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An Analysis Based Survey on Slow Flooding Time Synchronization in Wireless Sensor Networks

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Abstract

In these paper we present the survey analysis of slow flooding time synchronization. Slow flooding time synchronization is nothing but the broadcastings data in the sensor nodes. We firstly outline the design challenges in wireless sensor networks. Overall the analysis is classified into the different categories based on the different parameters. We also highlight the performance issues and drawback related to slow flooding time synchronization in wireless sensor network. The paper concludes with possible future research area in time synchronization in wireless sensor network environment.

Keywords**:** *wireless sensor networks, slow flooding time synchronization.*

1. Introduction

Due to recent advances in time synchronization in wireless sensor networks. A fundamental challenge in wireless networks is that flooding. Sensor nodes are subject to transmission power, energy consumption, sensor nodes accuracy, sensor node time delay , propagation speed, delay, reliability , scalability , waiting time , clock speed , data transmission information , packet loss , synchronization error , interference, which degrade the data delivery performance. A large number of sensor nodes can be networked in much real time application that requires unperformed operations. A wireless sensor network contains hundreds or thousands of sensor nodes. These sensor nodes have the ability to sense the data , transfer the data , hold the data ,process the data. A sensor nodes have the ability to communicate with each other in the network or outside the network directly or indirectly. Indirect communication is done with the help of external devices or with the help of base station.

Slow broadcasting time synchronization were developed for small wireless sensor networks with limited collision of traffic, and thus not considered for high collision traffic condition. As we know, wireless sensor networks are large in size, a greater number of sensor nodes allow for sensing over large network area. Hence the design limitations of slow flooding time synchronization become greatly stressed. Slow flooding time synchronization does not support large wireless sensor network environment.

In an area where the sensor nodes are deployed, coordinate them to produce the high quality information about the environment. These sensor nodes have the ability to trace the route information of other sensor nodes within the network or outside the wireless sensor network. While route information can be variable depending upon the path used.

Networking in large real time based applications like military application, weather forecast monitoring, civil applications , target field monitoring , security monitoring , disaster monitoring and many more applications. Development of the sensor nodes in this network area is in random fashion or can be manually planned. For example suppose in weather forecasting monitoring application large number of sensor nodes are dropped then ultimately operation of monitoring fail. Here in large area data transmission or information flooding with a single pair of nodes gives a strong channel; however, in scenarios with weaker channels and large nodes, shorter packets data flooding or information transmission may be preferable due to their lower susceptibility to loss. A node for a given node A broadcasting to another node B and third party node C is involved in the transmission of A and B, i.e. B did not get the transmission of A. This can lead to large data collisions, which occur when node A's packet is interrupted by the C's packets, and transmission not successes. Packet loss of this type maximizes with length of packets .Due to length maximizes, the involved node is remain quite.

Routing is the most challenging in wireless sensor networks. Firstly , due to the large sensor nodes is not possible to build a global addressing scheme. In wireless sensor network, for real time application sometime it is more necessary to getting the data than knowing the sensor node which sends the data. Secondly in sensor node communication almost all sensor network application requires the flow of sense data from multiple sensor nodes. Thirdly, sensor nodes are tightly coupled in terms of energy, transmission, processing etc. So they want proper resource management in the wireless sensor network environment.

Nodes in wireless sensor network environment are free to move anywhere in the network. Hence due to the random nature of sensor node, it is necessary to have the exact time synchronization approach. And also it is more necessary to flood the exact time information or to flood the exact data from one sensor node to another sensor node in the network.

