Research on Active Push Method of Multi-source Patrol Information in Large-Capacity Communication Network

Yan-song Hu(✉)

Liaoning Petrochemical Vocational and Technology, Jinzhou, China
gfy087@126.com

Abstract. The traditional large-capacity communication network multi-source patrol information active push method has the defect of poor push effect. For this reason, the active push method of multi-source patrol information in large-capacity communication network is proposed. The differential filtering method is used to preprocess the collected multi-source patrol information, based on the processed multi-source patrol information obtained above. The multi-source patrol information is grouped and clustered to obtain a multi-source patrol information feature set, and the obtained multi-source patrol information feature set is collaboratively filtered to obtain a user-neighbor neighbor multi-source patrol information set. The active push algorithm is used to actively push the nearest neighbor multi-source patrol information, which realizes the active push of multi-source patrol information in the large-capacity communication network. Through experiments, the proposed multi-source patrol information active push method push response time of the large-capacity communication network is 4.1 S less than the traditional method. The proposed multi-source patrol information active push method for large-capacity communication network has better push effect.

Keywords: High capacity · Communications network · Multiple sources · Inspection information · Push

1 Introduction

Due to the openness of communication networks, the information resources of communication networks are also expanding, bringing more and more difficulties to people, and the result is that people are more and more difficult to obtain multiple inspection information in the communication network [1]. In response to this situation, the information initiative push method came into being and it has developed rapidly. The rapid development of the information push method brings new vitality to the active push of multi-source inspection information in large-capacity communication networks [2]. The multi-source patrol information active push method of the large-capacity communication network maximizes the user's multi-source patrol information of interest, saving the user's active search time and satisfying the user's needs.

G. Gui and L. Yun (Eds.): ADHIP 2019, LNICST 301, pp. 478–487, 2019.
https://doi.org/10.1007/978-3-030-36402-1_51

The traditional large-capacity communication network multi-source patrol information active push method has the defect of poor push effect, mainly because the push response time is too long, and the user's demand for multi-source patrol information cannot be satisfied. Therefore, a large-capacity communication network is proposed. Research on active push method of multi-source inspection information.

2 Design of Active Push Method for Multi-source Patrol Information in Large Capacity Communication Network

In the traditional method, the cluster analysis method is mainly used to analyze the characteristics of the user. Due to the insufficient degree of information analysis, the user cannot provide satisfactory multi-source inspection information [3]. In the proposed method, the main information is used to push the multi-source inspection information with accurate, high-quality and high satisfaction through the multi-level and all-round analysis. Push the multi-source inspection information of interest to the user according to the user's needs. Firstly, the collected multi-source patrol information is pre-processed, then clustered, and then collaborative filtering method based on clustering and service evaluation method based on user preference is taken into consideration, taking into account user needs and preferences. The user pushes multi-source inspection information of interest and demand. The multi-source patrol information active push method framework of the large-capacity communication network is shown in Fig. 1.

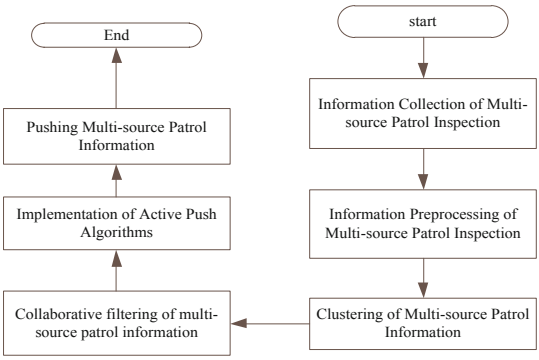

Fig. 1. Large-capacity communication network multi-source inspection information active push method framework diagram

As shown in Fig. 1, the active push method for multi-source patrol information in a large-capacity communication network is proposed to be implemented by multi-source patrol information pre-processing, clustering, collaborative filtering, and active derivation. The specific process is as follows.

