Research on Consistency of IoT Data Communication Based on Eigenvector Vector

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Abstract. Aiming at the large deviation of the traditional Internet of things (IoT) communication consistency algorithm, this paper designs the IoT information communication consistency algorithm. According to the obtained eigenvectors, the communication consensus protocol is generated, and the truncation factor is introduced to solve the problem that the cooperative variable deviation between the new node or restart node and the eigenvector is too large in the process of consistency, so as to realize the information communication consistency of the Internet of things. The experimental results show that the deviation value of this method is lower than that of the traditional algorithm, and is close to the standard value. This design ensures the consistency of the information communication of the Internet of things, and has certain application significance.

1. Introduction
In order to avoid the problem of traditional Internet of things (IoT) information communication consistency algorithm, the network management layer is established to reduce the phenomenon of multiple nodes sending repeatedly and multiple nodes sending together. On this basis, the eigenvector is obtained, and the information of two or more nodes with the same information state is obtained by formula calculation. According to the obtained eigenvector, the communication consensus protocol is generated\(^1\). It can reduce the deviation brought by the new nodes at any time, and apply the distributed theory to reduce the transmission problems in the network and reduce the network load, so as to realize the information communication consistency of the Internet of things. Through the experimental comparison, it is proved that the method designed in this paper is close to the standard value in the calculation, which can ensure the consistency of the information communication of the Internet of things, and has certain design application significance.

2. Design of consistency algorithm for Internet of things information communication

2.1. Establish a network management layer
Because there is no strict control management layer in the Internet of things, all information nodes are equal, so in the big data transmission under the environment of the Internet of things, there will be multiple nodes repeatedly sending and multiple nodes sending together. For this phenomenon, the network management layer \(^2\) is generated to track the node information that needs to be sent. The target of target tracking is to obtain the specified tracking accuracy with the minimum energy consumption. In each stage of information communication, the number of sensors participating in tracking is reasonably selected, and the target tracking algorithm is proposed to improve the control of
the network control layer on the information communication nodes [3]. The calculation formula is as follows:

\[ P_i = \sum_{k=1}^{n-1} E_{k \rightarrow s_i} + M_e \]  

(1)

In the formula, \( P_i \) represents the number of sending nodes, \( M_e \) represents the transmission time between nodes, and \( n - 1 \) represents the transmitted node information. This calculation does not perform orientation analysis.

The power consumption in communication [4] depends on the communication distance, and the information sent is determined by the range to be sent. In order to reduce the energy consumption of information nodes and the communication distance between cluster head nodes and cluster member nodes, a dynamic transmission algorithm is proposed. It is assumed that the sensor node is in a dormant state most of the time and is activated only when there is a communication service [5], and the calculation formula for selecting the cluster head is:

\[ \Delta F_j = \sum_{i=1}^{n} U \left( T \ast x_i \right) \]  

(2)

In the formula, \( F_j \) represents the process of selecting cluster heads, \( x_i \) represents the communication distance between nodes, and \( T \) represents the direction of movement of the cluster head nodes. This calculation does not do orientation analysis [6].

2.2. Obtaining eigenvectors

In order to achieve the consistency of information and communication, first of all, it is necessary to obtain the eigenvector, through which the communication nodes consistent with the target can be found. The process of obtaining the eigenvector is shown in the figure.

![Eigenvector acquisition process chart](image)

Figure 1 Eigenvector acquisition process chart

The figure shows the eigenvector acquisition process diagram. When the eigenvector is acquired, follow the above steps to acquire it, and when the nodes with the same information are found, the eigenvector acquisition is completed. The state of the system when it starts to run is set as an initial state of information node transmission. If \( n \) is transmitted to the receiver within time \( T_n \), if no other nodes send messages within the range of receiving distance, then there is no case of multiple nodes transmitting, and the receiver can receive \( n \) successfully. All the eigenvectors are set in the same working mode, and the algorithm can be entered from any node or multiple nodes [7].

\[ D(f) = \frac{r(n-1)+E}{DG_{r-1}} \]  

(3)
In formula (1), $c_f$ represents the node information in a static state, $G_{i-1}$ represents the eigenvector data information, and $E$ represents the node transmission time slot. This calculation does not perform orientation analysis.