The purpose of this analysis is to find the slow flooding time synchronization drawbacks for the real time based channel conditions applications. The basic idea is that if the Packet drops are too large, then packet retransmission rate will be

high due to packet drop error; on the other hand, if the packet drop is too small, then effective data throughput will be low.
Hence, it is indirectly related to the time synchronization parameters like synchronization accuracy, synchronization speed, etc.
Slow flooding time synchronization in wireless sensor networks must have the following important features.
(i) *Slow* flooding time synchronization is suitable for the small application wireless sensor network environment.
(ii) *Accurate* link estimation form due to the performance of sensor nodes in the small wireless sensor network environment.
(iii) *Easy* to use. Slow flooding time synchronization approach is simple to use in wireless sensor network area. Basically it is easy to use in small sensor node area network because it is best suitable for small area wireless sensor network, and also helps to give exact output to the real time indoor or outdoor application.
The rest of the paper is. Section II discussed related work. In section III analysis of slow flooding time synchronization with the help of various parameters in a table. In section IV research design of slow flooding time synchronization is explained. Finally conclusion of the paper i.e. slow flooding time synchronization approach is proposes.

2. Related Work

2.1 Packet loss Model

Losses in Wireless sensor network can be classified as moving object crashes occurred .Conditions. And the communication errors. Moving objects crashes occurred when a third party involves the transmission. A communication error form due to improper link . The packet drop probability *PD* can be computed as:

$$PL = 1 - (1 - PC)(1 - PE)$$

where *PC* is the probability of packets collision, and *PE* is the communication error.
Packets are loss due to improper link communication in the wireless sensor network. Large amount of packets losses produces result in proper way or generate the wrong output for the real time based applications. Due to large sensor nodes in the wireless sensor network environment, slow flooding time synchronization cannot manage the link of communication. Hence accurate routing method is necessary for accurate result and less errors in the wireless sensor network environment. Due to large packets loss reduces the scalability of sensor nodes. It also reduces the reliability of sensor nodes. That means that sensor nodes are not reliable in nature. i.e. sensor nodes are not perform their own task or work properly. Hence it is too much necessary that packet loss is less in any indoor or outdoor wireless sensor network area.

Figure1. Shows that the due slow flooding time synchronization in the wireless sensor network more amount of packets are loss due to large amount of sensor nodes in the wireless sensor network. Individual node successful transmits the packets. But due to large nodes in the network form packet loss.

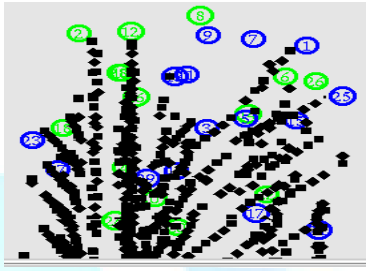

Fig1. Packet Loss by nodes due to slow flooding time synchronization.

2.2 Energy loss & Delay Model

Due to slow flooding time synchronization, in large wireless sensor network area nodes form more amount of energy loss. Slow flooding time synchronization flood the data in sensor node in slow form. Hence, due to slow broadcasting of data every node waits for a period of time. Suppose there is flooding between node A and B and at a time node C wants to flood their data to node A. Then at that time node C wants to wait until when node B totally broadcast or flood their own data packets or information. Due to this nature if sensor nodes large amount of energy is loss. As we know wireless sensor nodes are battery powered, hence due to large energy loss sensor nodes are easily switch off or destroy. In large wireless Sensor Network area due to energy loss exact output is not obtained. Hence slow flooding time synchronization is not the perfect time synchronization approach for large wireless sensor network area. To overcome this problem we need a strong time synchronization approach that gives exact output of the application. Due to this energy problem in real time application in wireless sensor networks does not give exact accuracy, synchronization speed, scalability. Energy loss by each node is due to waiting time of each node. Hence delay occurred in wireless sensor nodes.

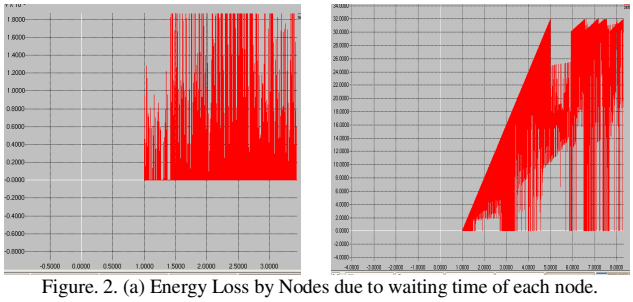

Figure. 2. (a) Energy Loss by Nodes due to waiting time of each node.
(b) Delay form due to waiting time of each sensor node.

