Mobile Sinks for Data Collection with Sink Trail Reactive Protocol in Wireless Sensor Networks

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***Abstract*— Wireless sensor networks are the grouping of tiny sensor nodes, which collects the information by sensing activeness from the surroundings similar lands, forests, hills, sea. In wireless sensor networks, using mobile sinks mobility rather than static sink for data collection is the new trend in present years. Current researches are focusing on moving patterns of the mobile sink to achieve optimized network performance, and also collecting a small area of sensed data in the network. In this paper we are going to discuss about the advantages of using mobile sink than static sink, mobile sink moving patterns, Sink Trail reactive data reporting protocol for collecting data using mobile sinks.**

***Index Terms*— wireless sensor networks, mobile sinks, reactive reporting protocol.**

I. INTRODUCTION

Wireless sensor networks (WSNs) enabled a large spectrum of applications finished networked low-cost low-power sensor nodes, e.g., environmental monitoring, precision agriculture, and forest fire accident detection. In the above mentioned applications, the sensor network will run under low few human interventions either because of the opposing environment or place management quality for physical maintenance. Since sensor nodes have less battery lifetime, energy saving, drive protection is of predominate importance in the figure of device meshing protocols.

The main question we tend to take into account is the way to create best use of those mobile sinks so as to enhance the effectiveness of network delivery. This raises many key analysis queries. When should detector nodes relay information via the mobile sink? However does the mobile sink create its presence well-known to the detector nodes? However will we tend to use the mobile sink to re-connect disconnected regions of the field? Note that the movement of the mobile sink isn't under the organization of the WSN.

Recent analysis on data collection revels that, rather than reporting prolonged, multi hop, and error prone paths to a static sink exploitation tree or cluster network structure, permitting and investing sink quality is a lot promising for energy capable data gathering [1]. Mobile sinks, like animals or motor vehicles are fixed with radio gadgets, are sent into a field and communicate directly with device nodes, leading to shorter data transmission paths and reduced energy consumption

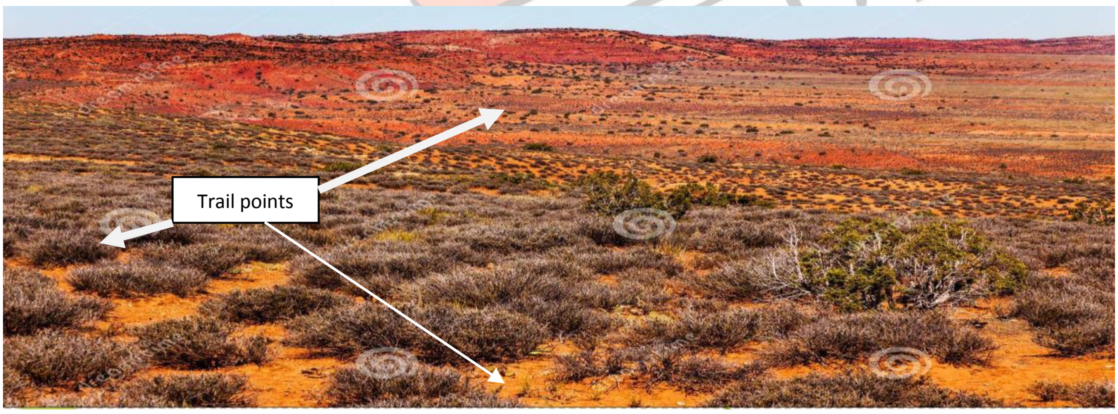

Fig 1[14]. A photograph showing a typical farmland of asymmetrical shapes.
A mobile sink's motion in such environment is constrained.

II. RELATED WORK

WSN with static sink

In the time period, a typical WSN was composed of static sensor nodes and a static sink placed within the determined region. In such a group, the main energy user is the communication element of each node. In observe, multi-hop communication is needed for sending data from sources to sink nodes. Accordingly, the energy utilization depends up on the communication distance. There is a way to reduce the communication distance is to use multiple static sinks [2] and to program every sensor node such it routes data to the nearest sink. This reduces the average path distance from origin to sink. The authors of [2, 3] propose to deploy multiple static sinks. These static sinks divide the WSN into little sub-fields each with one static sink.

