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Research on Fuzzy Information Adaptive Location in Electronic Communication Network

Xiaobao Zhang, Wei Chen
College of Information Engineering, NanChang University College of Science and Technology, Jiujiang, 332020, China

Abstract: Research on the positioning of mobile communication information in wireless network can better guarantee the operation quality of wireless network. Traditional methods use the influence degree of unknown information on positioning accuracy to adjust the influence weight of sampled particles to complete information positioning. However, the positioning model is not established, which leads to inaccurate positioning. In this paper, a wireless network based on particle swarm optimization (PSO) is proposed to optimize the fuzzy information adaptive localization method in electronic communication network. The mean square error between the estimated signal and the observed value of the fuzzy information in the electronic communication network is obtained by fusing the feature location principle. The mobile communication information location problem in the wireless network is transformed into a nonlinear optimization problem of the objective function. The location estimation probability of the information to be located is calculated, and a proposed density is searched to replace the real location probability density of the mobile communication information that cannot be collected Particle swarm optimization algorithm constructs the adaptability function and penalty function of network mobile communication information location, constructs the network mobile communication information location model based on particle swarm optimization, and uses the above model to carry out the global optimal solution to the nonlinear optimization problem of the transformed objective function, so as to complete the network mobile communication information location. Simulation results show that the improved method has high positioning accuracy and can effectively improve the operation quality of the network.

Keywords: Electronic communication; Information adaptation; Information location

1. Introduction

In the era of rapid development of communication network technology, electronic network communication has gradually become an indispensable part of daily life, and the current electronic network communication technology has gradually replaced the traditional communication technology [1]. In the process of using electronic communication network, fuzzy data is often generated due to communication conflict or network environment. In the process of managing and scheduling electronic communication network data, it is necessary to identify and locate the fuzzy data quickly. It can be seen that the effective fast positioning of fuzzy information is the key to realize the data scheduling and management of electronic communication network [2]. It is of great significance to study the fuzzy database model and location algorithm of electronic communication network. After the introduction of the concept of fuzzy information, fuzzy information fusion target recognition can be transformed into the recognition results of each data, which is about the importance of fuzzy data information [3]. The application of fuzzy information in the data target recognition general line of decision-making level is given, and the important positioning method of fuzzy information is provided. But this method is easy to be interfered by the external environment, resulting in low accuracy and slow speed of fuzzy data location. In view of the above problems, this paper proposes an adaptive location and recognition method of fuzzy information in electronic communication network, which proves the effectiveness of location and recognition of fuzzy information.

2. Adaptive Location of Fuzzy Information in Communication Network

2.1. Time frequency feature extraction of fuzzy information

The fuzzy information of electronic communication network usually exists in the form of unsteady broadband signal. It is necessary to establish the fuzzy database model of electronic communication network to locate and identify the fuzzy information by data detection method. In the fuzzy network information data model, the distributed code is used to distribute the task code to multiple data points to achieve distributed execution. After the execution, it is returned to the client, which can reduce the noise interference of electronic data network in transportation and transmission. When using single computer or network to access big data, the state of fuzzy information data can be evaluated and predicted. In the fuzzy information database of electronic communication network, some devices such as I/O and disk are used to carry out effective numerical access, so as to establish the management mode of fuzzy information processing of electronic communication network. It is assumed that the data set in the fuzzy information database of electronic communication network is $X = \{x1, x2, \ldots, xn\}$, n is the number of fuzzy information data sets X in electronic communication network. All the feature vectors in X are a p-dimensional vector. There are C fuzzy information categories in y. the i-th fuzzy information cluster center is $u_i = \{u_{i1}, u_{i2}, \ldots, u_{ip}\}$. If the fuzzy information database of electronic communication network is in an unstable state, sampling the broadband signal. If the function distribution of $\{x(t1+\tau), \ldots x(tn+\tau)\}$ has autocorrelation, the expression of fuzzy information using function is:

$$\theta_1(k+1) = X\theta_1(k) - \mu \operatorname{Re}[y(k)\varphi(k)] * Ypu_{ip} \tag{1}$$

