A HEURISTIC TO ACHIVE MAXIMUM LIFETIME AND TARGET COVERAGE IN WIRELESS SENSOR NETWORK

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ABSTRACT

Network lifetime plays an integral role in setting up an efficient wireless sensor network. This proposed method was able to achieve the theoretical upper bound. The objective of proposed system is contained as twofold. The first one is to deploy sensor nodes at optimal locations such that to achieve the theoretically computed network lifetime is Maximum. The another fold is to schedule these sensor nodes such that the network attains maximum lifetime. Thus, the overall all objective of the proposed system is to identify optimal deployment locations of the given sensor node with a pre-specified sensing range, and to schedule them such that the network lifetime is maximum with a required coverage level. An effective approach to extend the network lifetime is to schedule the active states is sensor. In this proposed system Artificial Bee Colony (ABC) algorithm used for sensor deployment problem followed by a heuristic for scheduling. The ABC approach is used to minimize the energy consumption. A comparative study shows that artificial bee colony algorithm performs better for sensor deployment problem.

Keywords:- Artificial Bee Colony, Sensor Network, Deployment, Energy Consumption.

1. INTRODUCTION

1.1 Wireless Sensor Network

Wireless sensor network applications include ocean and wildlife monitoring, manufacturing machinery performance monitoring, building safety and earthquake monitoring, and many military applications. An even wider spectrum of future applications is likely to follow, including the monitoring of highway traffic, pollution, wildfires, building security, water quality, and even people's heart rates. A major benefit of these systems is that they perform in-network processing to reduce large streams of raw data into useful aggregated information. Protecting it all is critical. Because sensor networks pose unique challenges, traditional security techniques used in traditional networks cannot be applied directly. A key feature of any wireless sensing node is to minimize the power consumed by the system. Generally, [4] the radio subsystem requires the largest amount of power. Therefore, it is advantageous to send data over the radio network only when required. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding. A modular design approach provides a flexible and versatile platform to address the needs of a wide variety of applications. For example, depending on the sensors to be deployed, the signal conditioning block can be re-programmed or replaced. [2] This allows for a wide variety of different sensors to be used with the wireless sensing node. Similarly, the radio link may be swapped out as required for a given applications' wireless range requirement and the need for bidirectional communications. The use of flash memory allows the remote nodes to acquire data on command from a base station, or by an event sensed by one or more inputs to the node.

2. METHODOLOGY

2.1 Existing System

The problem of energy-efficient routing in wireless networks that support sensor deployment and scheduling. In two energy-efficient approximation algorithms are presented for finding a cooperative route in wireless networks. The two algorithms for finding one cooperative route are designed such that each hop consists of multiple sender nodes to one receiver node. One of the algorithms is PSO is used The works focus on MAC layer design for networks with cooperative transmission. In, when no acknowledgement is received from the destination after timeout, the cooperative nodes, which correctly received the data, retransmit it. Only one cooperative node retransmits at any time, and the other cooperative nodes flush their copy once they hear the retransmission.

2.2 Proposed System

In this proposed method used Artificial Bee Colony (ABC) algorithm used for sensor deployment problem followed by a heuristic for scheduling. A comparative study shows that artificial bee colony algorithm performs better foe sensor deployment problem. The proposed heuristic was able to achieve the theoretical upper bound. AODV protocol is mainly used for the sensor deployment and scheduling Artificial Bee Colony (ABC) algorithm is a new swarm intelligence method inspired by intelligent foraging behavior of honey bees. In [7] the ABC algorithm, the colony of artificial bees is formed of three bee groups: employed bees, onlookers and scouts. A bee waiting on the dance area to determine to choose a food source is an onlooker and a bee goes to the food source visited by it previously is an employed bee. A bee that carries out random search is called a scout. The goal of bees in the ABC model is to find the best solution. Therefore, the position of a food source represents a possible solution to the optimization problem and the nectar amount of a food source corresponds to the quality (fitness) of the associated solution

2.1.1AODV Routing Protocol

Ad hoc On-Demand Distance Vector (AODV)

- Reactive routing protocol, meaning that it establishes a route to a destination only on demand.
- AODV avoids the counting-to-infinity problem of other distance-vector protocols by using sequence numbers on route

AODV is a method of routing messages between mobile computers. It allows these nodes, to pass messages through their neighbors to nodes with which they cannot directly communicate. AODV does this by discovering the routes along which messages can be passed. AODV makes sure these routes do not contain loops and tries to find the shortest route possible. AODV is also able to handle changes in routes and can create new routes if there is an error.

The diagram shows a set up of four nodes on a wireless network.