However, a significant drawback with multiple static sinks is that one has to decide wherever to deploy them within the monitored region therefore that the data relaying loads well balanced amongst the nodes. Vincze et al. contemplate this drawback in [4] as associate degree instance of the well-known ‘‘facility location problem’’ wherever for a given variety of facilities and customers the best position for the location of the facilities should be known in order that all facilities are equally burdened. If the positions of the static sinks are given, then the solution of this drawback may be used for locating the best partitioning of the sphere. However, even though we have a tendency to assume location-optimal deployment of static sinks, the nodes near a sink can expand their energy rather speedily. Adding some mobile sinks to a group of static sinks has been shown to boost the data delivery rate and to scale back energy dissipation of the detector nodes [5]. Some of the advantages of multiple static sinks for energy effectiveness can also be accomplished with one static sink by logically partitioning the sensing element field at one level or hierarchically. Such a partitioning is often either static or dynamic, and it are often preset or self-organized among the network. Besides the sector partitioning, the selection of a cluster head in every partition is associate important issue. In order to avoid the ‘‘dying’’ of nodes near the sink, partitioning of the sector into subareas (clusters) has been investigated (e.g. [12, 13]). Among every cluster, a cluster head is decided to which native nodes send their knowledge. Cluster heads tend to possess higher capacity than regular nodes and are accountable for forwarding collected knowledge to the sink over single or multiple hops. Both the cluster formation and therefore the choice of the cluster head is finished in such some way that the energy dissipation throughout routing are often reduced [8].This approach may be extended to structure hierarchies [9].

In order to increase the life of the cluster head node, the task of being a cluster head is revolved among a cluster [10]. The cluster head is chosen either stochastically (e.g. [7]) or primarily based on settled methods [6].

WSNs with a Mobile Sinks

Another approach for extending the life of the nodes shut to the sink is that the utilization of a mobile sinks. In some aspects, this is similar by using many static sinks – but, mistreatment many static sinks needs extra world communication for assembling all information at one final purpose [3]. In order to beat the shortcomings ascertained for a static sink, the utilization of a mobile sink has been projected [11]. A mobile sink can follow differing kinds of quality patterns within the detector field, such as random quality, predictable/fixed path quality, or controlled mobility, that has consequences with regard to energy efficiency and information assortment ways.

III. MOBILITY PATTERNS

Random quality: During this category, the sink follows a random path in the device field and vital queries relate to the information assortment strategy .Usually, the sink uses a pull strategy for collecting knowledge from the device nodes. During a pull strategy, a node forwards its knowledge only if the sink initiates asking for it, whereas in a push strategy a node proactively sends its knowledge towards the sink. Chatzigiannakis et al. have shown in [11] that random sink mobility is often wont to cut back Emax and Ebar compared to the case of a static sink. Single hop knowledge assortment results in the strongest reduction of energy consumption; as a result of no knowledge relaying load on the device nodes exists. However, it may end in incomplete knowledge assortment from the WSN, as a result of with a random mobility pattern there's no guarantee that the sink can reach all nodes within the device field or it'd take an excessive amount of time to try and do therefore. If the time needed for complete coverage of the sector should be even lower, then the sink are often programmed to gather knowledge from all nodes that square measure among a most range of hops larger than one. This ends up in increased relaying load on the device nodes, and therefore will increase Emax and Ebar compared to the case of single hop knowledge assortment [11].

Fixed quality: During this category of schemes the sink is programmed to follow a hard and fast path in a very spherical robin fashion. This mounted path is predetermined and isn't influenced by the behavior of the WSN at runtime. Coverage of the detector field has got to be secure by an applicable strategy for crucial the routing methods for the data packets. A vital distinction is whether or not the sink will predict its future positions or not. In [13], Giannakos et al. propose a reactive information forwarding mechanism employing a pull strategy based on request messages broadcasted by the sink. Moreover, sink quality is planned such the entire detector field are often traversed in minimum potential time. As a result, energy dissipation (Emax and Ebar) are often terribly low. Just in case the sink is ready to predict its future positions it will communicate this info to a node located within the neck of the woods of its future position. This node is accountable for aggregation the detector information in its neck of the woods so once the sink really arrives at this position, it mustn't got to wait for the information. Wu et al. [12] enforced this concept for a sink with directional antenna, claiming that their theme ends up in exaggerated packet delivery rate and reduced energy dissipation of the nodes.

