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An Energy Efficient Data Collection for Mobile User With Cluster Points

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Abstract: *Wireless sensor networks is a distributed and non-transferable resource. Over time, variations in energy availability would likely to arise. Protocols will be similar to routing trees may concentrate energy handling at certain nodes. Differences in energy harvestshould arising from environmental variations, such as if one node is in the form of cluster and another is in the shade, can pro- duce variations in charging rates and battery levels. We propose a novel approach for mobile users to collect the network-wide large data. The routing node structure of data collection is additively updated with the group of the mobile user. With this approaches, we only perform a limited modification to update the routing structure while the routing performance is bounded and controlled compared to the optimal performance. The proposed protocol is easy to implement. shows that the proposed scalable in maintenanceexpenses, performs efficiently in the routing performance, provides continuous data delivery during the user movement. We implement the proposed protocol an ns2 simulator to verify the efficiency of our proposed protocol*

I. Introduction

A main reason of energy spending in WSNs relates to communicating the sensor readings form the sensor nodes (SNs) to remote sinks. These readings are typically relay using ad hoc multihop routes in the WSN. A side effect should approach is that the SNs located close to the sink are heavily used to relay data from all network nodes; hence, their energy is consumed fasterleading to a nonuniform depletion of energy in the WSN [2]. This results in network disconnections and limited network lifetime.

Network lifetime can be extended if the energy spent in relaying data can be saved. Recentdo research work has proved the applicability of mobile elements (Submarines, cars, mobile robots, etc.)for the recovery of sensory data from smart dust motes [3] in comparison with multihop transfers to a centralized element. A mobile sink (MS) moving through the network deployment region can collect data from the static SNs over a single hop radio link when approaching within the radio range of the SNs or with limited hop transfer if the SNs are located further. This avoid long-hop relaying and reduces the energy consumption at SNs near the base station, prolonging the network lifetime. A large class of monitoring applications involve a set of urban areas (e.g., urban parks or building blocks) that need to be monitored with respect to environmental parameters (e.g., temperature, damp pollution, light intensity), surveillance, flames detection, etc. In these environments, individual monitor areas are typically covered by isolated "sensor island," which makes data recovery rather testing since mobile nodes cannot move through but only approach the periphery of the network deployment region.

The ubiquitous data collection problem onsidered in this paper essentially differs rom traditional data collection problems in static settings. In a static sensor network, is optimal data collection tree is usually built to collect the network-wide data. The data collection tree is fixed and suffices to efficiently deliver data to the static sink [10], [11], [12], [13], [14], [15]. In the presence of user mobility and the requirement of ubiquitous data access, however, the data collection tree constructed at one point is normally not enough as the mobile user moves. To efficiently deliver network-wide data to the mobile user, the data collection tree needs to be constructed or updated from time to time according to the mobile user's movement. Directly adopting traditional data collection paradigm results in building a series ofindependent data collection trees when the mobile user is at different positions.unveil by Kusy et al. [16], building the data collection tree introduces a large volume of communication overheads. Besides, the routing transitions between different data collection trees contain a nonnegligible time delay and may lead to is continuity or even loss of the data delivered to the mobile user, which significantly decreases the QoS of ubiquitous data collection.

In this paper, we observe that there exist strong spatial correlations among routing structures at different positions, and take advantage of such an observation to additively update the routing structure with the user's movement. The contributions of this work are as follows: First, we propose an additive approach that update the data collection tree. In particular, through aimperfect modification of existing data collection pecking

order in the network, a new collection tree can be constructed in a lightweight manner in terms of time efficiency and expenses. Moreover, the proposed approach is easy to implement and the resulting routing performance on the new collection tree is bounded and controlled with regard to the optimal value. Second, the proposed move toward in this work supports delivering continuous data streams
even with routing transitions.