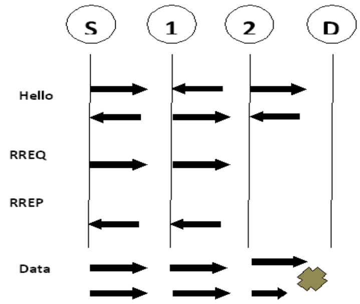

Fig 2.1 AODV Protocol Messaging

Because of the limited range, each node can only communicate with the nodes next to it. Nodes one can communicate with directly are considered to be neighbors. A node keeps track of its neighbors by listening for a HELLO message that each node broadcast at set intervals. When one node needs to send a message to another node that is not its neighbor it broadcasts a RREQ message. The RREQ message contains several key bits of information: the source, the destination, the lifespan of the message and a sequence number which serves as a unique ID. When source node's neighbors receive the RREQ message they have two choices; if they know a route to the destination or if they are the destination, they can send a RREP message back to source node. Otherwise they will rebroadcast the RREQ to their set of neighbors. The message keeps getting rebroadcast until its lifespan is up. If source node 1 does not receive a reply in a set amount of time, it will rebroadcast the request except this time the RREQ message will have a longer lifespan and a new ID number. All of the nodes use the sequence number in the RREQ to insure that they do not rebroadcast a RREQ.

2.1.2Flow diagram

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of the input data to the system, various processing carried out on these data, and the output data is generated by the system

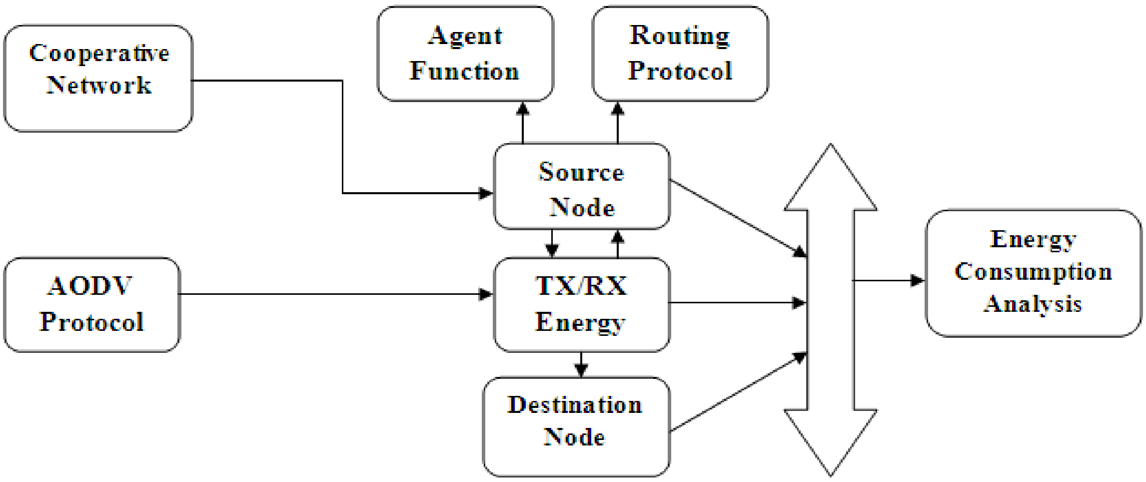

Fig5.4 Flow Diagram.

3. RESULTS AND DISSCUSSIONS

In the sensor network the nodes are created with source and destination. This is shown in below figure.

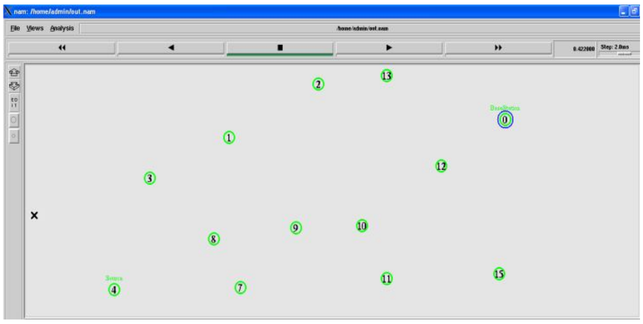

Fig 3.1 Source and Destination Node

The sensor nodes transmitting the data packets from source to destination through different paths**.** Fig3.2 represents the packet transmission from source to destination.

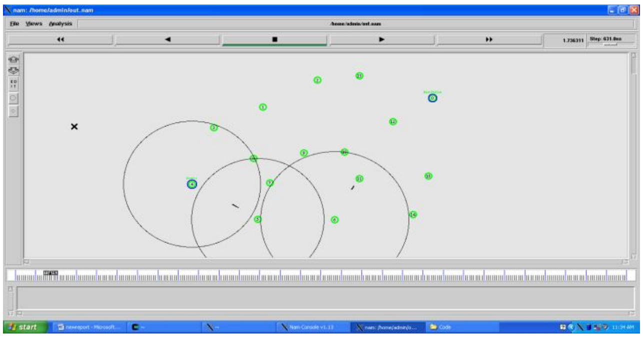

Fig3.2 Packet Transmission from Source and Destination

The data transmission path is changed due to failure of the path between the source and destination.

