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Peak Transmission of Typical Aware Aggregated Data Using Potential Based Dynamic Routing in Wireless Sensor Network

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Abstract
Sensor system comprising of hubs with restricted battery power and wireless communications are deployed to collect useful information from the environments in an independent way, and in this manner can uphold bottomless requisitions such as habitat monitoring, moving target tracking, and fire detection. Different sensor nodes for different application can be embedded in the same network. Data sampled by different sensor nodes have much redundancy. Data aggregation has been widely recognized as an efficient method to reduce energy consumption in wireless sensor networks. The packets from different applications cannot be aggregated. To provide efficient data aggregation this paper introduce the concept of packet attribute, which will be used to differentiate packets from different application and transmit the packets in dynamic system environment. This data aggregation with potential based dynamic routing will reduce the number of transmission and data collusion.

Keywords
Wireless sensor network, data aggregation, attribute-aware, dynamic routing, potential field

I. Introduction

A Wireless Sensor Network (WSN) consists of spatially distributed autonomous devices which are cooperatively monitor physical or environmental conditions, like as temperature, sound, vibration, pressure, ehavior, at different locations [1, 2].WSNs have been used in applications,such as environmental monitoring, land security, critical infrastructure systems, and many other applications that can be critical to save lives and assets [3, 4, 5].WSNs are generally event-based systems, and which consist of one or many sinks, which is responsible for collecting specific data by sending queries. Usually, sensor nodes are deployed densely and responsible for ehaviorng interesting events and sending related data to sinks. The various signal processing algorithms can be produced in WSN applications to improve the sensing performance.

Sensor nodes are energy-constrained devices and the energy consumption is generally associated with the amount of gathered data,since communication is the most expensive activity in terms of energy. What's more, the raw data has much redundancy since the sensor nodes in WSN are usually quite dense. Therefore, numerous data aggregation mechanisms [8]–[9] have been proposed to conserve energy by gathering the raw data together, preprocessing them at the intermediate nodes and transmitting only the abstracted data to the sink. For that reason, algorithms and protocols designed for WSNs should consider the energy consumption in their conception. WSNs are data-driven networks that usually collect a large amount of information that is routed, often in a multi-hop fashion,to a sink node, which works as a gateway to the application.

To reduce the Average Number of Transmissions (ANT)1, packets containing redundant information should be gathered together. However, to the best of our knowledge, although present data aggregation protocols propose sorts of strategies to make packets more spatially and temporally convergent to reduce ANT, they ignore considering whether the packets have redundant information or not. In this paper, we propose a data aggregation mechanism which takes the packet attribute into consideration and aims to make packets with the same attribute convergent as much as possible to improve the degree of data aggregation and therefore reduce ANT.

To design the dynamic routing, we borrow the concept of potential in the discipline of physics. The attribute-dependent pheromone information. The potential based routing is easy to be implemented since the information (node depth and attribute-dependent pheromone) it needs to dynamically route packets is easily gotten.