It is used to **Intermediatory Cluster Points** for reducing computationally overhead**.** Intermediatory cluster points are used to check the cluster Head has the data or not so that mobile users can collect the data without any data loss.Also no of Collectors can be used and also their efficiency is improved

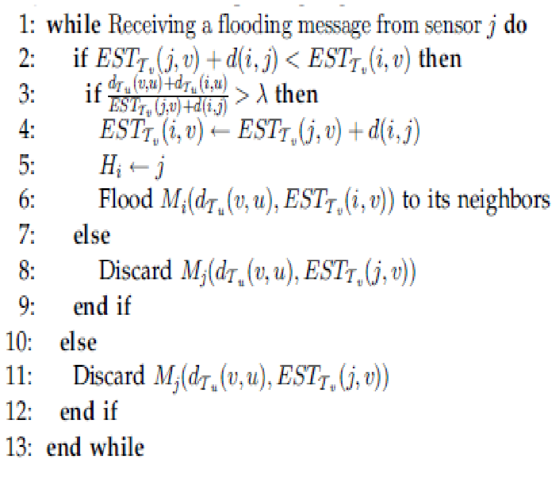
II. System Design

We elaborate the design of our protocol. The main idea of our protocol is utilizing the spatial correlation to efficiently build and update the data collection tree. Whenever the mobile user moves and changes the virtual sink to access the network, a new data collection tree can be efficiently formed by locally modifying the previously constructed data collection tree in the network. Based on such an observation, in the following section, we present the design details of three components in our protocol: 1) information Collection Tree Initialization, 2) Data Collection Tree update, and 3) Data direction-finding.

III. Data Collection Tree Initialization

We consider the entire wireless sensor network as a graph (G,V).Eg, where the vertex set V represents the static sensors and the edge set E represents the communicationallinks. Without loss of generality, the initial virtual sink is denoted as u 2 V , through which the mobile useraccesses the network-wide data at the beginning.
To facilitate the presentation, the data collection tree formed in the initialization phase is denoted as T u. After T u has been formed, the mobile user can collect data through the virtual sink u. In addition, each sensor (e.g., sensor i) is required to record its distance to the virtual sink u in T u, denoted as Tt(i,u),T(i,u) can be obtained during the assembly of T u. After T u has been formed, the distance between any two sensors, e.g., sensors i and j will be defined in two ways d(I,u) denotes the minimum distance between I and j, while d(I,j) indicates the distance between i and j constrained by Tu Data CollectionTree Updating The mobile user keeps moving around and the virtual sink that connects the user to the sensor network variations accordingly. When the mobile user moves away from the original virtual sink uand designate a new virtual sink v, a new data collection tree at virtual sink vobligation be constructed, namely T v. A natural solution is to reconstruct T v with the same development of building T u, i.e., Data Collection Tree Initialization can be launched to form T V

