Optimization of ant-colony algorithm in WSN

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Abstract

An energy consumption optimization algorithm based on ant colony algorithm is proposed for wireless sensor network. The proposed algorithm allows each node in wireless sensor network to save the distance and residual energy of neighbor nodes. Furthermore, in terms of probability selection of the nodes and the pheromone update, this algorithm focuses on the next hop node through the comparison of distance between the nodes and the residual energy, which ensures less possibility of nodes with low energy selected as the next hop. Therefore, the proposed algorithm improves energy load balancing, stability of wireless sensor network and, eventually, extends the life span of the wireless sensor network. The simulation results show that the improved ant colony algorithm avoids too much energy consumption of a certain local node resulting in more uniform energy consumption for each node.

Keywords: WSN, ant colony algorithm, energy load balancing, optimization

1.Introduction

A wireless sensor network **(WSN)** is composed of many nodes with low computing and data processing capabilities. In recent years, it has been widely used in military, medical, and other fields. However, the node's data processing capability is relatively low and its energy is limited. Meanwhile, the energy of the node is also related to the life span of **WSN.** The working principle of **WSN** is the monitoring environment of spatially distributed autonomous sensors. The source node transmits the data to the base station through a range of nodes. Sending and receiving data account for most of the energy consumption. Meanwhile, the consumption of energy is related to the length of the path, which means that short transmission distance of node corresponding to low consumption of energy. Thus, selection of a shortest path for data transmission plays an important role in reducing the energy consumption of the nodes and improving the stability of the **WSN.**

Currently, the ant colony algorithm is widely used in **WSN.** The algorithm not only can help the nodes in quickly and effectively finding the shortest path to the sink node but can also improve the work efficiency of the **WSN.** In the protocol proposed by low-energy adaptive clustering hierarchy (LEACH), [1] each cluster node sends data to sink node through the cluster heads resulting in high energy consumption by the cluster heads. The ant colony algorithm can help each cluster head to find the shortest path to the sink node. Hence,