II. System Architecture

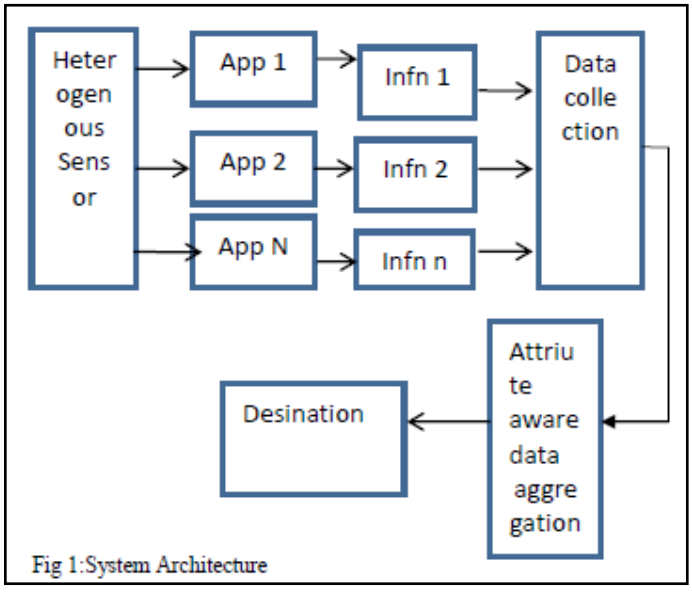

Fig 1:System Architecture

Fig 1 shows system architecture. Hetrerogenous sensors can be used to gather different information from an environment. Different sensor nodes can be embed in the same WSN for different application..Data gathered by various application has unique attribute.The packets from same sensor has same attribute and the packets from different sensors has different attribute. The packets on the same application are gathered together.To do this we borrow two concepts as follows to solve the problem.

Pheromone: In [8], the phenomenon of ant colonyfinding food is firstly applied to network. It constructsa route by modeling the variation of pheromone and the method of ant selecting paths. In nature, ants leave pheromone, which can emanate an odor and evaporate with time, along the path they have passed. The afterwards ants will select their path according to the amount of

the pheromone on different paths.
Potential: Pontential of the node in the network define data rate,,bandwidth,,processor speed etc
Based on this two concept data packets were transmitted to the sink node.

III. Generating Data Packets

Sensor nodes will sense the information from the environment and stroes the information as a data files in a network node, in which they were embedded. Sensor nodes can be used for different kind of application purpose. In our simulation hetrogenous sensor like humidity sensor, temperature sensor and pressure sensors were used,which are also used to sense the remote environment.In networking environment transmitting data files through network is not a recommended way to process. If we transmit files in a network means they may generate lot of traffic and also gives bourdon on server. So here we are generating packets and using the network environment without any data collision.

IV. Attribute Aware Data Aggregation

This scheme use the concept of packet attribute which is used as an identifier of the data packets generated from various sensor nodes. By this scheme attribute Id is assigned for each data packets. By this attribute ID data packets of same files were grouped together.

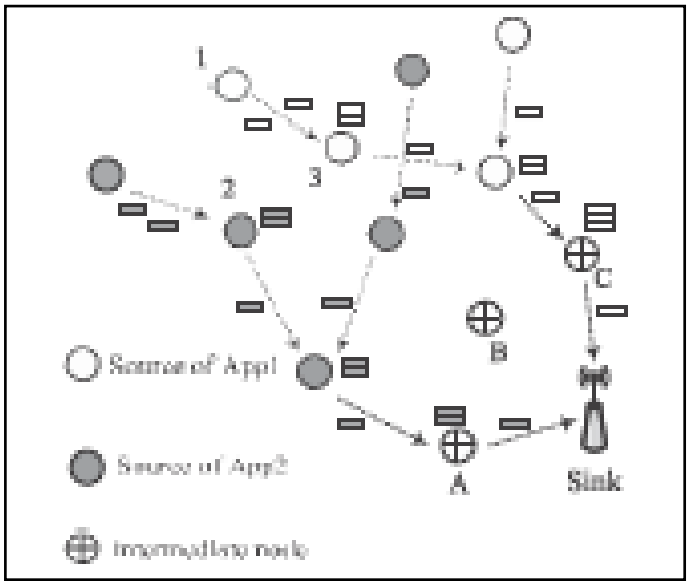

Fig. 2: Basic idea of ADA

In fact, the simplest way to aggregate data flowing from the sources to the sink is to elect some special nodes that work as aggregation points and define a preferred direction to be followed when forwarding data. In the approach based on tree [6, 7], a tree structure is constructed first and is later used to either route data collected or respond to queries generated by the sink. The aggregation is performed during the routing, when two or more data packets arrive at the same node of the tree. This node aggregates the data and forwards only one packet with the aggregated data. However, this approach has some drawbacks, such as the failures that can occur in WSNs.To Overcome this problem attribute ID of a data is associated each packet.In the initial transmission of the packets,attribute ID of the packets were leave to the intermediate nodes through which they are travelled.Based on this information for coming packets were aggregated.