2.1 Multi-source Inspection Information Preprocessing

Multi-source patrol information preprocessing plays an important role in the process of active push of multi-source patrol information. Multi-source patrol information preprocessing is mainly to remove the interference information in the collected multi-source patrol information, mainly Divided into two parts, namely interference information identification and interference information removal [4].

The multi-source patrol information pre-processing mainly deletes the information unrelated to the patrol information and processes the error information existing therein. Multi-source patrol information is mainly based on text content [5, 6]. Of course, there are also pictures, video, audio and other formats [7]. In general, the format is judged by the suffix of the information, and the multi-source patrol information can be preprocessed. The redundancy of the collected multi-source patrol information is significantly reduced, and the accuracy of the multi-source patrol information active push method is increased.

First, the collected multi-source inspection information format is unified, and the main unified process is:

$$A = \frac{1}{2}\left(\frac{1}{k \times X} + \frac{1}{k^2}\right) \tag{1}$$

Where A represents the multi-source inspection information with uniform format; X represents the collected multi-source inspection information; k represents the conversion factor.

The interference information present therein is then identified. Interference information identification mainly refers to the identification of irrelevant information and error information in a unified multi-source inspection information. The specific process is as follows:

$$D = \frac{1}{\alpha}\sum_{i=1}^{n}\frac{A}{\beta} \times \pi \tag{2}$$

Where in, D represents the identified interference information; α represents the identification parameter; β represents the proportion of interference information occupied; and n represents the number of multi-source inspection information in a uniform format.

Finally, based on the above-mentioned interference information recognition result, it is removed, and the differential interference method is mainly used to remove the identified interference information, and the removal formula is:

$$A' = A\left(1 - \frac{1}{\alpha}\right)\prod[1 - 2D + \zeta] \tag{3}$$

Where A' represents the multi-source patrol information after the interference information is removed; ζ represents the differential filtering parameter.

Through the above process, the multi-source patrol information of the collected communication network is preprocessed, and pure multi-source patrol information is obtained, which prepares for the active push of the multi-source patrol information of the communication network.

2.2 Multi-source Inspection Information Clustering

Based on the processed multi-source patrol information obtained above, the multi-source patrol information is grouped and clustered based on the user's demand characteristic attribute, and the following multi-source patrol information collaborative filtering is prepared [8, 9]. Multi-source patrol information clustering can greatly reduce the data sparsity problem in multi-source patrol information collaborative filtering, thereby improving the accuracy of multi-source patrol information active push. The multi-source inspection information clustering analysis process is shown in Fig. 2.

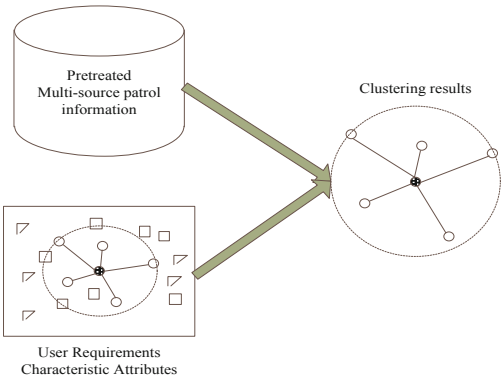

Fig. 2. Clustering design of multi-source detection information

Firstly, the demand characteristics of the user are obtained through the demand model. For the users who query the multi-source inspection information, the demand model can be divided into explicit demand and implicit demand. Use M to represent the user's total demand set, M_1 for the user's explicit demand set, and M_2 for the user's implicit demand set. Therefore, the user's total demand set is expressed as:

$$M = \{M_1, M_2\} \tag{4}$$

The user implicit demand set refers to the unconscious behavior record in the process of user search or query. It is important to analyze this part of the demand for the active push of multi-source inspection information. The analysis process of this part is mainly through the way of Web demand mining. The user's demand feature attribute is used to obtain the user's explicit requirement set, which refers to the user's conscious operation behavior during the search or query process, such as issuing the demand and other operational behaviors.

