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A NEW ALGORITHM FOR RESOURCE DISCOVERY IN SENSOR NETWORKS BASED ON NEURAL NETWORK

SHARIFZADEH MANAF[1], PAYAM PORKER[2], MEHDI GHEISARI[3], HAMED BALOOCHI[4], ABDOLHAMID HASSANZADEH MEHRABAD[5], HUSSEIN AKHTARI[6]

[1]Department of Computer, Firoozkooh Branch, Islamic Azad University, Firoozkooh, IRAN (manafsharif@gmail.com)

[2,3]Department of Computer, Damavand Branch, Islamic Azad University, Damavand, IRAN (payamporkar@yahoo.com),(mehdi.gheisari61@gmail.com)

[2,4]Researcher and Editorial board of free TowardScience journal (Hamedbaloochi@towardscience.com)

[5] Department of electrical power engineering, Kazerun Branch, Islamic Azad University, Kazerun, IRAN(hussein.akhtari@towardscience.com), (amir.hassanzadeh@towardscience.com)

ABSTRACT

Objectives: An algorithm should be generated for Resource discovery in Wireless Dynamic Sensors that improves operation level of wireless nodes in sensing and sending information to the sink nodes. We introduce a new algorithm.

Methods/Analysis: Multi-Layer Perceptron or other Neural Networks used to improve Resource discovery procedure. By using Neural Networks, results can be altered in some degrees and for this reason; just a single method is used.

Findings: In the present study an algorithm is generated for Resource discovery in Wireless Dynamic Sensors, in which Artificial Neural Networks are used to investigating resources.

Conclusion/Application: Results show that the method may majorly affect the process and improve operation level of wireless nodes in sensing and sending information to the sink nodes in term of total energy decrease. Both sides improvement estimated about 10%.

Keywords: Resource Discovery, Sensor Networks, Neural Networks

INTRODUCTION

Considering the decrease in sensors sizes and prices, neural networks are rapidly gained importance in the field of network systems [1-2]. Neural networks act based on cooperation of small nodes. Basically these nodes indicated by low energy consumption, low price and wireless communication systems and can be used in measuring the Temperature, Pressure, Moisture, light, etc. [3]. These networks transfer obtained information to a central unit via innermost networks. Today's modern systems are two-ways and provide feasibility of sensor controlling. Unlike traditional networks that are all-purpose, sensor networks are typically single-purpose [4]. The main idea of resource discovery protocols is finding the most optimize path to send/receive information. So, regarding the role of delay in information transfer lines, at first, we will describe influencing factors and delay calculation

In [5] authors aided to study energy aware in neural network via harmony search algorithm. The purpose of this research is introducing harmony search algorithm in neural networks, as a meta-heuristic network in successful routing, in term of increase longevity of this networks. For this reason, making this neural network specific for routing, two factors, energy usage and accommodating energy distribution among nodes which leads to increase longevity of the network, considered. Results confirm the ability of this algorithm in finding optimal route and balance between two mentioned factors. Also, Comparing (of) the proposed method with other methods in the same conditions managed by implementing a genetic algorithm, results confirm that the performance of neural network via harmony has a better function than Genetic algorithm. In [6] studied reduced energy amount with routing protocols in Sensory wireless networks with ant colonies approach. In this research, routing protocol based on ant's colonies approach presented to optimize mentioned parameters. This protocol was analyzed via NS-2 simulator, and the results confirmed 40% decrease in energy usage and increase 3 times of networks longevity regard to other methods. In [7] maximizing longevity of neural networks with unreliable communication is discussed. Main purpose of this study is presenting new routing protocol which aware of energy and optimal usage of energy, in a way lead to increase networks longevity with using unreliable communication. Also, this method considers common nodes effect on calculation of delay, as simulation indicate significant

improvement in networks longevity of wireless sensory systems. In [8] authors specifically studied S-MAC routing protocol optimizing for decreasing energy usage. In this study, it is shown that with comparing, assessment and simulating suggested protocols and S-MAC, functionality and improvement of energy usage for discovering and reporting caused by variation of S-MAC and is seen. In a study on "LABER [1]: they have aware routing protocol based on involved automated1 for sensory networks. In this article, author proposed an aware routing protocol, LABER, which used involved automated in finding suitable routing in sending data packages for stabilizing energy usage between nodes. This protocol simulated with NS-2 software, obtained results compared with other protocols. Results indicate that proposed protocol in the balanced energy usage between nodes and increased longevity point of view has better functionality when compared with other protocols. Authors [4] showed that collective intelligence often used in optimizing in distributed systems and inspired by ants. They employed some useful models in routing and using intelligent factors locally and nationally tried to improve and optimized routing operation.

