International Journal of Digital Information and Wireless Communications (IJDIWC) 2(1): 912-922
The Society of Digital Information and Wireless Communications, 2012(ISSN 2225-658X)

Route Discovery Methods Based on Received Power of Repeater Nodes for Wireless Sensor Networks

Makoto SUGITA† Yoshihiro KAINUMA†† Hiroaki INOUE†† Kenko OTA† Syunji SHIMIZU† Yukihiro HIRATA† and Hideaki MATSUE†

†Tokyo University of Science, Suwa

††Graduate School of Tokyo University of Science, Suwa

5000-1, Toyohira, Chino, Nagano, 391-0292 Japan

E-mail: †m-sugita@rs.tus.ac.jp, ††{jgh11606, jgh12701}@ed.suwa.tus.ac.jp,

†{otakenko, shun, yhirata, matsue}@rs.suwa.tus.ac.jp

***Abstract*— In this paper, two route discovery methods based on received power of repeater nodes for sensor networks are studied. The first proposed method is a simple one and the second proposed method is in multipath fading environments. In both methods, the received power information in Physical Layer of repeater nodes is added to Route Request Message, and the message is transferred from a source node to a destination node via repeater nodes. When each repeater node received Route Request Message, the message is decided whether accept or not by referring to received power information in Physical Layer. In the destination node, the most optimal route is selected from plural candidates according to the following criteria: received power level, number of hops and sequence number. From the results of computer simulations, it has been clarified that the first proposed method has advantages in the route effective time, data distribution ratio and throughput comparing with the conventional method even if the route discovery time is lengthened by about 0.5 seconds. Also it has been clarified that the second proposed method in multipath fading environments has advantages in the route effective time and data distribution ratio comparing with the conventional method even if the route discovery time is lengthened by about 3 seconds.**

Keywords-component; AODV, Route discovery method, Received power monitoring, Route effective time, Data distribution ratio, Throughput, multipath fading environmentis

I. INTRODUCTION

Recently, Wireless Sensor Networks (WSNs) based on Near Field Communication (NFC) standards are active research areas and are implemented in worldwide. A wireless sensor network (WSN) is comprised of spatially distributed autonomous sensors on each node to monitor conditions and cooperatively pass their data through the network to a main location and collect the data. The topology of multi-hop wireless networks enables the network to send the data to the distant node. The WSN has adhoc and routing functions which enable to determine the optimal route in any situations. The WSN can pass their data to the distant nodes through the multihop wireless networks

Various methods have been proposed to discover the optimal route in multi-hop wireless networks. The most famous one is AODV (Ad Hoc On-Demand Distance Vector) which is standardized in MANET (Mobile Ad-hoc Network). In AODV, when Request To Send (RTS) of data is generated, the network node that needs a connection discovers the plural candidate routes which are reachable to the destination node and select the route with the least number of hops. AODV discovers, establish and refresh the route by sending and receiving the route discovery request (RREQ) and Route Reply (RREP). The route with the maximum sequence number and the least number of hops is selected from them so that the transmission delay is small. However, the packet success probability on the distant link between the repeater nodes is low. Thus the problem is claimed that the established links quickly break down. Many studies are done to resolve such problems. Since AODV selects the route with the new route information and the least number of hops, the transmission delay is small, whereas the data distribution rate of links with the small received power value among the repeater nodes is low. The problem is pointed out that the route disconnection occurs soon after the route has established. Many countermeasures are proposed for this problem.

In this paper, the improved method adding the received power information to RREQ as routing conditions is proposed. In the proposed method, the repeater node detects the received power after receiving RREQ and the received power information is added to RREQ. If RREQ which was received by the repeater nodes has already included the power information, the power information is equalized and then the obtained average power information is added instead. At the destination nodes, the route is established according to the average power of route, the number of hops and the sequence numbers. By the computer simulation, we compare the data distribution ratio, throughput, the route discovery time and the route effective time with those of the previous method. We revealed the effectiveness of the proposed method.

In multipath fading environments we also propose the improved method which selects the route referring to the received power information added to RREQ in each hop. In the proposed method, it is determined whether RREQ is accepted or not by referring to the received power among the nodes when each node receives RREQ. For instance, when RREQ is