PYTHAGOREAN EQUATION BASED SIMPLE PAIRING IN THE WIRELESS SENSOR NETWORK FOR SLEEP SCHEDULING

Aakriti Mahajan & Harjit Pal Singh
CT Institute Of Engineering, Management & Technology
India

Abstract: The node pairing is the mechanism to pair the nodes on the basis of their behavior, distance or other parameters in order to serve the various purposes in the case of wireless networks. The simplest node pairing can be accomplished on the basis of node distance, which must be equal to or lesser than the maximum transmission distance decided according to the wireless standard or node's capability. The node pairing has been tested up to various extents in this paper, while using the simplest node pairing. The network performance is thoroughly analyzed on the basis of various performance parameters, where the primary performance indicators are throughput and transmission delay. The proposed model is observed as a scalable and balanced solution for the wireless networks, which has been clearly observed from the results.

Keywords: Simple node pairing, Network restructuring, Binary pairing, Nearest neighbor selection.

INTRODUCTION

Other than amplifying the network lifetime of network nodes, it is desirable over disperse the vitality scattered all through the remote sensor network with the specific goal for limit upkeeping and augment general framework execution. Any correspondence protocol that includes synchronization between peer hubs causes some overhead for the incorporating of correspondet nodes. WSN routing or grouping protocols decide if the advantages of more mind boggling routing calculations eclipse the additional control messages every hub needs to impart. Every hub could settle on the most educated choice in regards to its correspondence choices in the event that they had finish information of the whole network topology and power levels of the considerable density of the wireless sensor nodes in the given network. This undoubtedly demonstrates to yield the best execution if the synchronization messages are not considered. Notwithstanding, since each of the sensor nodule would dependably need worldwide information, the cost of the synchronization messages would at last be exceptionally costly. For both the dispersion and bunching calculations, we will dissect both practical and ideal plans with the detailed aim for acquisition for understanding in the properties of both methodologies.

LITERATURE REVIEW

Chen, Manju [1] et. al. has built up a novel three-dimensional restriction calculation in view of DV-HOP. Its situating deviation is too substantial to discover the obscure hubs, and the extent of scope is too little to discover each of the sensor nodes. Gayan Samiru et. al. [2] has worked on the enhancement of DV-Hop counting or evaluation mechanisms, which are specifically designed for the estimation of node and setting up their particular positioning in the given topology. The node positioning is quite important for the node pairing during the sleep scheduling applications, hence the node positioning accuracy has been

further improved in this model to create the highly compatible pairs. Bal Mert et. al. [4] has developed a test-bed environment for the testing of the sleep scheduling based simulations in the multi-parameter based performance. This test-bed has been specifically constructed to offer the efficient network localization practices along with the node status and node health monitoring in the WSNs. Shekofteh, S. Kazem [5] et. al. has built up a limitation calculation for wireless sensor networks utilizing the Tabu and Series based network route inquiry and recreated tempering. This paper proposes a strategy in which the restriction is done through two stages. Pei, Zhongmin et. al. [6] have built up a grapple free limitation technique for versatile focuses in coal mine wireless sensor networks. Kumar, Anil, Arun Khosla [7] and others have chipped away at Meta-heuristic range based hub limitation calculation for WSNs. Tan Liping et. al. [8] has carried out his work towards the improvement in the localization of the WSNs, which has been primarily accounted around the moving anchor or beacon nodes in the given simulation. The primary improvement is primarily made to the WSN in coordination with with higher order of innovation among the WSNs, which coordinate information obtaining, preparing and transmission, correspondence, cause the consideration of individuals.