Algorithm1. Limited Updating Algorithm at Sensor



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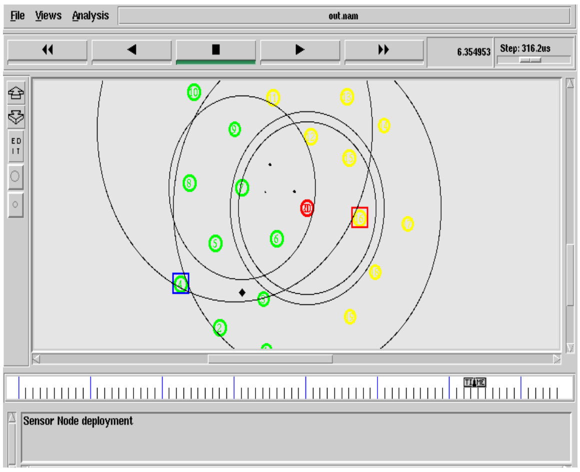
while Receiving a flooding message from sensor $j$ do
    if $EST_{T_v}(j,v) + d(i,j) < EST_{T_v}(i,v)$ then
        if $\frac{d_{T_u}(v,u)+d_{T_u}(i,u)}{EST_{T_v}(j,v)+d(i,j)} > \lambda$ then
            $EST_{T_v}(i,v) \leftarrow EST_{T_v}(j,v) + d(i,j)$
            $H_i \leftarrow j$
            Flood $M_i(d_{T_u}(v,u), EST_{T_v}(i,v))$ to its neighbors
        else
            Discard $M_j(d_{T_u}(v,u), EST_{T_v}(j,v))$
        end if
    else
        Discard $M_j(d_{T_u}(v,u), EST_{T_v}(j,v))$
    end if
end while
```

1)T i is the routing tree formed at virtual sink i.
2)Hi is the child node of sensor i in the routing tree, i.e., sensor i always transmits or relays packets to sensor Hi.
3)H(I,J) is the minimum distance between sensors I and j.
4)D(I,J) is the distance between sensors i and j in T k.
5) EST(I,J) is the minimum distance from i to j in T k known so far, which will be used in the routing tree updating process. Virtual sink v reverses the path V→U (in T u) U->V
first, and then launches the Data Collection Tree Updating process by broadcasting M(dT u; V,U)).EST(V,U)to all its neighbors. Note that EST==0 and the initial value of EST(V,U) for any i not equal 1.

$$\frac{d_{T_u}(v,u)+d_{T_u}(i,u)}{EST_{T_v}(j,v)+d(i,j)}.$$

If $EST_{T_v}(j,v)+d(i,j)<EST_{T_v}(i,v)$ and

$$\frac{d_{T_u}(v,u)+d_{T_u}(i,u)}{EST_{T_v}(j,v)+d(i,j)}>\lambda,$$



Sensor Node deployment

Fig. 1 Data Collection

After Data Collection Tree Updating completes, a new routing structure is built. If sensor i has data to send or helps other sensors to relay data, it simply transmits datato the neighbor indicated by Hi. Data are guaranteed to be delivered toward the mobile user by Theorem 3. In this section, we examine the routing efficiency for the sensors outside V. Theorem 4 will show that the routing delays of those sensors are bounded and controllable, the mobile user can easily adjust the routing efficiency according to his requirement

Experimental Evaluation

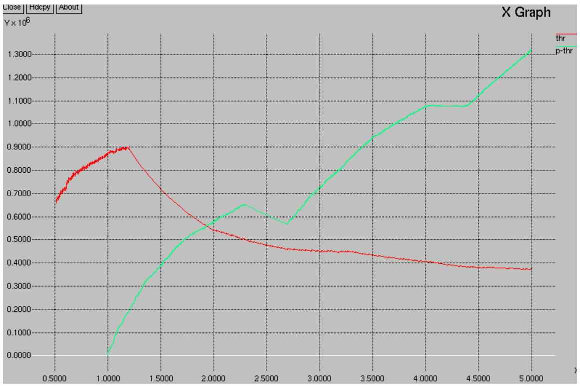


FIG 2: Data Collection Efficiency

In this section, we validate the feasibility and applicability of the proposed protocol in practice. We simulate randomly deployed sensor nodes in a rectangular area with an average node degree ranging from 5 to 10.for also intermediate cluster points CDF of delay performance. We take a snapshot at the middle point of the mobile user's movement according to the simulation setting in Fig. We illustrate the CDF of sensors' routing path lengths in Fig. Withthe fixed setting, as most sensors have been updated by our approach, the CDF of sensors' routing path lengths is similar to that in the optimal routing tree. On the otherhand, Fig. also indicates that with the adjusted setting, most of sensors still have short routing paths and only a small number of sensors suffer a relatively long routing delay. The routing efficiency distortion with adjusted is not excessively large while the cost of updating the routing tree formation is significantly reduced.

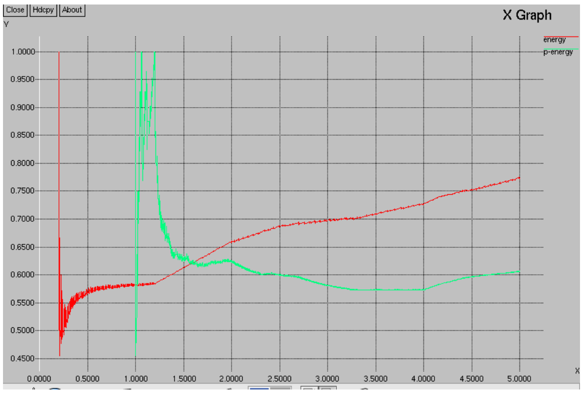


Fig 3: Energy Rate

When compare with existing method our intermediate cluster point approach reduce the average energy spending by data collection and also considerable amount of improvement in data packet collection throughput.

IV. Conclusion

In this work, we study the ubiquitous data collection for mobile users in wireless sensor networks. Essentially different from present works, we utilize the spatial correlation to efficiently build and update the data collection tree in the system. Whenever the mobile operator moves andchangesthe virtual sink to access the sensor networks, a new data collection tree can be efficiently formed by locally modifying the previously constructed data collection tree.

With such an approach, the routing performance is bounded and controlled compared to the optimal performance while the overhead in updating the routing structure is sensitively reduced. Such a property sanctions low data collection delay, providing real-stretch data acquisition for the mobile user

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