Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 47 (2015) 452 – 459

Procedia Computer Science

An Enhanced Ant Colony Based Approach to Optimize the Usage of Critical Node in Wireless Sensor Networks

M. Umadevi[a], Dr. M. Devapriya[b]

[a]PhD Scholar, [b]Assistant Professor
PG & Research Department of Computer Science, Government Arts College, Coimbatore-18, India.

Abstract

The issue of energy constrained and non-renewable energy of sensor nodes has made the node weaker as a critical challenge in wireless sensor networks. The workload of nodes may varies depends on position and mobility of each involved nodes. In mobile environment, the unreachable information, packet drops and link failure influence for the requirement of new protocol. The protocol needs to monitor the network which aims at topological changes and workload of each node. This paper we have considered the problem of determining the reachability of node in the network stimulate into the enhancement of its transmission. So, we propose an Enhanced Ant Colony method (EAC) for such critical node in mobile WSNs by considering mobility as a key metric. It optimizes the routing paths, providing an effective reliable data path transmission for acquiring reliable communications in the case of critical node. The main goal is to maintain the maximum lifetime of network, during data transmission in an efficient manner. This paper contributes the implementation of this work and makes a comparison of its performance with AODV routing protocol based on packet delivery ratio, throughput, jitter, delay and energy level.

Peer-review under responsibility of organizing committee of the Graph Algorithms, High Performance Implementations and Applications (ICGHIA2014)

Keywords: WSN; Routing; Active node; Pheromone; Dense network;

[1]Corresponding author. Tel.: +91-876-058-2352;
E-mail address: umamohanshri@gmail.com

Peer-review under responsibility of organizing committee of the Graph Algorithms, High Performance Implementations and Applications (ICGHIA2014)
doi:10.1016/j.procs.2015.03.229

1. Introduction

Wireless Sensor Networks (WSNs) consists of several nodes that are able to interact with its own environment by the way of sensing or processing physical parameters[15]. These nodes have collaboration to perform the tasks in wireless communication. The feature makes WSN as self-organizable, low power, low memory, and low bandwidth for communication. Therefore, the design of WSN must meet these factors in order to accomplish a reliable network. Wireless sensor networks (WSNs) are being used in a wide variety of applications such as military and health-care applications. WSNs are densely coupled network in different physical environments for monitoring accurately. The sensed event is important for correct interpretation and knowledge in critical environment. This may lead to high power consumption of sensor nodes for finding the shortest path, which may cause breaking down of path. This can be performed by keeping nodes powered up all the time which makes nodes out of energy and it leads to degrade the network life time[9]. Also, there is a chance of link or node failure which brings network for reconfiguration and re-computation of the routing paths, route selection in each communication method results either message delay or choosing long routes which decreases network lifetime. So, alternatively shortest path selection can provide better communication resulting from exhausted batteries[10]. Finally, the solutions for such environments should have a method to provide reliable and fault tolerant communication, quick reconfiguration and minimum consumption of energy. Many researches on routing protocols have been designed to address all of the above problems. Consequently, it is critical to assess routing protocols for critical monitoring applications. The less energy node or ill node need to be identified[11] and make essential actions in critical environment for better communication by applying enhanced mechanism of Ant Colony Approach.

Basically nodes transfer packets from a sensor node to the base is called flooding[12]. The parameters used for optimization in WSN routing process achieves maximum service life of the network by combinatorial optimization problem. Many researchers have recently studied the cooperative behavior of ant in a bio inspired aspects providing a natural model for combinatorial optimization problems[13]. Ants in a colony are able to assemble for finding the shortest among multiple paths and a food source. The moments of ant deposits the chemical substance on its every crossed path which is easily volatile on certain time is called pheromone. While locating food, ants deposit is increased in the same traversing path and the concentration of pheromone is higher[14]. Subsequently this mechanism guide other ants by allows them to mark paths which is useful to find good paths from the overall behavior of the colony.

The rest of this paper is organized as follows: Section II presents related work. Section III presents motivation and objectives of the proposed research. Section IV describes the proposed algorithm. Section V describes the details of simulation model. Simulation results and discussions are presented in section VI. Section VII concludes this paper.

2. Related Work

Van der et. al., proposed an Ant Colony Optimization Approach (ACO) to solve the shortest path problem with fuzzy constraints[1]. This work determines possible paths from the source to the target and calculates the probability of each path of possible paths. The calculation of the average trail of each path gives solution for shortest path Problem. SehungHo et. Al., proposed a modified ant colony system (ACS) algorithm is proposed to find a shortest path based on the preference of links[2]. This shortest path is not surely an optimum path for the drivers who prefer choosing a less short, but more reliable or flexible path. Most of the shortest path search algorithms aim at finding the distance or time shortest paths. This work proposed the preference-based shortest path search algorithm which uses the properties of the links of the map.

Claes and Holvoet assume access to historic data in order to make travel time predictions in cooperative system[3]. They also proposed use of primer and exploration ants for each route, the path will be traversed twice. Finally, the system is not cooperative given that pheromones from different vehicles do not interact and consequently the other vehicles in the network do not benefit from the information brought back by that particular ant. Ando et al. proposed a cooperative system that makes short-term predictions of traffic[4]. There are some similarities between their concept and ours but we do not intend