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ROBUST METHODOLOGY FOR PROLONGING LIFESPAN OF WIRELESS SENSOR NETWORKS

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ABSTRACT:
Maximizing the lifetime of wireless sensor networks (WSNs) is a challenging problem. Although some methods exist to address the problem in homogenous WSNs, research on this problem in heterogeneous WSNs have progressed at a slow pace. Here we propose an ACO-based approach that can maximize the lifetime of heterogeneous WSNs the methodology is based on finding the maximum number of disjoint connected covers that satisfy both sensing coverage and network connectivity. The results show that the approach is effective and efficient in finding high-quality solutions for maximizing the life time of heterogeneous WSNs.

Keywords: Stochastic, Heuristic, Pheromone, Homogeneous, Heterogeneous, Disseminating.

INTRODUCTION:

Overview:

Advance of electronics and communication technology, real-time monitoring, such as battlefield surveillance, environment supervision, and traffic control, has become a reality. These applications generally require the use of wireless sensor networks (WSNs), and their quality of services is strongly dependent on the network performance. A fundamental criterion for evaluating a WSN is the network lifetime, which is defined as the period that the network satisfies the application requirements. Since most devices of WSNs are powered by non-renewable batteries, studies of prolonging the network lifetime have become one of the most significant and challenging issues in WSNs. The existing methods for prolonging the lifetime of WSNs focus on the issues of device placement, data processing, routing, topology management and device control. Among them, the device control approach that schedules the device sleep/wake up activities has shown to be promising.

A number of methods have been proposed for finding one connected cover from a WSN. Maximizing the number of connected covers is a more direct way to maximize the network lifetime. The problem of finding the maximum number of connected covers is difficult because each connected cover must fulfill sensing coverage and network connectivity simultaneously. Its sub problem of maximizing the number of subsets that fulfill sensing coverage is already in the non-deterministic polynomial time (NP) complete complexity class . These methods are able to maximize the lifetime of WSNs while maintaining both sensing coverage and network connectivity with a premise that the devices are identical and have a transmission range that is at least twice the sensing range. However, they cannot ensure the network connectivity when the required premise is not satisfied. Their robustness in real world applications thus cannot be guaranteed. Zhao et al proposed a greedy algorithm that addressed both sensing coverage and network connectivity, but the algorithm can only handle the coverage of discrete points.

A growing trend of heterogeneous designs has also been witnessed in a number of applications. In order to prolong the lifetime of heterogeneous WSN's ,novel device placement methods ,routing protocols, and topology management strategies have been introduced. The device control approach for planning the activities of different devices, however, remains unexplored. In this paper, a common type of heterogeneous WSN's is considered and a novel activity planning approach for maximizing the network lifetime is proposed. The approach can be used in both cases of discrete point coverage and area

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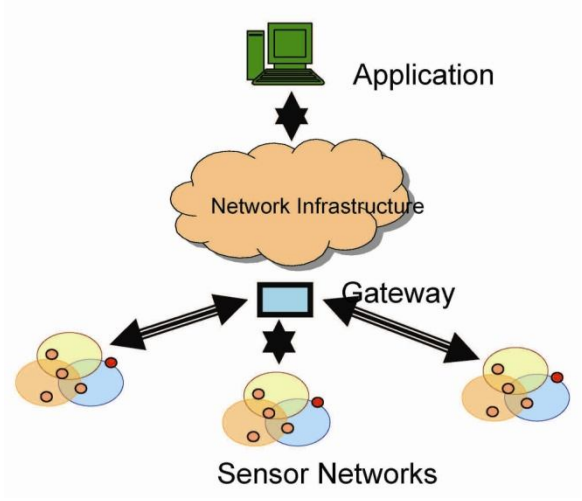
coverage. We focus on more general case. i.e., area coverage, in the following study.



The considered heterogeneous WSN,s comprise two types peripheral devices: sensors and sinks. The sensors monitor the target and transmit the monitoring results to the sinks. The sinks relay the monitoring results to the destination. Therefore, a connected cover in the heterogeneous WSN's must satisfy the following three constraints: 1) The sensors form complete coverage to the target, 2)All the monitoring results obtained by the sensors are transmitted to the sinks, and 3)The sinks compose a connected wireless network. These three constraints interact with each other as second constraint involves both sensors and sinks. Finding the maximum number of connected covers is thus more difficult than either the problem of maximizing number of sensor subsets under the coverage constraint or the problem of maximizing the number of sink subsets under the connectivity constraint .It is unlikely to have a polynomial-time deterministic algorithm for solving the problem.

Scope

The major scope is to maximize the lifetime of wireless sensor networks. For achieving this we use the ACO based approach that is ACO-MNCC for maximizing the lifetime by finding the maximum number of connected covers

PROBLEM DEFINITION:

EXISTING SYSTEMS:

In existing methods for prolonging the lifetime of WSNs focus on the issues of device placement, data processing, routing, topology management and device control.