Web mining technology is one of the keys to realize the active push of multi-source inspection information in communication networks [10]. It is generally divided into three stages: preprocessing, pattern discovery, and pattern analysis. It is mainly divided into three categories, content mining, structure mining, and usage mining. The so-called Web demand mining method is essentially a process of extracting Web feature attributes centered on user needs. The specific user requirement feature attribute extraction process is:

$$M' = \coprod_1^n \frac{2}{\beta} \times M^{\chi} \tag{5}$$

Where M' represents the extracted user demand feature attribute; β represents the extraction ratio; χ represents the extraction parameter.

The multi-source patrol information is grouped based on the obtained user demand characteristic attribute, and the process is:

$$A' = \frac{M'}{a}\left(A'_1, A'_2, \cdots, A'_m\right) \tag{6}$$

Where a represents the classification factor; m represents the number of categories.

The early clustering method only deals with the information of a single attribute type, and the attribute type of the multi-source patrol information of the communication network data is mixed and has the characteristics of large amount of information. The early clustering method cannot process it. With the continuous updating of technology, the spectral clustering method is applied. It is mainly based on the spectral theory and seeks the global optimal solution. This method does not need to set the initial clustering center. Accurate, the calculation process is relatively simple.

The clustering analysis method is used to cluster the above groups, and the feature set of the multi-source patrol information of each group is obtained as:

$$K = \sum_{i=1}^{m} \sqrt{(1 + A')^2 + \eta} \tag{7}$$

Where K represents each set of multi-source inspection information feature sets; η represents calculation parameters:

It can be seen that the purpose of cluster analysis is to obtain feature sets of multi-source patrol information of the same category, which facilitates collaborative filtering of multi-source patrol information as described below.

2.3 Multi-source Inspection Information Collaborative Filtering

Based on the multi-source patrol information feature set obtained above, the multi-source patrol information is collaboratively filtered. In the obtained multi-source patrol

information feature set, the relationship between user demand and information is a one-to-many relationship, and the multi-source patrol information contained therein has obvious similarity, and similar threshold information is found to find similar multi-source patrol information. The collection forms a collection of nearest neighbor multi-source inspection information, and provides multi-source inspection information for users to actively push.

Collaborative filtering refers to recommending information that is of interest to users according to certain preferences. The data is appropriately evaluated by a cooperative mechanism and recorded to achieve filtering purposes and to filter information. The collaborative filtering algorithm is mainly for users with search or query records. For new users, they do not have records of search or query. Therefore, when the collaborative filtering method is used to push multi-source inspection information, it is mainly through A multi-source patrol information set in the class feature set and its nearest neighbor to predict the multi-source patrol information of the user's interest or demand, and then actively push it according to the predicted result, the method solves the cooperation to some extent Cold start problem in the filtering algorithm. The process of collaborative filtering of multi-source inspection information is:

$$Q = \frac{K}{\varepsilon} \sum_{i=1}^{m} (1 + ang(K)) \tag{8}$$

Where in, Q represents a similar multi-source inspection information set; ε represents a set threshold; $ang()$ represents a similar information search formula;

The nearest neighbor multi-source inspection information set is expressed as:

$$K_o = \int_1^m \frac{Q}{\varepsilon^2} \times \pi \tag{9}$$

Where K_o represents the nearest neighbor multi-source inspection information set.

Through the above process, the user needs the nearest neighbor multi-source patrol information set to provide data support for the implementation of the following multi-source patrol information active push.

2.4 Implementation of Active Push of Multi-source Inspection Information

Based on the user-required nearest neighbor multi-source patrol information set obtained above, the active push algorithm is used to actively push the multi-source patrol information. The specific steps are shown in Table 1.

