Heterogeneous Network Task Scheduling Parody Based on Improved Grey Relation

Zengtan Lin[a,*], Zicheng Huang

College of Engineering and Technology, Yang-En University, Quanzhou, Fujian, 362014, China

[a] lztlenovo@163.com

*corresponding author

Abstract: This paper analyzes and studies the influence of inaccurate decision of heterogeneous network switching algorithm on table tennis, and puts forward a heterogeneous network switching algorithm based on differential threshold ratio and improved grey association analysis. the algorithm uses the difference threshold ratio to pre-judge whether the network is switched or not, and then selects the target switching network through the improved grey association analysis algorithm to judge whether the network is switched or not. to test the performance of the algorithm, a heterogeneous network environment integrating WLAN and UMTS is established. MATLAB、 OPNET and other simulation tools are used to compare the number of network switching and the failure rate of network switching. The results show that the algorithm reduces the number of network switching and the failure rate of network switching. The experimental results show that the algorithm can effectively improve the accuracy of network switching decisions and suppress the ping-pong effect..

1. Introduction

With the rapid development of mobile Internet communication and broadband technology, the existing network working environment is becoming more and more complex. many access technologies, such as wireless local area networks (WLAN), global mobile EOM communication systems (GSM), universal mobile communications (universal mobile Telecommu nications). communication systems (UMTS) and so on overlap in a certain range, forming heterogeneous network fusion environment. The integration of heterogeneous networks is the inevitable trend of future network development. Different networks have their own advantages and disadvantages in transmitting different services. WLAN has the characteristics of high bandwidth, small coverage, high data transmission rate, UMTS low bandwidth, wide coverage, low data transmission rate. Therefore, the integration of the network can avoid the waste of resources and provide high quality services for mobile terminals. In this context, heterogeneous network switching has become a hot topic. At present, the research of heterogeneous network switching algorithms usually includes horizontal and vertical switching H1.. the level switching takes the received signal intensity (RSS) of the mobile terminal for different networks as a reference, and the switching decision will be made only RSS certain conditions are satisfied. based on the above analysis, a heterogeneous network transition algorithm based on differential threshold quotation and improved grey association analysis is proposed to reduce the switching time due to switching to the optimal network.

In order to enable mobile terminals to better access the optimal network and avoid the waste of resources, a unified description of heterogeneous network resources is needed. in heterogeneous network fusion environment, in order to make network exchange more accurate, as many attributes as possible are selected as decision parameters of network exchange. in selecting network decision parameters, the requirements of mobile terminal, specific service and network sub-station are usually considered. in this paper, decision attributes, bandwidth, delay, tension and cost are selected

from three aspects: mobile terminal speed, signal strength and communication volume.

1.1. Traditional Grey Relational Analysis

Grey condition analysis (Gila) is a common method to calculate the relative degree of evaluation system. The evaluation system is sorted according to the correlation between contrast. The greater the gray correlation in the evaluation system, the better the evaluation system. On the contrary, the evaluation system is worse, and the calculation amount of this method is small, but because each index is treated equally, its objectivity is poor, so the subjective and objective weight method can reflect both subjective and objective.

1.2. Network Attribute Weights Determined

The weight determined by AHP can reflect the needs of enterprises and the preferences of users. It is a method to determine the weight of decision skills through subjective evaluation. The AHP method can be divided into four steps :(a) to establish the hierarchical structure of heterogeneous networks ;(b) to establish the comparison matrix of decision attributes. Compare the scale value with the attribute j Q.C and calculate the weight of each attribute. the self-vector corresponding to the maximum attribute value in the matrix C is calculated by the attribute value equation CW=amaxw. in this paper, the weight of the network attribute is calculated and normalized by the square root method. the ratio of sweetness to consistency index is concave and randomly generated to test the consistency requirement in the evaluation matrix. less than 0.1, the judgment matrix is considered to be consistent. otherwise, adjust the evaluation matrix again. reset the meaning of each parameter.

Entropy weight method is widely used in multi-objective selection, system optimization and evaluation. it is a common target weight method. its weight is determined by attribute information entropy. the smaller the attribute information entropy, the greater the weight. On the contrary, the less important it is. Trade law can be divided into three stages.

2. Improved Heterogeneous Network Switching Algorithm

Based on the analysis of traditional algorithms and grey correlation analysis, an improved method is proposed. first, the difference ratio between the current network received signal strength and the reserved threshold value is periodically detected as the switching trigger condition. if the threshold ratio is less than 0.05, the switching trigger request is started, otherwise it resides in the current network. Using the differential threshold ratio to predict the decision can guarantee the communication link to switch without interruption, if the direct pre-judgment according to the received signal strength, it is possible that the current network link has been interrupted, but has not yet switched to the optimal target network. Secondly, we judge whether the network coverage is a multi-network coverage area, if so, we use the network switching algorithm proposed in this paper to improve the grey correlation analysis to obtain the grey correlation value of the candidate network, so as to select the target network and decide whether to switch the network. the flow of the proposed heterogeneous network switching decision algorithm is shown in figure 1.
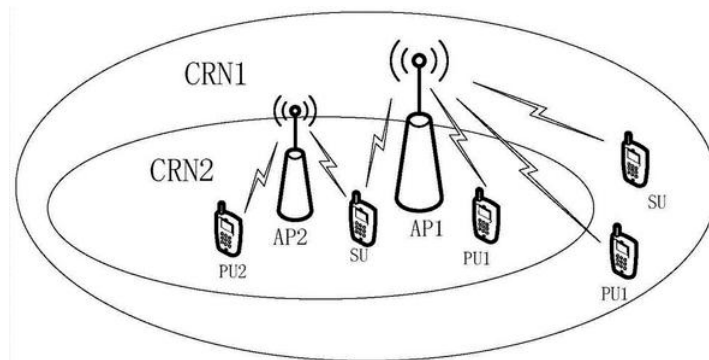