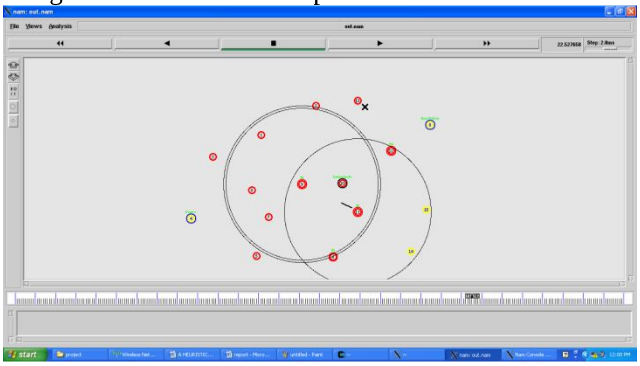

Fig 3.3 Different path to reach Destination

4. PERFORMANCE PARAMETER

4.1 Delay

Network delay is an important design and performance characteristic of the computer network. The delay of a network specifies how long it takes for a bit of data to travel across the network from one node or end point to another.

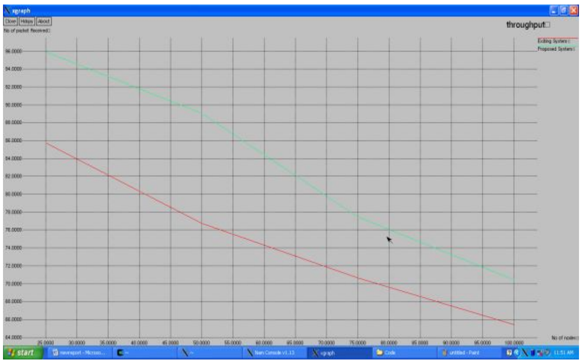

Fig 4.1 Delay

4.2 Throughput

Network throughput is the average rate of successful message delivery over communication channel. This data may be delivered over a physical or logical link, or passed through a certain network node

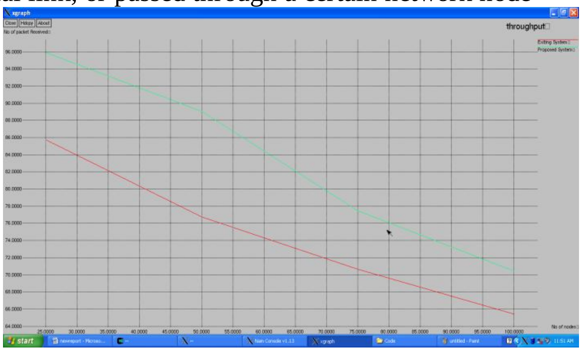

Fig 4.2 Throughput

4.3 Energy

The energy consumed by the node is the Power consumption constrains for nodes using batteries or energy harvesting. Energy saving techniques at network layer and the routing strategies that allow better energy expenditure and load distribution in order to extend the network lifetime are considered. After defining a simple energy consumption model to use as reference for the protocol performance evaluation .

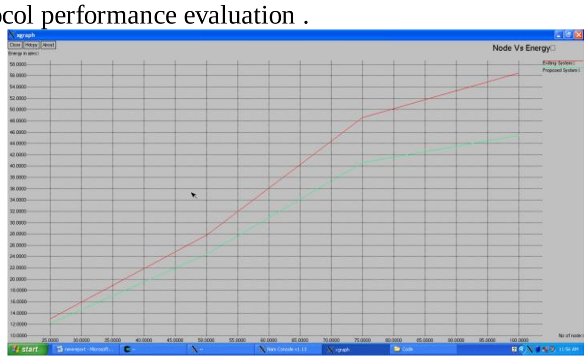

Fig 4.3 Energy

5.CONCLUSION

The proposed method computes deployment locations for sensor node using artificial bee colony algorithm such that the network lifetime is maximum. Artificial bee colony algorithm performed better than PSO algorithm for this problem. In order to avoid battery drain of all nodes at a time, sensor node scheduling can be done so that only minimum number of sensor nodes required for satisfying coverage requirement needs to be turned on. The other nodes can be reserved for later use. This method helps to extend the network lifetime. It uses a heuristic which is powerful enough to schedule the sensor node in such a way that the network lifetime matches the theoretical upper bound of network lifetime. Network lifetime is extended by using ABC algorithm method of deploying at optimal locations such that it achieves maximum theoretical upper bound.

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