EXPERIMENTAL DESIGN

The proposed model is based upon the simplest distance based pairing mechanism, which is used to create the lower level connectivity to segment the network in the different active zones with time synchronization. In this paper, the primary focus lies upon the neighbor formation with the non-paired devices, where all of the paired nodes are labeled with different labels, such as 0 for first node in each pair and 1 for the second node in the given pair. The pairing has been tested in the 2-D plane using the 2-D (x,y) coordinates. The pairing method is designed according to the following algorithmic workflow:

Algorithm 1: Simplest pairing algorithm
1. Load the simulation parameters ← (Transmission range, Number of nodes, Area width, Area length, Base station)
2. Create the random coordinates for each of node according to count of nodes in form of [nX, nY] parameters
3. Create 2-D plot with area width and length in accordance with the topological parameters
4. Plot the nodes on the specific coordinates generated on step 2, plot(nX, nY)
5. Acquire the transmission range, **Tr**← Transmission range
6. Iterate for each of source nodes in the given node data
   a. Iterate for every node in the list of given nodes
      i. If ID of target node and source node is equal
         1. Do not consider pairs, as a node can't pair with itself
      ii. Otherwise
         1. Acquire the coordinates of the source node, [srcX, srcY]
         2. Acquire the coordinates of the target node, [targX targY]
         3. Compute the distance between the two nodes using Pythagoras theorem (squared distance)
         4. If the distance is lesser than **Tr**
            a. Check if source of target nodes are already paired with some other node
            b. If there is no existing pairing of both nodes
               i. Create the pair
               ii. Reserve the pair by updating the pairs matrix
            c. Go to 6(a)(i)
         5. Otherwise
            a. Go to 6(a)(i)
      iii. If it's the last node
         1. Return the iteration
7. Plot the pairs on the 2-D plot created on step 3
8. Return the simulation

RESULT ANALYSIS

The performance of this model is evaluated on the basis of network performance measures of throughput and transmission delay. There is no direct parameter to compute the fitness of the pairing. The network performance estimation is the only source to know the proposed scheme's performance in our scenario. Hence, the results are obtained in the form of throughput (Figure 1.1) and transmission delay (Figure 1.2). In the figure 1.1, the values of throughput for the simulation of nearly 10 seconds has been presented,

where the curve is shown in the form of rising curve and shows the improving performance of given network segment with efficient convergence. The throughput parameter based network efficiency has been observed between the range of 0 Kb and 16 Kb per second in this experiment, which indicates vital and vigorous performance of the WSN based duty cycling scheme in this simulation. Throughput value is observed nearly on 10 Kbps on an average, which again echoed the throughput's range based results. The throughput based results are graphically represented in the figure 1.1 in detail for the simulation sequence of 9 seconds.

performance of the proposed model, which indicates the consistent performance of the wireless network.
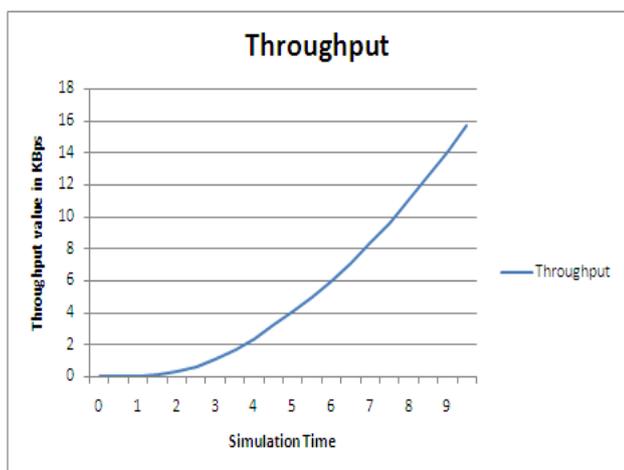

Figure 1.1: Performance evaluation in the form throughput parameter

In the figure 1.2, the proposed model's performance is observed in the form of transmission delay, where the average delay has been recorded below 0.04 seconds. The value of 0.04 seconds shows the proposed scheme's robust
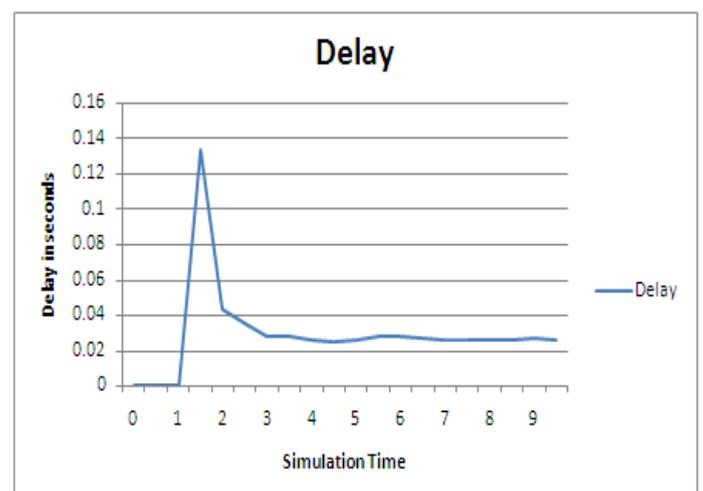