Figure 1 Improved heterogeneous network switching algorithm

2.1. Improved Grey Association Analysis Algorithm

The improved grey correlation analysis method is to solve the problem that the correlation degree of each attribute association coefficient is calculated by means of mean value method and the correlation degree of the network will be equal and the network can not be switched accurately. in order to improve the computational accuracy, this paper uses the combination of generalized weighting and euclidean distance to represent the degree of difference between the comparison candidate network and the optimal network.

2.2. Identification of an Optimal Reference Network

The optimal reference network is the best network composed of the optimal reference attributes of all networks. When the attribute is the benefit type attribute, the optimal attribute value is the maximum value in each column, and when the attribute is the cost type attribute, the optimal attribute value is the minimum value in each column, which is recorded as a tie.

3. Determine Network Attribute Weights

Considering the influence of subjective and objective factors on mobile terminals, this paper synthetically considers service preference and network current conditions to assign a combination weight for each attribute. the determination of network attribute weight uses the combination weighting method mentioned earlier. 3 Simulation experiment and 3 result analysis

3.1. Simulation Scenario

To facilitate the simulation research, a heterogeneous network environment with overlapping coverage of WLAN and UMTS networks is built. as shown in figure 3, the RSS threshold values with bandwidth of 10 Mbps,UMTS network bandwidth of 2 and UMTS are set to one 95 dbm、one 105, respectively, using multimode terminals as mobile terminals. the mobile terminal moves from the UE—A end to the UE—B end at a uniform speed of 1-5 m/s from the middle point of overlap between the WEAN and the network, respectively. the mobile terminal will switch between networks in the range covered by the three networks overlapping as shown in figure 2. if the heterogeneous network switching algorithm is not selected properly, there will be multiple unnecessary network switching in the partially covered area of the three overlapping networks.
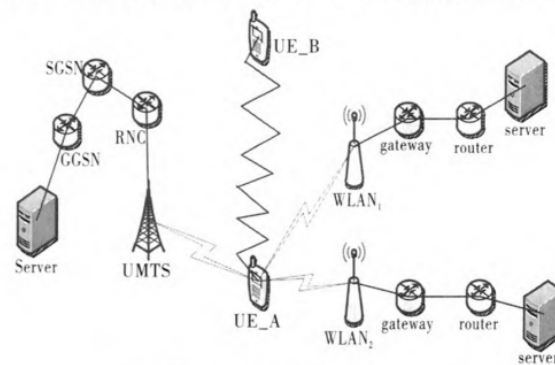

Figure 2 Mobile terminals

3.2. Simulation Analysis

The performance of heterogeneous network switching algorithm is mainly determined by the performance evaluation index of switching algorithm. In this paper, switching times and switching failure rate are used as the evaluation index of switching algorithm. By OPNET the two business types in the heterogeneous network simulation scenario are simulated 16 times, and the number of network switching and the switching failure rate of each experiment are counted. For session business, the traditional grey association analysis algorithm is about 8 times less than the traditional grey association analysis algorithm, and the traditional RSS algorithm is about 4 times less than the

traditional grey association analysis algorithm. For streaming services, the traditional gray association analysis algorithm is about 9 times less than the traditional RSS algorithm in switching times, while the algorithm in this paper is about 4 times less than the traditional gray association analysis algorithm in switching times. Therefore, this algorithm obviously reduces the number of network switching of mobile terminals due to ping-pong movement in the course of network edge movement.
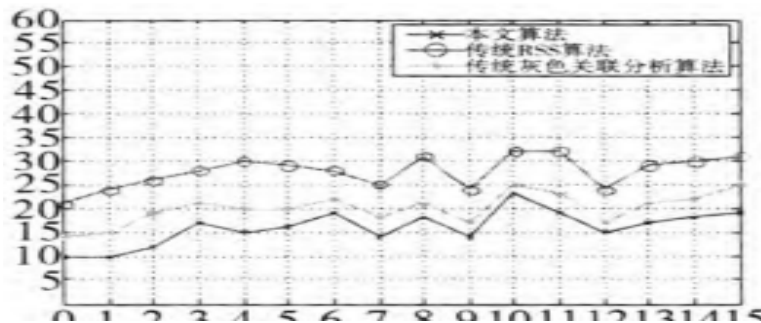

Figure 3 Relevant figures

4. Concluding Remarks

In the heterogeneous network simulation environment, this paper fully considers the received signal strength, mobile terminal speed and other network attribute parameters. By analyzing the shortcomings of the traditional algorithm and the traditional grey association analysis algorithm, this paper proposes a switching algorithm based on the difference threshold ratio and the improved grey association analysis. The difference threshold ratio is used to pre-judge the current network, and the combined weighting method is used to determine the weight allocation of each evaluation attribute. Through the simulation and comparison analysis of three heterogeneous network switching algorithms, the proposed algorithm can accurately switch trigger and switch decision, at the same time reduce the number of mobile terminal switching in the mobile process, reduce the failure rate of network switching. In the future research process, the effect of energy loss on heterogeneous network switching will be further considered.

Fund Project

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