Survey on route optimization selection in Wireless Sensor Network (WSN)

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Abstract— **The development of WSN started in the 1950s when US military developed the Sound Surveillance System (SOSUS) used in submerged acoustic sensors. Wireless Sensor Network contains hundreds of thousands of low-cost sensor nodes. A sensor node has constraints like storage, energy, limited processing and transmitting capability [8]. The sensor node monitors the physical and environmental condition, such as temperature, pressure, motion, fire, humidity and many more. WSN is applicables for tracking, surveillance, monitoring, healthcare, disaster relief, event detection, biodiversity mapping, intelligent building, facility management, preventive maintenance, etc. Now my objective is to study and analysis various route optimization techniques for WSN.**

Keywords— **ABSE, Agent, Optimization, Route, Soft Computing**

I. INTRODUCTION

A Wireless Sensor Network (WSN) is a network comprising large number of wirelessly connected heterogeneous sensors which are spatially distributed across an interested field. It has been applied in many fields such as military investigation, medical treatment, environmental monitor and industry management. However, WSNs differ from other networks, in which sensor nodes have limited energy supply, constrained computation and communication abilities.

A distributed heuristic solution like ACO routing algorithm shows many features that makes it particularly suitable for wireless sensor network.

- Algorithm is fully distributed that mean there is no single point of failure.
- The operations done in every node are simple.
- Autonomous interaction of ants, and the algorithm based on agents‟ synchronous.
- It is self-organizing, thus robust and fault tolerant. There is no need to define path recovery algorithm.
- Intrinsically adapts to traffic without requiring complex, and yet inflexible metrics.
- It inherently adapts to all kinds of variations in topology and traffic demand, which are difficult to be taken into account by deterministic approaches.

The main function of wireless sensor nodes is to sense and collect data from a target area, process, and transmit the data via a radio transmitter back to a command center where the underlying application resides (sink). In order to achieve this task efficiently, an efficient routing protocol is needed to set up paths of communication between the sensor nodes (sources), and the command center (sink). The path selection must be such that the lifetime of the network is maximized.

II. ROUTE OPTIMIZATION TECHNIQUES

1. Fuzzy Logic

Fuzzy logic is an extension of Boolean logic which can handle the idea of partial truth that is, truth values between "entirely true" and "entirely false". Fuzzy logic primary modes of thinking are estimation instead of being precise. Fuzzy logic originated from the human natural way of done by fit chromosomes who survive. Between the fit and less fit surviving chromosomes, reproduction of

more offspring's is done by the fit chromosomes than the less fit.

2. Traveling Salesman Problem

The traveling salesman problem is made up of a number of cities and a salesman. The salesman is required to visit the cities one after another beginning with one of the cities (for instance, the home town) and arriving back to the city of departure. The problem faced with the traveling salesman is desired to reduce the overall distance of the journey thereby reducing cost [8]. The traveling salesman problem (TSP) is a combinatorial optimization problem which is studied widely, since the problem appears to be simple but extremely hard to find solution hence attracting scientists and researchers' interest. The aim is to get an optimal route with the intention of traversing through every node at least once in the graph. It has the objective of entirely decreasing the traveling span [5]. There is generally no known best method of solving this problem, it is NP-hard (Non-deterministic Polynomial-time hard) problem.

3. Dijkstra's Algorithm

The foundation of shortest-path algorithm is the Dijkstra's Algorithm. Dijkstra computes the shortest paths from a particular node which is the source to every other available node in the graph by preserving provisional distances for every node. The nodes are visited in sequence following the shortest-path from the origin by the algorithm. It stops the sequence after all goal nodes are visited [10]. Dijkstra's algorithm resolves problem in single-source shortest path and it is not suitable for graphs with negative edge weights.

4. A* search Algorithm

A* search algorithm is an algorithm which is generally useful in graph traversal and path discovery. It is the method of plotting capable passable path involving multiple nodes. A* uses heuristics to accomplish improved time performance. In order to achieve target it uses lower bounds on target distance to straight the search of Dijkstra's algorithm to the goal [10]. The node is resolved in order of their provisional distance between the origin and goal plus the lower bound. The effectiveness of this approach depends highly on the lower bounds. The nodes geographic coordinates determines the simplest lower bound, in road networks and this result to poor performance. A* algorithm and graph were used in the development of a novel algorithm for self-aware route planning [11]. The algorithm was able to forecast traffic and planned route for each car.

5. ALT (A* search Landmarks and Triangle inequality)

ALT is Dijkstra's algorithm speed-up technique which is pre-processing-based that permits speedy calculations of shortest paths in large road networks. There are some degrees of freedom in pre-processing of the ALT algorithm that is, in the graph it must choose a subset of nodes, called landmarks, which perform a particular role. Landmark selection is NP-hard, thus there exist no effectual precise answer or algorithm.

ALT is acronym for A* search, Landmarks and Triangle inequality, which are the major constituent of the algorithm. A* algorithm is a simplification of Dijkstra's algorithm, that uses a function (the potential function π) to assess distances from one node to another in the graph. A thinking which has to do with approximations, thus making it very significant.

6. Genetic Algorithms (GA)

GA is an acronym for Genetic Algorithm that symbolized a new programming paradigm which strives to imitate the natural process of evolution in resolving optimization and computing problems. In GA, strings of bits called computer chromosomes are usually selected randomly from the population of the computer chromosomes. This population is changed into a new population by a kind of selection naturally, using operators stimulated by the natural genetic operators. Inversion, crossover and mutation operators are the operators identified by Holland which are used in the selection.

7. Ant Colony Algorithm

Ant colony algorithm is an algorithm for discovering optimal route which is found on the behaviour of ants seeking for food. Ant Colony Algorithm is also known as Ant Colony Optimization (ACO). Ant Colony Optimization (ACO) is a population-based method for resolving combinatorial optimization problems which is stirred by the behaviour of ants and their natural approach towards finding the shortest path from a source of food to their nest. This algorithm exploits the behavior of the real ants during the search for food. Observation reveals that the ants drop some amount of pheromone on its routes as it travels from its nest to the food source. When returning, the ants are forced to trail the same route noticeable by the pheromone drops and also drop more pheromone on its way back. The ants routing through the shorter path are likely to arrive earlier and therefore boost the quantity of pheromone drop in its path at a quicker rate than the ants using a longer routes.

III. CONCLUSIONS

In this paper we presented a on-demand routing approach for mobile multi-hop ad-hoc networks. The approach is based on swarm intelligence and especially on the ant colony optimization metaheuristic. routing in wireless sensor networks (WSNs) focuses on the crucial problem of extending the network lifetime of WSNs, which are reduced by low-capacity batteries. GA has very high processing demands and is usually centralized solutions. They are slightly better suited for clustering when the clustering schemes can be pre-deployed. ACO is very flexible, but generates a lot of additional traffic because of the forward and backward ants.

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