Also in [9], authors showed that genetic algorithm was really flexible in solving dynamic problems. Goal of using genetic algorithm is minimizing energy usage in nodes of the network. Fitness criteria in this study, are based on minimum removed energy from networks nodes. Results show that in using genetic algorithm in choosing clusters and by using minimum energy difference in comparison to last step as fitness function, energy distribution through nodes are a bit uniform, so longevity of network will increase.

1. Proposed method:

A special architecture was used in which sensors organize themselves like clusters. Each cluster is a combination of sensors. For dynamic resource discoveries, this organization pursues the following objectives: 1. Cluster head is a logical point in preserving complex features; 2. Cluster head receive requests of dynamic resource discoveries and able to respond to them and make free other sensors to make their force come down in term of no activity, and 3. If hierarchy appellation is desired, clusters can be transformed to big one to better manage requests to more structured bundles. In utilized clustered algorithm, GAF is aware of energy protocol, design of GAF is based on energy which controls energy consumption

caused by transfer information, this method equipped to a mechanism which turn off unnecessary sensors but preserve the constant amount of routing. In the proposed algorithm it is emphasized that clustering is the basis of resource discovery protocols and other method of clustering can also be used. All of the process can be counted as a continuous process which consists of the followed stages:

1. Cluster selecting

Cluster selecting is the process of clusters identification which is the data input and control point and Meta data warehouse for cluster itself. In this stage each sensor sent a Resource Description Format and a massage contain remaining energy amount. The neighborhood receives signals and determines the nodes with highest remained energy and makes it the cluster point. Then remained nodes improve their self as clusters [10-11]. Pay attention that in the proposed algorithm use (a) very simple criteria, but in practice this can be complex.

2. Transfer Meta data

In this process, nodes transfer Meta -data (meta-data) to the cluster as Resource Description Format, where a simple mapping from Resource Description Format transfer information to a specified database. For fixed features, by adding Meta data to the selected clusters (cluster can do composition and compression of information simply). Interest massage established whole in network, whereby suitable nodes which has priority searched, so local addressing will be sufficient and there is no need for national addressing. In this way much of redundant and unnecessary transportation decreased [12].

Until now, in this article our focus mainly on the discovery protocols (Features Tracking). By the way, Meta data is necessary in describing data stream reported by a sensor. For some kind of long requests, it is possible to report data by a sensor (be) more dynamic. Considering a particle, equipped to temperature, voice and light sensor. Request (can) need some information from sensor in term of any (of the) specified parameters. In such a condition, Meta data sensor must be accompanied by its current, this is necessary in identifying process and knowing the temperature, pressure, sound variations.

3. Make a request

Consider a scenario, in which a customer's mobile (Personal digital device) is in touch with an external network, or in the case of mobile sensors, it is possible for a sensor to change its location and deliver thoroughly to a new place. For example in the case of Fig. 2-3, temperature mobile sensor S1, moves

out from cluster 1 and it is delivered through the second cluster. In both cases, it is possible for sensor to use different services in new situation (second cluster). For example, use a new service for positioning new physical coordinate and use another service for synchronizing time and date. So, for S1it is required to dynamically check services in second cluster. S1 then interred to the making request and send one to second cluster. In simulating a request in SQL (Structured Query Language) generated, but for some tasks that the number of complex queries are high enough. However, for preliminary queries, (it is possible that) pre-organized mechanism may be applicable which is sent as ASCII. In this study MLP was used [13-12].

4. Evaluation of presented approach:

For modeling energy model in a more realistic way, in our modeling we use low power radio 802.15.4 and simulation region limited to 350×350 m2 and every blocks dimension is 70×70 m2 (totally 25 blocks considered). Radio transmission area adjusted to 100 meters to make sure (us) that all (of) the sensors in one region be in touch with each other.

Table 2-4 contain average energy consumption for a sensor per different coding formats [54]. As it can be seen, (with) using XML format based on ASCII, transfer energy and also compliance energy consumption is 9 times higher than used energy of coding customization.

Table 4-1- Simulation parameters

row	Parameter	Value
	Simulation region	350 x 350 m2
	Transfer amplitude	100 m2
	Primary energy	100 J
	MAC protocol	CSMA-CA
	Band width	250 kbps
	Transmission force	0.0522 W
	Received power	0.0591 W
	Unemployed force	0.00006 W
	Number of nodes	50

On the other hand, using XML coding format in compressed binary (Predetermined pattern and isolated XML) consumes as much energy as customized coding format. As described in previous sections, customized protocols, have the highest power efficacy, but they have much lower flexibility and cooperation. While text XML represents the other end of the spectrum. The use of XML has a number of striking benefits but Verbose causes high energy costs in relation to the length (approximately 9 times the energy

order of the 4th custom).However, using XML Binary XML compromise between text and custom formats.