The fuzzy database features are analyzed by using the fuzzy degree function, and the same variable y value and the data set $X = \{x1, x2, \ldots, xn+m\}$. In the fuzzy information database are confirmed, xn + m}. Suppose $(R_1, +, \times), (R_2, \oplus, \otimes)$ is a closed loop of two eigenvectors and a function of the probability distribution of fuzzy feature points in the fuzzy database of electronic communication network $f : R_1 \mid\rightarrow R_2$, the feature extraction equation of fuzzy data is as follows:

$$\dot{x} = V\cos\theta\cos\psi v \tag{2}$$

$$\dot{y} = V\sin\theta \tag{3}$$

$$\dot{z} = -V\cos\theta\sin\psi \tag{4}$$

$$\dot{\varphi} = \omega_y \sin\gamma + \omega_z \cos\gamma \tag{5}$$

$$\dot{\psi} = \left(\omega_y \cos\gamma - \omega_2 \sin\gamma\right) / \cos\varphi \tag{6}$$

$$\dot{\gamma} = \omega_x - \tan\varphi\left(\omega_y \cos\gamma - \omega_z \sin\gamma\right) \tag{7}$$

Where x, y and z are the initial frequency values of fuzzy information in the fuzzy information database of electronic communication network; ψ is the fuzzy information data set, θ is the vector in the space of variable Q, φ is the instantaneous amplitude of complex signal z(t) in the fuzzy information database of electronic communication network, and γ is the resonant amplitude in the frequency domain of fuzzy data.

2.2. Selection of information link in communication network

Based on the dependency relationship between link fault and node fault, the fault dependency graph is improved. According to the dependency relationship between network nodes in the Markov network model of smart grid, the directed graph is established, and the fault location is carried out through the correlation matrix of Markov network under certain conditions, Through the establishment of forward multilayer neural network model, the neural network is trained by samples. According to the difference between the expected output and the actual output, the connection weights between the neurons are continuously adjusted, so that the actual output value is close to the expected value with the required accuracy. The fault diagnosis method based on fuzzy neural network is adopted, and the fault alarm information is fuzzified before fuzzifying. In order to improve the efficiency of fault location and analysis, the communication information network nodes are divided by network clustering.

Aiming at the correlation effect of communication network fault on information network fault, a bipartite graph fault correlation model is established for each network sub domain, so as to analyze the clustering and fault effect of communication network information network. The details are as follows.

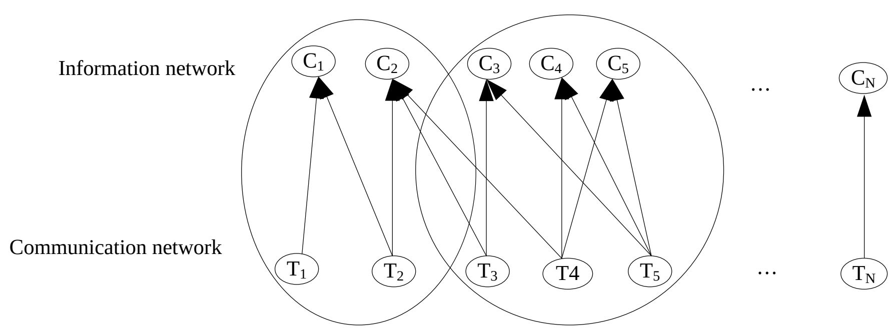

Figure 1. Clustering and fault impact of communication network and information network

The arrow in the figure indicates that the related communication network fault node will be associated with the information network fault area. The real fault location information of the network can be obtained by the statistical model. According to the known conditions, the joint fault location problem of communication and information network is modeled and solved. The location of mobile communication information in wireless network needs to initialize the one hop and two hop error points. Based on this, the location of unknown mobile communication information is estimated. The probability of mobile communication information at different times is analyzed. The collected information location information is filtered to filter out the information that does not meet the constraints, and the mean value of the remaining samples is calculated, The communication radius of the network information is given. According to the ratio of the estimated position and the euclidean distance of the sample matrix to the communication radius, the location of the wireless network mobile communication information is completed. The specific steps are as follows.

Suppose that l represents the posterior position distribution of mobile communication information at time t, and represents the observation information received from anchor information point at time t, $p\{l_i|\ l_{t-1}\}$ position distribution at time t is predicted by the position S at time t-1. Then, according to the following formula, the position of unknown mobile communication information is estimated by the initial one hop and two hop anchor communication information of unknown mobile communication information. The specific algorithm is as follows:

$$\eta^*(a) = \frac{S_t \times (t-1) @ O_t}{p\{l_t|\ l_{t-1}\}} \otimes \frac{\left[(S_t)\otimes t\right]}{S_{t-1}} A\times e \qquad (8)$$