Controlled quality: refers to schemes wherever sink mobility is controlled or guided supported a parameter of notice, such as unconsumed energy of the nodes, or on a defined objective function, or on predefined discernible events. Bi et al. argued that an energy-unconscious quality of the sink ends up in uneven energy dissipation from the nodes.To deal with this specific problem, the authors conferred a mobile sink based mostly approach, where the sink tries to remain far away from the nodes with less residual energy and tries to be within the neighborhood of these nodes that have high residual energy. This helps reconciliation the energy dissipation from the nodes, and therefore reduces Emax.

IV. SINK TRAIL: A REACTIVE DATA REPORTING PROTOCOL

Introduction

We take into account an oversized scale, uniformly distributed sensing element network N deployed in an out of doors space. Nodes within the network communicate with one another via radio links. We have a tendency to assume the whole sensing element network is connected that is achieved by deploying sensors densely. We have a tendency to additionally assume sensing element nodes Square measure awake once information gathering method starts (by synchronized schedule or a brief “awaken” message). To gather information from N, we have a tendency to sporadically channel a number of mobile sinks into the sphere. These mobile sinks, like robots or vehicles with laptops Put in, have radios and processors to communication with sensing element nodes and process perceived information. Since energy supply of mobile sinks is replaced or recharged easily, they're assumed to possess unlimited power. A data gathering method starts from the time mobile sinks enter the field and terminates when: either (1) enough information are collected (measured by a user outlined threshold); or (2) there are not any a lot of information reports in an exceedingly bound amount. The SinkTrail protocol is planned for sensing element nodes to proactively report their information back to 1 of the mobile sinks. For example our information gathering rule clearly, we initial take into account the state of affairs wherever there's just one mobile sink in N.

Reactive protocol

Reactive protocols explore for to line up routes on-demand. If a node must initiate communication with a node thereto it's no route, the routing protocol will arrange to establish such a route. The philosophy in RDRP, like all reactive protocols, is that topology information is simply transmitted by nodes on-demand. Once a node desires to transmit traffic to a host to that it's no route, it'll generate a route request (RREQ) message that may be flooded in a very restricted way to different nodes. This tenets control traffic overhead to be dynamic and it’ll end in an initial delay once initiating such communication. A route is taken into account found once the RREQ message reaches either the destination itself, or an associate intermediate node with a valid route entry for the destination. Intended for as long as a route exists between two end points, RDRP remains passive. Once the route becomes invalid or lost, RDRP can once more issue a call for participation we have a tendency to implement index addressing primarily based path establishment throughout path generation thus we have a tendency to preserve lot of energy.

Algorithm 1

1. Source(S) finds the path to the Sink(R) by route discovery.
   1.1 S broadcast RTS messages to all the nodes.
   1.2 Once R received the RTS it replies with the acknowledgement.
   1.3 S finds the possible paths, and selects the path which has less hop count.
   1.4 Then sends the data to R.
2. If any failure occur
   2.1 S didn’t get the acknowledgement in the time period(tm).
   2.2 S determines the route was failed.
3. S sends the request to the cluster head (CH).
   CH received the request from S. It passes it to the failure detector.
   Failure detector check the link quality using passive monitoring.
4. Then Ch going for a Reconfiguration plan.
   In the reconfiguration it has a routing table (RT).
   The RT has all the possible paths between S to R.
   Then immediately it selects the next possible path.
   And send the data to R.

The future SinkTrail protocol can be readily extensive to multisink scenario with little modifications. Once there is more than one sinks in a network, each and every mobile sink sends trail messages. Totally different from one sink scenario, a sender identification field, msg.s identification, is added to every trail message to distinguish them from dissimilar senders. Algorithms executed on the sensor node side should be customized to accommodate multisink scenario as well. As an alternative of using only one trail reference, a sensor node maintains numerous trail references that each corresponds to a different mobile sink at the same time. Multiple logical coordinate spaces are constructed simultaneously, one for each mobile sink. When a trail message arrives, a sensor node verifies the mobile sink’s ID in the message to conclude if it is necessary to create a new trail reference.