Table 1: Analysis of slow flooding time synchronization

Sr. No.	Parameters	Analysis
1	Propagation Speed	Slow
2	Synchronization Accuracy	Decreases due to waiting time of each node
3	Synchronization Scalability	Decreases
4	Reliability	Slow
5	Clock Speed	Slow
6	Waiting Time	Slow
7	Timing Information	Slow
8	Neighborhood Contention	High
9	Packet Loss	High
10	Energy Consumption	Not Maintained
11	Synchronization Error	High
12	Delay	High

3. Research Design

In this section, we present the design of slow flooding time synchronization, a flooding packets scheme for small area WSNs. Below; we identify the major design goals.

- Adaptation Dynamically. Slow flooding time synchronization should provide an adaptation scheme in dynamic manner to achieve performance improvements in dynamic, time-varying sensor networks.
- Accurate link estimation. Slow flooding time synchronization should implement an accurate link estimation method in small wireless sensor network area.
- Lightweight for implementation. Slow flooding time synchronization should be lightweight for resource constrained sensor nodes.

3.1 Proposed Methodology

Slow flooding time synchronization approach works as follows. Firstly the sensor nodes are deployed in the wireless sensor network environment depending on the application requirement. The sensor node performs the broadcasting phenomenon onto the sensor nodes in the wireless sensor network indoor or outdoor environment. Sensor node passes an application-level message for transmission purpose from one node to another node in the network environment. Slow flooding time synchronization is routing based approach. Routing phenomenon decide which sensor node to keep in track and which sensor node to discard. To minimize energy consumption various routing methods are given. Different routing methods give different result to the application in the wireless sensor network environment. Almost all the routing methods are classified according to their network based structure topology or according to location based. Without proper routing method in wireless sensor network application will not achieve the exact output.

Due to slow flooding time synchronization, sensor nodes flood data slowly in the wireless sensor network environment. As the name itself suggest the flooding phenomenon is slow. That means that here broadcasting of data packets are broadcast slowly. Due to slow broadcasting of data packets various problems are seen in slow flooding time synchronization approach. The various problems are seen is that the synchronization speed is slow due to slow broadcasting of data packets. Here synchronization speed is slow because each node waits a given period of time to flood its data pakets or data information.

Also synchronization accuracy is slow due to slow transmission of packet information. Due to slow synchronization speed and slow synchronization accuracy large amount of packets are loss. i.e. in slow flooding time synchronization packet loss or packet delivery ratio is high. Due to slow propagation speed in slow flooding time synchronization approach, large amount of packets time delay occurred in to the sensor nodes. Packets time delay occurred because every node holds their time and perform the flooding operation in extra time period. That means that due to slow flooding, sensor nodes takes extra time to flood its packets information in the wireless sensor network environment. It is also seen that more amount of synchronization error are form due to slow flooding synchronization. It is shown that due to high amount of synchronization error occurred in the network reduces the scalability of synchronization. As we know wireless sensor node is battery powered hence due to large amount of time required by nodes, energy is not maintained. i.e. proper energy consumption is not achieved in slow flooding time synchronization. It is also seen that due to high neighborhood contention exact output is not obtained in slow flooding time synchronization. Hence reliability of sensor nodes decreases.

4. Impact of Slow flooding time synchronization

This approach proposed here will provide the accurate link estimation in small wireless sensor network area, efficient utilization of channel in small environment. This will improve the system throughput and packet delivery ratio in wireless sensor networks in small area network application.

5. Acknowledgement

I am thankful to all papers related to time synchronization that are given as references below. This is a analytical study paper on slow flooding time synchronization approach.

6. Conclusion

The slow flooding time synchronization approach will be implemented using the software modules. The slow flooding time synchronization approach provides various parameters that capture by wireless sensor networks. Here analysis shows that parameters which are widely used by slow flooding time synchronization are not suitable for large real time based wireless sensor network applications.

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