Figure 2 illustrates a small part of WSN. The white circles and black circles represent the source nodes of applications App1 and App2 respectively (assume one application generates packets with the same attribute). The white circles with plus signs represent the intermediate nodes. If the dynamic routing would be con- structed according to the network state and the data features as shown in Fig. 2, for example, node 1 sends packets to node 3 instead of node 2, the packets from App1 could gathered together as much as possible, and thus the aggregation ratio would be improved drastically. The packets on the same application are attracted together as soon as possible. In this way, not only ANT can be dramatically reduced but also the communication overhead of some intermediate nodes can be cut down.

V. Potential Based Dynamic Routing Policy

Depth: The depth of a node is the number of hops that it is away from the sink.
Neighbor: The neighbor of node i is all nodes in the radio coverage disk of node i ,that are nearest nodes of I except for i itself, denoted by.$\Omega(i)$.
Attribute: The attribute of data packet is its identification.The heterogenous sensors and nodes involved in different applications may generate data packets with different attributes. The identical sensors on the nodes involved in the same applications will generate the packets with identical attribute.

In PBDR, all the nodes have a scalar potential that constructs a potential field. Each node updates its potential based on local information, such as potentials, its residual energy and that of its neighbors, or hop counts to a sink node. A sensor node whose hop count to a sink is smaller (larger) has a higher (lower) potential. Each node with data to be sent forwards the data to a node whose potential is higher than its own, and then the data ultimately reach the sink node. The basic idea behind PBDR is ACO algorithms for routing [11, 12] is the acquisition of routing information through the sampling of paths using small control packets, which are called ants.

A. Potential Field Model:

A single-valued potential V(u), is assigned to node u on the WSN to form a scalar potential field. Now, consider a packet p at node u,is transmitted to reach the sink, it will be forwarded to one of the neighbors of u. Let $\Omega(u)$ be the neighbor set of node u. To determine the next hop of packet p, following the concept of force given in [28], as follows:
$F_{u-v}=V(u)-V(v)$
Thus the packets are transmitted to the node which has the maximam potential.

B. Depth Potential field

The depth potential field ensure that the data packets were transmitted to the sink via the shortest path.Let D(u) be the depth of node u. The depth potential $V_d(u)$ is defined as $V_d(u) = D(u)$. Hence, the force from node u to one of its neighbors $v \in \Omega(u)$ in the depth potential field is
$F_{u\to v} =D(u)-D(v)$
In a word, the depth potential field will drive packets move to the sink along the shortest path without any loops; thus, it can provide the basic routing function

C. Pheromone Potential field

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Pheromone potential field is constructed to gather the packets with the same attribute together. If the packets in WSN are treated as the ants leaving volatile pheromone at each passed node, a path selected by more packets will have more pheromone and can attract more packets with the same attribute.
This process is quite similar to the pheromone laying and following ehavior of real ant colonies. Like their natural counterparts, the artificial ants are in practice autonomous agents, and through the updating and following of pheromone tables.

D. Hybrid Potential field

To transmit the packets to the sink ,we linearly combine the depth potential field and the pheromone potential field to form a hybrid potential field. Then the packets were transmitted to the node which has maximum hybrid potential force. It is noted that each node in networks can obtain its depth by receiving the routing update message sent from the sinks periodically. The nodes one hop away from the sink will get their depth by adding 1 to the depth value in the update message. Then, the other nodes will also obtain their own depth by receiving update message from its neighbors who already have a depth just in the same way as the nodes one hop away.

VI. Results

The data packets from different sensor nodes were transmitted to the sink node with minimum number of transmission. In this section we are verifying that the data packets have been received without any data collusion or not.