Where V is the set of one hop anchor information points and D is the set of two hop information points. Suppose, $\eta(z)$ represents the Euclidean distance of the communication information. If the speed and moving direction of the information point cannot be known, but its speed is less than the maximum moving speed of the information point represented by E, the position estimation probability of the mobile communication information at any time can be obtained by using the formula:

$$\mu(\wp) = \frac{V_{\max}\otimes l_{t-1}}{l_i \otimes V_{\max}} d\left(l_t, l_{t-1}\right) \otimes \frac{\eta(z)\otimes\Phi(\partial)}{A\times e} \qquad (9)$$

Where $\eta(z)$ represents the connectivity between unknown mobile communication information and anchor information points, φ(a)represents the weight of each anchor information point. Hypothesis, by E(w), on behalf of all the beacon information point weighted moving average, x represents the state vector of the mobile communication information at the moment i and k, s "(v) represents the moment U mobile information I state equation, the use of type on the basis of an accept mobile information unknown jumped and anchor point information for mobile location using filter samples, eliminate does not conform to the constraints of samples, specific algorithm is:

$$q^\alpha(z) = \frac{E(w)\otimes x_k^i}{s''_{(v)}} \otimes \frac{a_{(m)}\oplus\xi(s)}{X_{(I)}} A\otimes e\times\Gamma(\mu) \qquad (10)$$

Where a (m) represents the observation equation of mobile communication information I at time t, and (s) represents the range of sensor ranging error, $\ell(d)$ R (μ) represents the environmental information obtained from the real position of the point. Suppose that $\hbar(i)$ represents the propagation state of signals between information points, $K(x,y)$ represents the probability density function of the measurement noise, then the communication radius of the network information points is given by the formula, and the mean value of the remaining samples is further calculated:

$$\gamma(S) = \frac{\ell(d)\times\hbar(i)}{\theta(Q)} \otimes \frac{\delta^*\otimes K(x,y)}{U} \qquad (11)$$

Where U represents the communication radius of the network, δ represents resampling to increase the number of samples, and Q represents the initial estimated location of unknown information points. Assuming that the path loss index is determined by the industry representative, the positioning of mobile communication information in wireless network is completed by using the formula

$$\zeta(s) = \frac{\Psi\times d\left(l_1, l_{t-1}\right)}{(A\times e)\times U} \otimes \gamma(S) \qquad (12)$$

In order to improve the accuracy of fault location and the efficiency of network fault location analysis, the network nodes are clustered first, which greatly reduces the scale of relevant fault location model and problem solving time. According to the fault correlation degree between communication network nodes, the network is clustered, and each cluster is taken as a network sub domain for independent network fault analysis. Secondly, a bipartite graph fault correlation analysis model is established for each network subdomain. According to the fault propagation characteristics of communication information network, the communication network fault node is taken as the root fault layer, and the information network fault node is taken as the associated fault layer. Through the fault propagation association relationship between the source fault node and the associated fault node, the joint location of communication information network is realized. Finally, the problem of joint fault location is solved by using the objective ranking method to achieve efficient and accurate joint fault location between information and communication networks.

2.3. Realization of information adaptive location in communication network

The main purpose of network communication is data transmission and sharing, but now more and more enterprise business applications are deployed to the communication network, and the realization of various business applications has gradually become a new feature of the communication network. In order to ensure the normal operation of the network deployed for various specific business needs, fault location is regarded as the core function to meet the new characteristics. Starting from the analysis of the characteristics of network faults, the specific location of network faults is summarized.

The communication network structure includes database server and network terminal server. The database server is mainly installed in Oracle database, and the servers are all installed in Apache server, which is deployed on the corresponding network page for the business logic in the front page. The Axis2 server is deployed in the network terminal server. Both database server and network terminal server are public servers. The required database server is public server, which is connected by router, and the servers connected by different routers are located in the subnet. According to the structure diagram, the communication fault can be quickly located. According to the topology of the network nodes, the nodes are mainly distributed in the sensor module. Therefore, the node distribution of the module is analyzed, and the clustering channel is designed to send the node information to the cluster head in the form of data. Between the cluster head and the sink node, the channel tracking fusion technology is used to locate the mobile vulnerable nodes. The clustering channel is shown in the figure.