The results of the simulation help to prove the proposed method and demonstrate its usefulness. The number of other articles, which can be seen in Table 4.2, had been simulated and the results are dedicated to previous methods.

Table 4-2

Receive energy	Transfer energy	Data size	Protocole type
0.000038	0.000033	160	custom
0.000342	0.000302	1448	XMLAscii
0.000038	0.000033	160	XMLbinary

Performance Criteria

Permittivity

Throughput=$\frac{\mu}{t}$

In this formulae, t is time and μ is received bits.

Equal to the average throughput for the entire network of nodes

End-to-end Delay

D = Td-TS

D: delay time of a data pocket.

Td Depending on the time of receipt at destination

Ts Depending on the time of origin

Delivery rate

$$\mathbf{PDR} = \frac{\mathbf{Receive_Pckt}}{\mathbf{Sent_pckt}}$$

Power consumptions nodes:

Etx(p)=(280 mA × V × tt) Energy used for sending

Erx(p)=(204 mA × V × tr) Energy used for receiving

Eix(p)=(178 mA × V × ti) Energy used for off state

Esx(p)=(14 mA × V × ts) Energy used for sleeping

The IEEE standard for power consumption in the network interface card (NIC) 2Mbps is:

NodeRemEng = NodeRemEng - (Etx × Nt+ Erx × Nr+ Eix+ Esx)

Defined scenario for the simulation is as follows:

Number of nodes created in an environment with dimensions of 350 × 350, which at the top of the tree a node defined as coordinator, the rest of the nodes in the tree like structure scattered in simulation environment. Level Number of nodes in terms of its distance from the coordinator is calculated. As a result, a number of the coordinator in trees is 0 and other nodes has a number of 1 or higher. Each node can have a father and some children, all of these dependent to the distance of each node from higher and lower level nodes. In simulation assumed that in less than 40 meter or lesser (40 meters or less) can identify each other.

Father node – the node with minimum distance at a given level of each node - can be considered as a father node. Since the last

line nodes do not have any children, they are counted as common nodes. But other nodes except the top node, routing nodes are considered to be different from the common and started to work. In fact, these nodes have also routing capabilities.

In this scenario, aside from coordinator node which is constant, two of the nodes are considered randomly and as receivers and two of them work as transmitters.

Total time for simulation is 200 seconds, one of the transmitters begins its activity after 83 seconds and the other one started after 86 seconds. Both of them stopped after 20 seconds of activity. Number of nodes in the network increase from 20 nodes to 40 nodes by the rate of 5 nodes and parameters like delay and loss of information and network throughput in increase of nodes. The following charts compare the various routing methods coming together on a variety of routing algorithms in ZigBee networks that have been proposed in recent years. These figures show the average of 20 times in the simulation which has been run. Also try to find suitable value for k to reach better outputs. Here, k is the number of perception layers which is equal to 2 and α of synaptic coefficient of 10 is considered. By changing these parameters results can be changed majorly. Type of outgoing traffic for data transfer can be divided into three forms: 1-CBR 2-Poisson 3-FTP, which is often used.

Network topology for scenarios 1 and 2 are shown in Fig. 4-1 and Fig. 4-2, respectively:

Figure 4-1 Network topology of Scenario 1

Figure 4-2 Network topology of Scenario 2

Figure 4-3 packet delay in the first scenario (node - ms)

Figure 4-4 packet loss in the second scenario (node - number of lost packet)

Figure 4-5 packet delay in the second scenario

Figure 4-6 throughput in the first scenario (kbps)

Figure 4-7 Average energy of network nodes with node number 50 (in percent)

Figure 4-8 Throughput graphs in the second scenario

Figure 4-9 Comparison of throughput in the first scenario

Figure 4-10 compares the throughput in the second scenario

Figure 4-11 Comparison of delay in the first scenario

Figure 4-12 Comparison of delay in the second scenario

Figure 4-13 Comparison of the number of steps in the first scenario

Figure 4-14 Comparison of the residual energy of the nodes in the scenario of two

The results show that in terms of throughput and delay and packet loss, and in particular, energy consumption, this algorithm can have a significant impact, even though results in the number of steps recovery are so many. The effect of this algorithm revealed in selecting the best route in terms of distance and barriers that have an important impact on decisive role in finding a path to the destination. In the first scenario, the network topology is a tree; it will even have more of that.

CONCLUSION

The Proposed method improve results up to 10% in delay of packets point of view and create better traffic pattern for network, and majorly avoid packet loss. This is despite the fact that such an important parameter in network throughput does not decrease, and this is an important issue.

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