

Simulation of Dynamic Scheduling of Redundant Nodes in Sparse Multipath Channels in Communication Networks

Xi Jiang^{a,*}, Lin Tang, Tong Liu

Department of Big Data and Internet of Things, Chongqing Vocational Institute of Engineering, Chongqing, 402260, China

^a 467685311@qq.com

*corresponding author

Keywords: Communication Network Wash, Multipath Channel, Redundant Nodes, Scheduling.

Abstract: The traditional difference algorithm and energy prediction method are used to dynamically schedule redundant nodes of communication network multipath channel, and the scheduling effect is defective. Therefore, in order to solve these problems, this paper proposes a new communication network sparse multipath channel redundant node dynamic scheduling mode, the main content of which is to clarify the network topology structure and prepare for scheduling coverage redundant nodes. According to the resulting network topology, the node distribution of the sensor can be clearly defined, so as to determine whether the node is redundant or not, and the node sleep processing can be carried out to complete the scheduling.

1. Node Coverage Model

The sparse multipath channel test paper has a large multipath delay spread, and the channel impulse response is concentrated in the far less outgoing tap, while most are zero channels or channels with small energy. In order to improve the communication quality, it is necessary to eliminate symbol interference by using equalization technique at the receiver[1]In order to ensure coverage, a large number of redundant nodes need to be deployed in order to ensure coverage. When all nodes work, although the coverage is guaranteed, it will lead to the waste of redundant node energy, which makes the network work cycle shorter. In order to solve this problem, the global network node sleep and working state can be dynamically scheduled to ensure the rationality of the scheduling mode, so that the redundant nodes can be temporarily dormant processing, while reducing energy consumption and ensuring the coverage of the region, so as to achieve energy loss balance and prolong the network working time. the algorithm is based on the coverage model of tolerant coverage area. adding residual energy factor to the coverage redundancy discrimination condition is that the node with low energy can have more chance to enter the pre-sleep state, thus saving energy, and adding the pre-sleep election mechanism to the pre-sleep node state scheduling to prevent it from entering the sleep state at the same time, so as to ensure the coverage of the region.

According to the research, if the communication range of nodes is more than twice the sensing range, the connection problem is covered. If the communication radius of the node is exactly twice the sensing radius, the two nodes perceive the area tangent, and the node spacing is the largest. At this point, if the sensor node communicates at the maximum distance range, the number of nodes per unit area is the least. This method can save energy when coverage is guaranteed to the maximum extent, but it requires more deployment when the environment is complex, and if the remaining energy of the node is uneven, it will cause some nodes to sleep ahead of time, which will affect the quality of network coverage[2]. The model of tolerance coverage area is adopted first. as shown in figure 1.

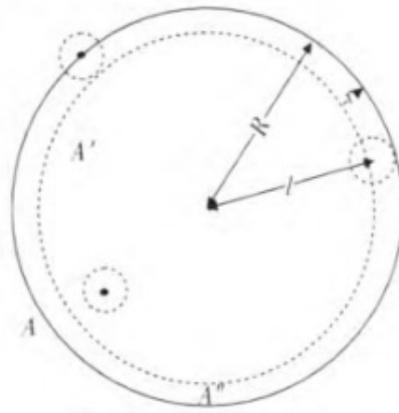


Figure 1 Monitoring area plane

Redundant coverage area and general coverage area contrast restraint, if the node radius increases, the node perceived coverage area is affected by the boundary factor in the middle of the month, at this time because of the node energy imbalance, it appears part of the node sleep ahead of time, affecting the overall coverage quality. Radius based on the tolerant coverage area model affects the foot and therefore counteracts the boundary factor[3]Therefore, the scheduling algorithm based on tolerant coverage area can judge node redundancy condition more objectively, so that the energy can be balanced to the node without energy imbalance, so the scheduling mode under such a model is more suitable for infinite sensing network.

2. Node Scheduling Algorithm

LDAS LightDependency-Awarescheduling lightweight deployment sensing uses sensing nodes to send beacon packets in the same sensing range, and all sensor nodes maintain the state and information of their adjacent nodes. When the adjacent working nodes are larger than the set threshold, this node randomly sends packets to these adjacent nodes, and the nodes receiving the packets enter the dormant state after receiving a certain amount of dormant data. A scheduling mechanism based on tolerant coverage area based algorithm TCA-NS (Tolable Cover Area Based Node Scheduling) using cycle reincarnation. after the beginning of the cycle, each node in the network sends information to adjacent nodes, including the number of adjacent nodes and the distance between this node and adjacent nodes. The TCA-NS algorithm uses B at the discrimination $\frac{E}{r[C]} > \text{threshold } B$ of the formulaiAn area covered by adjacent nodes, E . $r[C]$ denotes the area of the area covered by tolerance, threshold is the threshold for node coverage redundancy[4]. The coverage redundancy condition can be satisfied when this formula is satisfied. The node that satisfies the condition will enter the sleep period, if receives the adjacent node's pre-sleep information will return to the working state, otherwise carries on the sleep. Start the next scheduling cycle after the hibernation time is over.