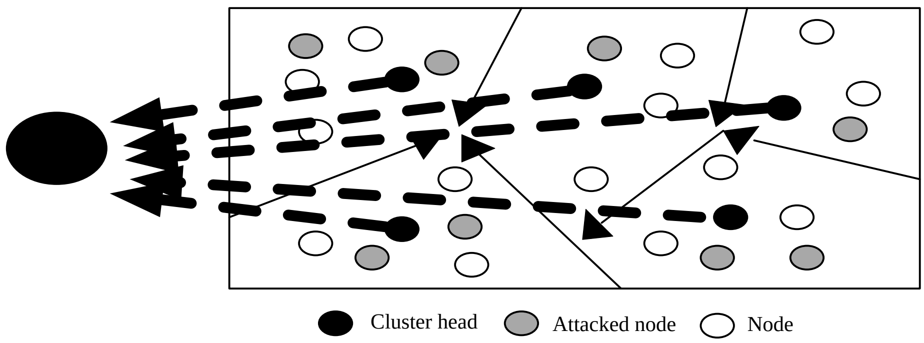

Figure 2. Schematic diagram of electronic communication network clustering channel

It can be seen from the figure that the channel of the communication network is composed of cluster heads, nodes and attacked nodes. The attacked node has dynamic attributes, so it is relatively easy to locate, while the normal node has static attributes, so it is difficult to locate. Cluster head has dynamic attributes; local coordination can produce clusters, and has the advantages of data fusion, which lays the foundation for mobile node channel tracking fusion positioning. According to the time-frequency feature extraction of fuzzy information, the fuzzy data in the access network database is divided into explicit data and pseudo data. Compared with the information in the two states, the information features that can be extracted are different. Fuzzy information monitoring and diagnosis of electronic communication network is the detection and collection of signals. Using the collected information, the fuzzy information model of electronic communication network is designed, the fuzzy information data set is fused and analyzed, and the feature extraction and classification features are used to diagnose the fuzzy information. The steps of fuzzy information positioning in electronic communication network are as follows:

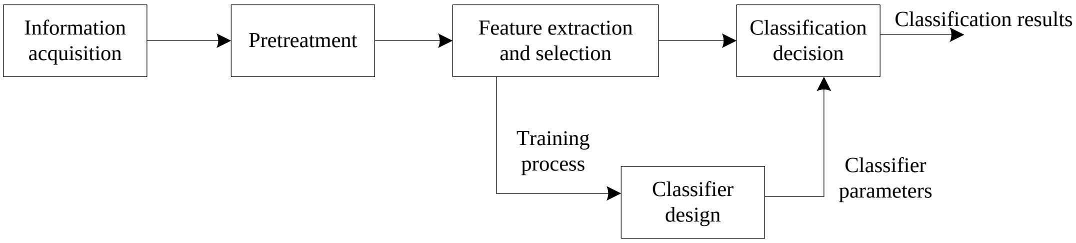

Figure 3. Optimization of fuzzy information location steps in electronic communication network

The accurate way to judge the characteristics of fuzzy information is based on Fisher linear analysis method, which is to ensure the maximization and minimization of inter class dispersion. When searching the mapping direction of the operation target, the distance between all classes should be ensured to reach the maximum, and then the normalized fuzzy information data should be classified to realize the recognition of fuzzy information data.

3. Analysis of Experimental Results

In order to verify the adaptive positioning effect of fuzzy information in electronic communication network, the experimental environment is amda10-5750m2.50ghz CPU, 4GB memory, win10 operating system, visual studio 2013 + opencv3.0, matlab 2013 software. In order to prove the validity of the proposed algorithm, an experiment is needed. The corresponding verification needs to be carried out through experiments, and the network mobile communication information positioning experimental platform is created in Matlab environment. The simulation area of the experiment is 120m × 120m. In this area, 120 unknown information points and 10 anchor information points are randomly deployed, and the communication radius of each information point is r = 15m. The simulation results are obtained through 9 times, and the root mean square error represented by RMSE / M is used as the evaluation index of positioning error.