The device control approach that schedules the device sleep/wakeup activities has shown to be promising. Devices in a WSN carry out both monitoring and communication task the monitoring task requires devices to offer satisfying sensing coverage to the target. The communication task demands devices to form a connected network for collecting and disseminating information via radio transmissions. In a WSN where device are densely deployed, a subset of the device can already address the coverage and connectivity issues the rest of the device can be switched to a sleep state for conserving energy therefore, the lifetime of a WSN can be prolonged by planning the active intervals of devices at every point during the network lifetime, the active devices must form a connected cover to fulfill sensing coverage and network connectivity.

The greedy algorithm is a one of the existing that addressed both sensing coverage and network connectivity.

DISADVANTAGES OF EXISTING SYSTEM

1) The problem of finding the maximum number of connected covers is difficult because each connected cover must fulfill sensing coverage and network connectivity simultaneously
2) the greedy algorithm can only handle the coverage of discrete point it is also difficult to extend the algorithm to heterogeneous WSN that comprise different type of devices.

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Proposed systems

ACO-MNCC approach for maximizing the number of connected covers in a heterogeneous WSN. In ACO, ants are stochastic constructive procedures that build solutions while walking on a construction graph. Such constructive search behavior makes ACO suitable for solving combinatorial optimization problems. The proposed ACO –based approach for maximizing the number of connected covers (ACO-MNCC) first transforms the search space of the problem into a construction graph.

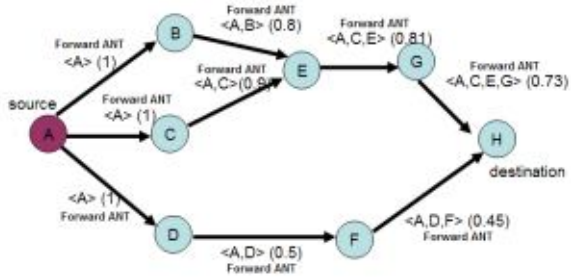
ACO algorithms that focus on routing issue in homogeneous WSNs. ACO utilizes search experiences (represented by pheromone) and domain knowledge (represented by heuristic information) to accelerate the search process. ACO algorithms have been successfully applied to a number of industrial and scientific problems.

Advantages of proposed system

1. ACO- based routing algorithms have been used for improving the power efficiency in uni casting, broadcasting and data gathering.
2. ACO -based approach for maximizing the lifetime of heterogeneous WSNs by finding the maximum number of connected covers.

ANT COLONY OPTIMIZATION

Ants are stochastic constructive procedures that build solutions while walking on a construction graph such constructive search behavior make ACO suitable for solving combinatorial optimization problems. ACO utilizes search experiences (represented by pheromone) and domain knowledge (represented by heuristic info) to accelerate the search process. ACO algorithms have been successfully applied to a number of industrial and scientific problems. In the field's of WSNs, ACO-based routing algorithms have been used for improving the power efficiency in uni casting, broadcasting and data gathering. Different from the above ACO algorithms that focus on the routing issue in homogenous WSNs, this paper proposes an ACO-based approach for maximizing the lifetime of heterogeneous WSNs by finding the maximum number of connected covers. Each vertex in the graph denotes an assignment of a device in a subset. Heuristic info is associated to each assignment for measuring its utility in reducing constraint violations. Pheromone is deposited between every two devices to record the historical desirability of assigning them to the same subset. In each iteration, the number of subsets is adaptively determined as one plus the number of connected covers in the best-so-far solution. The ants thus concentrate on finding one or more connected cover and avoid constructing subsets excessively. A local search procedure is designed to refine the solutions by reassigning redundant devices. The ACO-MNCC is applied to 33 heterogeneous WSNs with different characteristics. The experimental results validate the effectiveness and efficiency of the proposed approach.



CONCLUSION

With the objective of maximizing the network lifetime, this paper considers the problem of finding the maximum number of connected covers in a heterogeneous WSN. An ACO-based approach, termed ACO-MNCC , is proposed to solve the problem. The approach searches for the optimal solution by always pursuing one more connected cover than the best so far solution. This way, the approach not only avoids building excessive subsets but also improves the search efficiency by setting an explicit goal for the ants. Pheromone and heuristic information are also designed to accelerate the search process. A local search procedure is proposed to refine the best so far solution in the end of on iteration. Experimental results on 33 heterogeneous WSN's with different characteristics validate the effectiveness and efficiency of the approach, indicating that ACO-MNCC is a promising method for prolonging the lifetime of heterogeneous WSN's.

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RESULT

ACO-MNCC is a promising method for prolonging the lifetime of heterogeneous WSN's. Thus lifespan of Wireless Sensor Networks can be prolonged.

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