3. Node Scheduling Optimization Algorithm

The above algorithm does not take into account the residual energy factor of the node. If the node energy is low, if the redundancy discrimination is carried out according to the above algorithm, this part of the node will always work, and the part of the node energy high may be dormant all the time. At the same time, the deployment of wireless sensor network nodes is random, so there will be some regional nodes dense, some regional nodes sparse, while the dense part of the region node coverage is more redundant. During the TCA-NS algorithm, multiple nodes are in pre-sleep when they meet the redundant coverage condition[5], and will detect and send this information. In the case of the same fallback time, some node discrimination conditions conflict. In the case of too many nodes adjacent to one node, the problem of multiple nodes working at the same time or entering sleep at the same time can not be solved. For the problem of node redundancy

discrimination, parameter E can be added to the threshold value of the formula to measure the residual energy of the node remain, the value is 0-1, when the parameter is 0, it means that the node has no energy, and when the parameter is 1, it means that the node energy is the initial state, so as to judge whether the node is dormant or not. Formula $B_i E / r[C] > \text{threshold} * E$ remain[6] Parameters E remain is the ratio of the remaining energy of the node to the initial energy. when the node enters the discriminant condition, the energy value of the current node will be detected, and the parameters will be obtained. if the value of threshold is set to 1 in this study, the smaller the parameter will be, the easier it is for the node to discriminate the condition, while the node with low energy is easier to enter dormancy than the node with high energy. For the problem of conflict between nodes, the appropriate redundant coverage discrimination condition can be selected to make the node pre-sleep, and the node of the pre-sleep state will judge the number of adjacent pre-sleep nodes, and judge whether to enter the sleep state by the quantity. And the nodes with the lowest energy will sleep more easily, this way can solve the situation of adjacent nodes working and sleeping at the same time, the principle is that the nodes are only covered by adjacent redundant nodes, and the nodes with the largest number of coverage can have permission to enter dormancy. Figure 2 is the node state transition diagram.

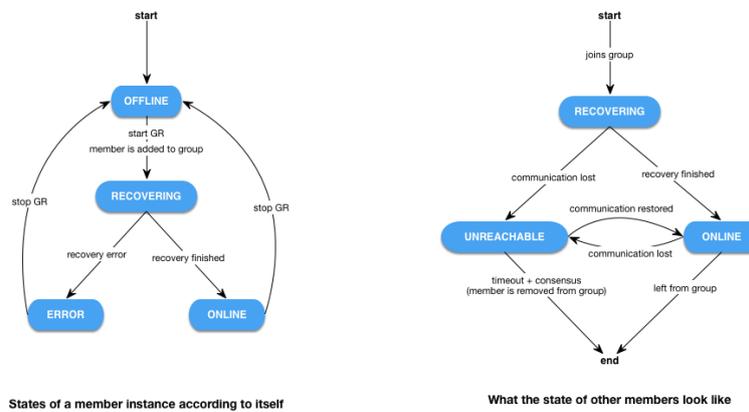


Figure 2 Node state transition

4. Simulation Results and Analysis

The statistics of node coverage and number of adjacent nodes are shown in Figure 3.

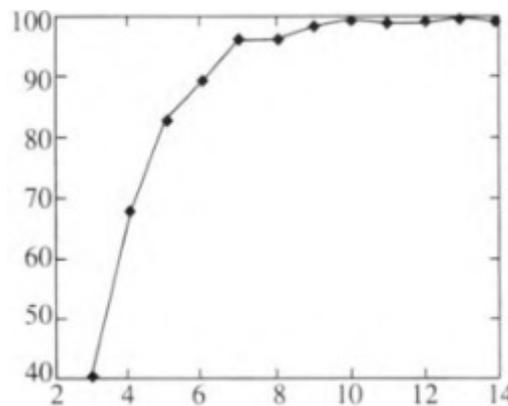


Figure 3 Relationship between adjacent nodes and coverage

It can be seen that the more the number of adjacent working nodes, the higher the coverage of nodes. It can be analyzed that in the case of random deployment of nodes, the number of adjacent nodes can reach 90% coverage at 7, and the coverage is already over 99% when the number of nodes is above 10. It can be concluded that when a certain threshold is reached, the increase of the number of nodes is more and more effective on the increase of coverage, at this time there will be many redundant nodes, so that these nodes can enter dormancy can save energy. Election Sleep

Scheduling Algorithm (Voting Sleep Schedule)[7]able to achieve relatively better coverage quality. The main reason is that the energy of some nodes is tight, but the algorithm proposed in this paper also has good coverage quality, which can show that when redundant nodes are too many, the pre-sleep nodes will sleep at the same time, and the coverage quality will decrease. At the beginning of the operation, the number of node work is reduced, the overall energy is saved, and good coverage can still be maintained at the later stage.

5. Conclusion

In the wireless sensor network technology is widely used today, its perception redundancy and data fusion feature is used with many fields. sensor node resources are limited, large-scale deployment will appear node redundant coverage, especially in the case of sparse communication network, energy saving of energy conservation has a great impact on coverage. the conventional scheduling algorithm ignores the influence of boundary factors, and the residual energy factors of nodes are not taken into account. in the case of low node energy, if redundant discrimination is carried out according to the above algorithm, this part of the node will always work, and the part with high node energy may be dormant all the time.the node has the problem of not dormant in the boundary, and the problem of coverage shrinkage after energy depletion. in this paper, the factors tolerate the coverage model of the coverage area, and the residual energy parameters are added to its discriminant conditions, which solve the problem of node dormancy and reduce the energy consumption. In addition, the algorithm of pre-sleep node entering dormancy by election method is proposed, which improves the efficiency of energy utilization and ensures the coverage quality.

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