Through the above formula, the integrity of eigenvector list acquisition is improved. If the above formula is true, it means that any two nodes that are neighbors have the same information state. Because there are many node data to be transmitted, if any two nodes' information is consistent, the eigenvector is obtained successfully. By obtaining network nodes, the network load can be reduced and the calculation time of algorithm can be saved [8].

2.3. Generation of communication consensus protocol

The influence of all nodes on a given node is obtained by a fixed approximation. The reference state in the neighborhood system of the node is defined as:

$$E_C = \frac{x_c + t}{\sum_j p(z - w_j)}$$  (4)

In formula (4), $E_C$ represents the initial co-variable obtained by the node during the configuration process, $w_d$ represents the optimal function of the variable, and $z$ represents the optimal goal to be reached. This calculation does not perform orientation analysis.

From the analysis of the above formula, it can be seen that when $r(n - 1)$ achieves the minimum value, the best advantage of consistent global system information is obtained. However, in the above calculation, obtaining a certain node will produce a certain network load, which will increase the information interaction time in the network, and may lead to the information obtained out of date. To solve this problem, the distributed theory is applied to reduce the transmission problem in the network, reduce the network load and improve the consistency of information communication in the Internet of things.

3. Case demonstration analysis

3.1. Experimental environment settings

The experimental environment uses a UDHFGI bus network to summarize a system composed of 10 nodes, including multiple critical objects and multiple equivalent load nodes, the ratio of read and write operations is set to 1:1, and the bus uses UPKIGV/SIJO communication mode. In order to facilitate the experimental analysis, it is assumed that each node only interacts with the horizontal node and its horizontal or eigenvector. The standard neighbor system is used to exchange cooperative variables between each node and its neighbors, and update its own variable information state, and set the experimental parameters, as shown in the table.

| Node | Active power/MW | Equivalent load/MW | Equivalent load reactive power/MVAr |
|------|----------------|--------------------|-----------------------------------|
| 1    | 10             | 0.452              | 0.844                             |
| 2    | 0.5            | 0.751              | 0.7441                            |
| 3    | 5              | 0.785              | 0.3211                            |
| 4    | 5              | 0.874              | 0.45                              |
| 5    | 0.5            | 0.7514             | 0.32                              |
| 6    | 0.5            | 0.5512             | 0.78                              |
| 7    | 3              | 0.7241             | 0.21                              |
| 8    | 5              | 0.7888             | 0.78                              |
| 9    | 0.5            | 0.7851             | 0.21                              |
| 10   | 0.5            | 0.4577             | 0.75                              |
Table 1 shows the settings of the experimental environment parameters. Both algorithms are tested in this environment to ensure the rigor of the experiment.

3.2. Analysis of experimental results
This experiment mainly tests the communication consistency of the two methods, compares the deviations of the two methods in the calculation, and sets the highest deviation line. The deviation value is controlled within this line, which will not affect the consistency of the algorithm. The experimental results are as follow:

From the analysis of Figure 2, it can be seen that the traditional information communication consistency algorithm has a lot of difference with the standard line, and the algorithm value is not stable, sometimes high or low, and the deviation is large. In this paper, the communication consistency algorithm is close to the standard line in the calculation, which shows that the method has high consistency, can greatly reduce the deviation in the algorithm, reduce the damage to the communication network, and reduce the situation of multiple nodes preemptively sending. Through the above experiments, the effectiveness of the algorithm designed in this paper can be proved and the traditional calculation can be improved The problems in the method are of practical significance.

4. Conclusion
Aiming at the problem of the consistency algorithm of the information communication of the Internet of things, this paper designs the consistency algorithm of the information communication of the Internet of things through three steps. The target tracking of node information that needs to be sent can be carried out to improve the control of network control layer over information communication nodes and reduce the situation of multiple nodes sending simultaneously. Experimental results show that the algorithm has low deviation, greatly improves the efficiency of the algorithm, reduces the number of required messages, and reduces the type of messages. In short, the design of the Internet of Things information communication consistency algorithm has certain practical application significance, it is hoped that this design can provide certain help to the Internet of Things information communication, promote the development of the Internet of Things information communication.

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