Figure 1.2: Performance evaluation on the basis of transmission delay

In figure 1.2, the performance of this proposed optimized sleep scheduling oriented duty cycling model has been evaluated over the given set of nodes in the experimental simulation. The transmission delay in the simulation is recorded up to 0.14 seconds, which is considerably and significantly lower in relation to general requirements for data delivery services. Also the non-zero value for transmission delay are recorded between 0.02 and 0.04 seconds on nearly all of the events, excluding the peak between 1st and 2nd seconds, which could be caused by the higher volumes of data received during this time event. Overall result of this model indicates the significant and stable performance in this scheme under the sleep scheduling paradigm.

CONCLUSION

This proposed model is based upon the 1-hop and 2-hop neighbor formation for the implementation of this model smart pairing model over the 802.11 standard. The proposed scheme's performance is analyzed with various performance parameters of throughput and transmission delay. The throughput readings has been observed for the complete simulation of nearly 10 seconds, where the minimum non-zero value has been recorded at 0.0506 KBps and maximum value of 15.6 KBps during the wireless network setup phase. The proposed model has been recorded at 0.025 as the minimum non-zero value, whereas the maximum value of 0.35 seconds is observed from the simulation model, which can be easily considered as the efficient value for the transmission delay across the wireless network.

REFERENCES

[1] Chen, Manju, Xiangqian Ding, Xiaodong Wang, and Xiaowei Xu. "A novel three-dimensional localization algorithm based on DV-HOP." In Signal Processing, Communications and Computing (ICSPCC), 2014 IEEE International Conference on, pp. 70-73. IEEE, 2014.

[2] Gayan, Samiru, and Dileeka Dias. "Improved DV-Hop algorithm through anchor position re-estimation." In Wireless and Mobile, 2014 IEEE Asia Pacific Conference on, pp. 126-131. IEEE, 2014.

[3] Wu, Jiawei, Jinming Yu, Aijun Ou, Yiming Wu, and Wujun Xu. "RCDV-Hop Localization Algorithm for WSN." In Wireless Communications, Networking and Mobile Computing (WiCOM), 2012 8th International Conference on, pp. 1-4. IEEE, 2012.

[4] Bal, Mert, Henry Xue, Weiming Shen, and Hamada Ghenniwa. "A Test-Bed for Localization and Tracking in Wireless Sensor Networks." In SMC, pp. 3581-3586. 2009.

[5] Shekofteh, S. Kazem, M. B. Khalkhali, M. H. Yaghmaee, and Hossein Deldari. "Localization in wireless sensor networks using tabu search and simulated annealing." In Computer and Automation Engineering (ICCAE), 2010 The 2nd International Conference on, vol. 2, pp. 752-757. IEEE, 2010.

[6] Pei, Zhongmin, Zhidong Deng, Shuo Xu, and Xiao Xu. "Anchor-free localization method for mobile targets in coal mine wireless sensor networks." Sensors 9, no. 4 (2009): 2836-2850.

[7] Kumar, Anil, Arun Khosla, Jasbir Singh Saini, and Satvir Singh. "Meta-heuristic range based node localization algorithm for Wireless Sensor Networks." InLocalization and GNSS (ICL-GNSS), 2012 International Conference on, pp. 1-7. IEEE, 2012.

[8] Tang, Liping, Wanfang Chai, Xuanguang Chen, and Jianbin Tang. "Research of WSN Localization Algorithm Based on Moving Beacon Node." In Circuits, Communications and System (PACCS), 2011 Third Pacific-Asia Conference on, pp. 1-5. IEEE, 2011.S