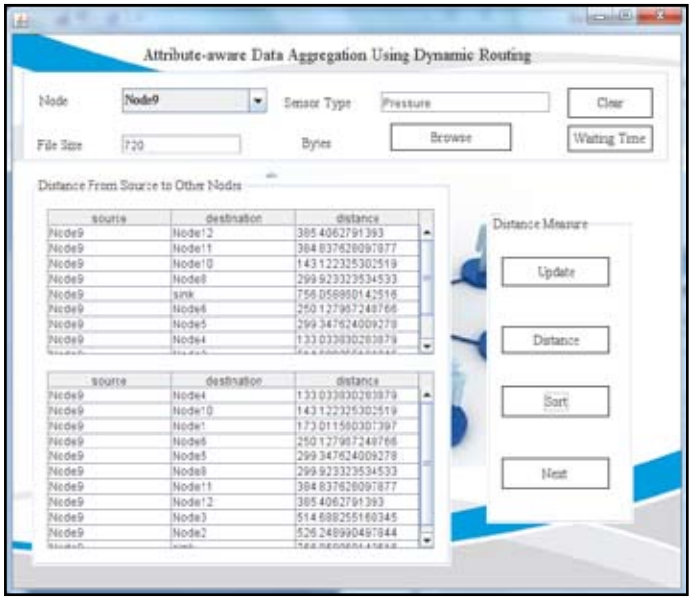

Fig 3: Result of PBDR transmission

In our simulation data packets from sensor nodes were transmitted to the sink via intermediate nodes which has maximum bandwidth,minimum waiting time(fig 3). Here we will also provide security for data transmission in WSN as per fig 4. Our simulation scheme use the transmission of data packets for three different applications with N number of nodes.

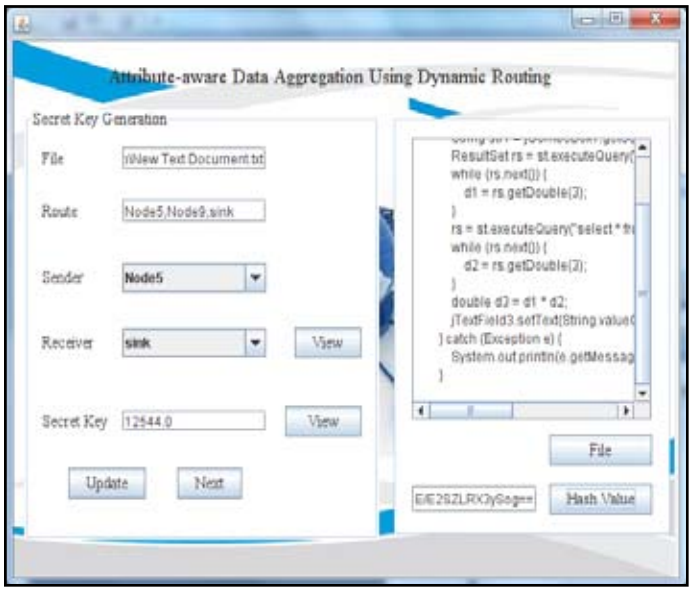

Fig. 4: Process of Security

VII. Conclusion

This paper deals with the concept of packet transmission using potential based dynamic routing in heterogenous wireless sensor network.Packets from different applications has much redundancy. To solve this problem data packets from same sensor nodes can be aggregated based on the packet attribute value.Data aggregation is an efficient method to reduce the number of transmission. Transmission delay and energy conception was reduced by using Potential based dynamic routing . Packets are treated as ants, and then the basic mechanism for finding paths based on pheromone in ant colony is borrowed to attract the packets with the same attribute to gather together.Potential field is constructed for each node,based on this field packets were transmitted through the node has highest potential.so that energy conception of wireless sensor node was reduced.
Security is the another major problem in wireless sensor network since there is more chance to hack the data by unauthorised person, to solve this problem packets from heterogenous sensor node were encrypted using diffiehellmen key exchange algorithm.Thus security for data transmission also acheived.

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