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(x-\hat{x}_i\right)^2+\left(y-\hat{y}_i\right)^2} \qquad (13)$$

Where (x, y) represents the reality of the unknown information point, the position of the unknown information point estimated in the ith experiment, and N represents the number of experiments. Compared with the fuzzy information location method of virtual hierarchical three-dimensional space node, the fuzzy information adaptive location and recognition method of electronic communication network proposed in this paper is verified, and the effectiveness of this method is verified. In the simulation part, the positioning accuracy and positioning time of fuzzy information are compared. In the experiment, it is assumed that the observation rate of network data is or = 100%, the loss rate is 0%, and the false rate is 0%, as shown in the figure in normal time:

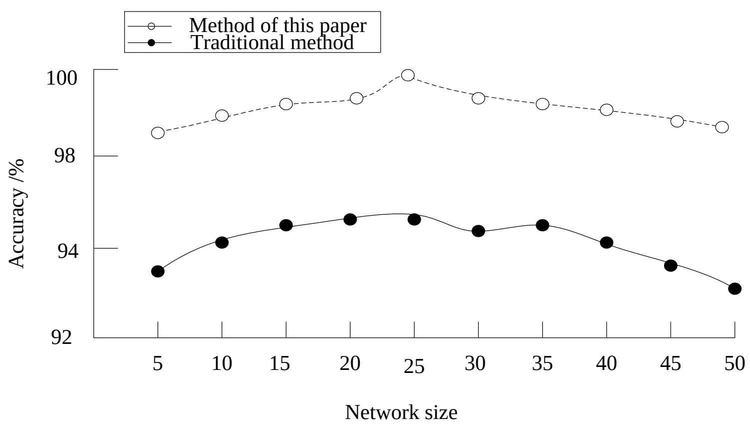

Figure 4. Comparative detection of information positioning accuracy

In the figure above, we compare the accuracy of fuzzy information location between the proposed method and the virtual hierarchical 3D space node fuzzy information location method in the normal time window for different network sizes in the above simulation environment. It can be seen from the figure that the results of this method are relatively stable under different network sizes. When the network size is 25, the accuracy of fuzzy information positioning gradually presents a downward trend. The main reason is that the larger the scale is, the more fuzzy information is and the more complex the situation is, the greater the impact on the accuracy of fuzzy information positioning is; and the positioning accuracy of virtual hierarchical 3D space node fuzzy information positioning method fluctuates greatly. At the same time, from the trend point of view, the overall positioning accuracy of this method is higher than the virtual hierarchical 3D space node fuzzy information positioning method, and the average accuracy remains above 98%. Furthermore, the time cost of the proposed method is compared with that of the virtual hierarchical 3D space node fuzzy information location method under different network sizes:

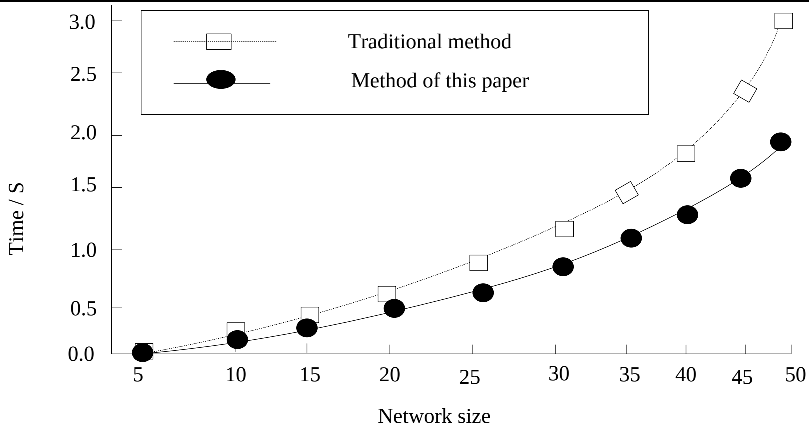

Figure 5. Time consuming contrast detection of fuzzy information location

Under different network sizes, the time cost of the proposed method is much higher than that of the proposed method. The main reason is that the calculation is complex, and the calculation speed of the proposed method is faster and more efficient. At the same time, with the continuous change of network scale, the time cost of fuzzy information location rises rapidly, which affects the final location efficiency. However, when the mobile communication information is located in the current wireless network, the accurate location information of unknown information points can not be obtained, and the accuracy of the information points obtained by this method is not high. The simulation results show that this method has high positioning accuracy and can effectively improve the operation quality of network information.

4. Concluding Remarks

Accurate and fast location and mining of fuzzy information in electronic communication network database is an important way to realize fuzzy information scheduling and management. This paper proposes a new adaptive location method of fuzzy information in electronic communication network. Experimental results show that the proposed method is faster and more accurate than the traditional method. Although the above experiments prove that this method can quickly and accurately locate the fuzzy information of electronic communication network, there are still many places to be improved. For example, when the electronic information network is unstable, fuzzy information location will be time-consuming. We can try to deeply analyze the electronic communication network structure, so as to improve the efficiency of subsequent location work and better guarantee the effect of network information adaptive location.

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