Table 1. Active push algorithm execution step table

Step	Concrete content
Step 1	Initialization, input user requirement nearest neighbor multi-source patrol information set
Step 2	Start matching, matching the nearest neighbor multi-source patrol information set according to the content of user search or query
Step 3	Judge whether to push multi-source patrol information to users, judge whether users are interested in information according to the content of users' search or query and whether they need it, and push information if they are interested. Continue to implement step 2 if you are not interested
Step 4	Pushing multi-source patrol information, first decoding the user's needs, then sorting the push multi-source patrol information according to the specific user's demand characteristics, and sorting according to the degree of demand
Step 5	Push sequence adjustment, according to the changes in user needs, constantly adjust its push multi-source patrol information

As shown in Table 1, the basic flow of the active push algorithm: firstly, according to the user search or query, it is determined whether multi-source patrol information push is required; secondly, the push content matching is performed according to the user's demand feature attribute, and the user's demand characteristic attribute and user are The nearest neighbor multi-source patrol information set is matched and sorted according to the degree of demand; finally, according to the change of the user demand, the order of the nearest neighbor multi-source patrol information collection is adjusted, and then actively pushed. The flow chart of the active push of multi-source patrol information in the large-capacity communication network is shown in Fig. 3.

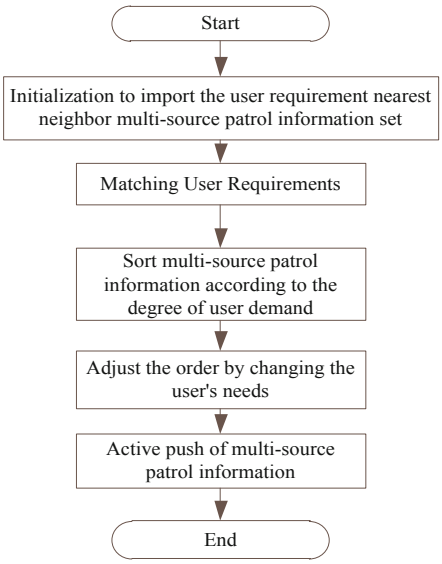

Fig. 3. Multi-source inspection information active push flow chart for large-capacity communication network

Through the above process, the active push of multi-source patrol information in the large-capacity communication network is realized, which provides power for the development of the large-capacity communication network.

3 Analysis of Push Effect of Active Push Method for Multi-source Inspection Information

The above-mentioned active push method of multi-source patrol information for large-capacity communication network has realized the active push of multi-source patrol information, which fully proves the feasibility of the proposed method, but the push effect needs further study. Therefore, the comparison experiment is used to analyze the push effect of the proposed multi-source patrol information active push method for large-capacity communication networks.

The experiment mainly uses the proposed multi-source patrol information active push method for large-capacity communication network and the traditional large-capacity communication network multi-source patrol information active push method to test the push response time. In order to facilitate the experiment, the proposed large capacity will be proposed. The active push method of the multi-source patrol information of the communication network is set as an experimental group, and the active push method of the multi-source patrol information of the traditional large-capacity communication network is set as the control group.

In order to obtain accurate experimental data, the experimental environment is set. Set the communication network mode to TCP mode, the threshold is 0.9, and the number of experiments is 100.

Experiments were carried out based on the set experimental environment parameters, and the response time of the multi-source inspection information active push method was tested. Because of the difference between the experimental group and the control group, it is not possible to conduct a direct comparative analysis. To this end, statistical software was used to record and compare experimental data. The push response time is shown in Table 2.

Table 2. Push response schedule

Number of experiments	Propose a method to push response time	Traditional methods push response time
10	1.6 s	6.4 s
20	1.8 s	4.4 s
30	1.2 s	4.4 s
40	2.6 s	6.4 s
50	0.8 s	6.4 s
60	1.8 s	4.6 s
70	2.0 s	7.2 s
80	1.5 s	5.6 s
90	2.2 s	4.6 s
100	2.8 s	4.0 s

The comparison of push response time is shown in Fig. 4.

