restrictedly floods the records handiest in the region. Also, to guide neighborhood movement of member sinks closer to out of scope of the location, some nodes on boundary of the region preserve the facts and provide it to member sinks out of scope of the vicinity. The proposed M-Geocasting (Mobile Geocasting)

representatively registers place data of a sink organization. The location data contains the middle factor region data and the radius with appreciate to the CGR where all member sinks of the institution exist. Sources disseminate information to the CGR via the shortest paths; then, the closest nodes restrictedly flood the data handiest inside the CGR. Also, to help nearby motion of member sinks toward out of scope of the CGR, a few nodes on boundary of the CGR, named cache nodes, keep the facts and provide the data to member sinks out of scope of the CGR.

III. SYSTEM ARCHITECTURE

A. Trilateration Algorithm

The trilateration algorithm does not need an offline phase like fingerprinting. However, trilateration still desires a precise AP location database, including precise Access Point coordinates and the exclusive Media Access Control (MAC) address for each AP. All through active measurement, after calculating average signal strength for each visible AP, the system uses this value as an approximation for distance to trilaterate the device's location. It is of substantial prominence that the general relationship between signal strength and distance may vary from different networks of APs, so it is practical and essential to recalculate the general relationship when the network of Access Points change. This also recommends that trilateration aids from the use of a common or small set of AP models. The common ground of the two methods is the need for an precise database of AP locations and the dense and consistent wireless signal.

The aim of this algorithm is to determine a location by running trilateration, once the location found a blind node is to be moved to localize the blind node and converted it into anchor node. In order to initiate the algorithm a node must be provided with mobility and as per the mobility following can be the various conditions:

1. A sensor node can move anywhere in the network area.
 2. The node starts moving towards the destination with a velocity
 3. After reaching the destination, the node stops at the destination for a duration specified by pause time.
- This procedure is summarized in the following piece of pseudo code:
1. When a positioning packet has been broadcast by anchors
 1. IF a blind node is within the range of broadcast
 2. Then store the positioning packet and compute the estimated range to the anchor using, broadcast the anchor node position to other blind nodes.
 3. Else do nothing

4. IF a blind node receives packets from at least three different anchors
5. Then perform trilateration
6. Else do nothing
7. If the trilateration is successful, blind node becomes converted anchor node
8. Then Go to 1
9. Else repeat 6
10. Call Set destination() to localize the node
11. End

IV. RESULTS AND DISCUSSION

We implemented our algorithm in NS-2 simulator. We used AODV protocol with 10 nodes. We compared the performance with mobility control scheme and without this too. For the algorithm to actually compute the location of the blind node it needs some input parameters.

V. CONCLUSION

As at hand are dissimilar clarification have been suggested to control the mobility over wireless sensor network. All these solutions talk about the performance of the mobility management methods but no one talk about the performance of the routing protocols being used. In this paper, we obligate realized a mobility management algorithm to regulate the mobility of the nodes vigorously. Mobility management process solitary flinches, if and only if there is any packet loss owing to mobility. If packet loss extents overhead then the normal packet drop threshold, only then it becomes triggered and controls the mobility and manages the topology of whole network. We studied the performance of the protocols on the basis of QoS parameters like Throughput, Packet Delivery Ratio, and Delay and energy consumption. On the basis of performance results, we can conclude that impact of mobility control scheme also depends upon the selection of routing protocol.

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