Broadcasting Frequency

The affect of sink broadcast frequency is two sided. If the mobile sink broadcast its trail messages a lot of oftentimes, sensor nodes will get a lot of up-to-date trail references, which is useful for locating the mobile sink. On the opposite hand, frequent trail message broadcast result ends up in heavier transmission overheads. Suppose the time period between two consecutive message broadcast.

V. CONCLUSION

The results and demonstrates the benefits of SinkTrail algorithms over previous approaches. The impact of many style factors of SinkTrail is investigated and analyzed. The advantage of SinkTrail is that the logical coordinate of a mobile sink keeps invariant at every path purpose, given the continual renew of trail references. The advantage of including sink position following, we tend to compare the general energy consumption of SinkTrail with these protocols. Simulation results for SinkTrail-S also are conferred to indicate more improved performance.

REFERENCES

[1] S. Basagni, A. Carosi, E. Melachrinoudis, C. Petrioli, and Z.M.Wang. Controlled sink mobility for Prolonging Wireless sensor networks lifetime. ACM/Elsevier Wireless Networks, 2007.

[2] E. Lee, S. Park, F. Yu, S. Kim, Communication model and protocol based on multiple static sinks for supporting mobile users in wireless sensor networks, IEEE Transactions on Consumer Electronics 56 (2010) 1652–1660.

[3] E. Lee, S. Park, J. Lee, S. Oh, S. Kim, Novel service protocol for supporting remote and mobile users in wireless sensor networks with multiple static sinks, Wireless Networks 17 (2011) 861–875.

[4] Z. Vincze, R. Vida, A. Vidács, Deploying multiple sinks in multi-hop wireless sensor networks, in: Proceedings of ICPS IEEE International Conference on Pervasive Services, Istanbul, Turkey, 2007, pp. 55–63.

[5] C. Avin, B. Krishnamachari, The power of choice in random walks: an empirical study, in: Proceedings of the 9th ACM international symposium on Modelling analysis and simulation of wireless and mobile systems (MSWiM '06), New York, NY, USA, October 2006, pp. 219–228.

[6] M.J. Handy, M. Haase, D. Timmermann, Low energy adaptive clustering hierarchy with deterministic cluster-head selection, in: Proceeding of 4th International Workshop on Mobile and Wireless Communications, Network, 2002, pp. 368–372.

[7] S.V. Manisekaran, R. Venkatesan, Energy efficient hierarchical clustering for sensor networks, in: Proceedings of international conference on computing communication and networking technologies, 2010, pp. 1–11.

[8] P.T.A. Quang, N.Q. Dinh, J. Yun, D. Kim, Optimal clustering for wireless sensor networks using intermediate nodes, in: Proceedings of IEEE 3rd InternationalConference on Communication Software and Networks (ICCSN), 2011, pp.138–142.

[9] A.R. Masoum, A.H. Jahangir, Z. Taghikhani, R. Azarderakhsh, A new multi level clustering model to increase lifetime in wireless sensor networks, in: Proceedings of the second International Conference on Sensor Technologies and Applications, 2008, pp. 185–190.

[10] J.N. Al-Karaki, R. Ul-Mustafa, A.E. Kamal, Data aggregation in wireless sensor networks – exact and approximate algorithms, in: Proceedings of IEEE Workshop on High Performance Switching and Routing (HPSR), Phoenix,Arizona, USA, 2004, pp. 241–245.

[11] I. Chatzigiannakis, A. Kinalis, S. Nikoletseas, Sink mobility protocols for data collection in wireless sensor networks, in: Proceedings of the international Workshop on Mobility Management and Wireless Access, MobiWac '06, Terromolinos, Spain, 2006, pp. 52–59.

[12] Y. Wu, L. Zhang, Y. Wu, Z. Niu, Interest dissemination with directional antennas for wireless sensor networks with mobile sinks, in: Proceedings of the 4th international Conference on Embedded Networked Sensor Systems, SenSys '06, Boulder, Colorado, USA, 2006, pp. 99–111.

[13] A. Giannakos, G. Karagiorgos, I. Stavrakakis, message-optimal sink mobility model for wireless sensor networks, in: Proceeding of 8th International Conference on, Networks, 2009, pp. 287–291.

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