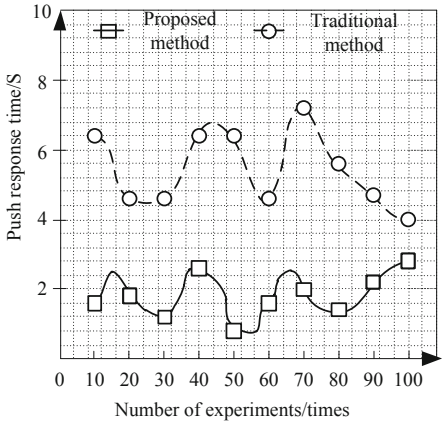

Fig. 4. Comparison of push response time

As shown in Fig. 4, the response time of the experimental group is significantly less than that of the control group. The minimum response time of the experimental group is 0.8 s, the average value is 1.8 s, and the minimum response time of the control group is 4.0 s. The average is 5.9 s. The average response time of the experimental group was 4.1 s less than the average of the response time of the control group. The proposed multi-source patrol information active push method for large-capacity communication network has better push effect.

Active push method of multi-source patrol information in large-capacity communication network is to improve the efficiency and quality of traditional network multi-source patrol information. Here we include the following points: the width of network multi-source patrol information is the key to affect the quality and efficiency of active push. With the rapid development of network technology, broadband technology has emerged, which greatly widens the width of network multi-source patrol information, and thus improves the efficiency and quality of active push.

Because there are many interference signals in active push, the emergence of multi-source patrol information technology can improve the anti-interference ability of active push by restoring the signal and multi-channel technology. The diversification of multi-source patrol information in communication network is more common than that in traditional communication network, which transmits signals in words and languages, seriously affecting the quality of active push. Nowadays, the multi-source patrol information technology of communication network can carry out many new communication modes, such as video telephone, multi-person telephone, besides the communication modes of text and language. Therefore, diversified multi-source patrol information of communication network can improve the effect of active push.

4 Conclusion

The proposed multi-source patrol information active push method for large-capacity communication network realizes the active push of multi-source patrol information, which greatly reduces the push response time. However, due to the setting of the experimental process environment parameters, the influencing factors are ignored. The interference results in a certain error in the experimental results, but the overall trend is unchanged, so the impact on the experimental results is not large, but we still need to pay attention to the active push method for multi-source inspection information in large-capacity communication networks. Conduct further research and analysis.

References

1. Zhu, X., Yu, Z., Lin, Y., et al.: Research on multi-source geographic data push method based on model requirement template matching. Geogr. Geogr. Inf. Sci. **32**(1), 24–28 (2016)
2. Lu, J., Wang, C., Xiao, G., et al.: Research and application of cloud push platform for multi-source heterogeneous data. Comput. Sci. **43**(s1), 12–15 (2016)
3. Liu, J.: Huadian University Tong Qinjiashan 100,000 kW photovoltaic power station UAV automatic inspection and hot spot image automatic recognition. Solar Energy **56**(5), 45–48 (2017)
4. Liu, J.: Practice and understanding of the construction of integrated information system for oil field exploration and development. Contemp. Petrochem. **24**(10), 46–50 (2016)
5. Li, W., Wang, Y., Xu, B., et al.: The research on network management and online monitoring for communication network for smart distribution and consumption network. Autom. Instrum. **4**, 27–30 (2018)
6. Ding, W., Qiu, W., Chen, D., et al.: Application research of PTN technology in Shaoxing power telecommunication network. Zhejiang Electric Power **37**(5), 22–26 (2018)
7. Xie, Y., Wu, L., Zhang, S., et al.: Realization of security protection system for power communication network based on bigdata. Electron. Des. Eng. **25**(19), 131–135 (2017)
8. Cui, L., Geng, Z., Shu, Q., et al.: Key link identification in electric power communication network considering grid correlation degree. Electric Power Constr. **38**(5), 124–132 (2017)
9. Liu, Y.: Design and implementation of computer room patrol management system based on NFC technology. Financ. Technol. Time **10**, 48–51 (2017)
10. Liu, X.: Application of network communication technology in reality. Digit. Commun. World **169**(01), 206 (2019)