Research on real-time acquisition method of logistics location information of electric commerce based on ranking threshold

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Abstract: In order to overcome the problems of high energy consumption, poor real-time performance and low quality in current methods of collecting positioning information of e-commerce logistics, this paper proposes a real-time method of collecting positioning information of e-commerce logistics based on ranking threshold. By adjusting the mechanism of sensor nodes, the deployment of information acquisition nodes is realised. Redundant data in e-commerce logistics positioning information is removed by comparator, and sorting threshold method is introduced. The real-time collection of e-commerce logistics positioning information is completed by classifying and processing e-commerce logistics positioning information with mixed features. The experimental results show that the energy consumption factor of the proposed method is less than 1.8, the information transmission delay is less than 0.2, and the user satisfaction is more than 90%. It proves that the proposed method is more effective and robust.

Keywords: sorting threshold; e-commerce logistics positioning information; information collection; redundant data.

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1 Introduction

With the rapid development of network technology and information technology, e-commerce has a great impact on social economy. Logistics is the basis of e-commerce development, and also an important step in e-commerce (Fattahi and Govindan, 2017). Logistics distribution has obvious decentralisation and randomness in e-commerce mode,

and faces many challenges and opportunities in the process of development (Lo and Kuo, 2017a). Logistics distribution is more complex in e-commerce trading platform, and needs to meet the distribution needs (Zhang et al., 2016b). In the logistics information, most of the information is related to the spatial location, so for the optimisation of logistics distribution, the collection of positioning information of e-commerce logistics plays an important role (Wang et al., 2016). At present, the methods of collecting positioning information of e-commerce logistics have the problems of high energy consumption, poor real-time performance and low quality of information collection. It is necessary to analyse and study the real-time methods of collecting positioning information of e-commerce logistics (Chen et al., 2017a).

Ren et al. (2016) is proposed based on circular structure of electronic business logistics location information real-time acquisition method, according to the network logistics node set up dynamic ring structure, according to the dynamic ring structure, constructing logistics information location path, target location information in e-commerce platform process, processing the information sent to the gathering node to complete the determination of electronic business logistics, but the method of information collection season points of high energy consumption, cause the method has the problem of high energy consumption. Fu et al. (2017) is proposed based on the location information of electronic business logistics supply chain logistics monitoring real-time acquisition method, to set up the electronic commerce logistics mode of source nodes, analysed the electronic commerce logistics need to collect the information and real-time monitoring through the Internet of things technology e-commerce logistics, e-commerce logistics information collection, based on automatic identification technology, the realisation of electronic business logistics mode position and structure, the method of electronic business logistics location information transmission in the internet of things, but when the platform management centre is affected by the noise, there is the problem of high information transmission delay. Zhang et al. (2016c) is proposed based on virtual instrument technology electronic commerce logistics location information real-time acquisition method, through LabVIEW software designed to locate information acquisition system, electronic business logistics, based on GPS technology by LabVIEW software acquisition logistics positioning information, and the collected information display on the map, the collected information stored in the system database, complete e-commerce logistics positioning information acquisition, but this method's collection of electronic business logistics positioning information cannot meet the needs of users, information collection is not high quality problems. Zhang (2017) is proposed based on the vast web hanging yards of e-commerce logistics information real-time acquisition method, by the location of the neural network to the electronic commerce logistics information standardising, the features of the location information of electronic business logistics and the corresponding fuzzy membership function, the introduction of gradient optimisation algorithm, the validity of information collection "the position of the e-commerce logistics as the objective function, the parameters of support vector machines (SVM) coding as objective function, the construction of electronic business logistics positioning information retrieval model, implement e-commerce logistics positioning information collection, but the method in the process of collecting e-commerce logistics positioning information transmission delay, there is the problem of poor real-time performance."

Because the current method does not collect positioning information of e-commerce logistics by deploying information acquisition nodes, it leads to the problems of high

energy consumption, poor real-time performance and low quality of information acquisition. In order to solve the problems existing in the current method, high-efficiency and high-accuracy positioning information acquisition is realised, and sorting threshold method is introduced. In order to better realise the acquisition of e-commerce logistics positioning information, promoting the development of e-commerce technology and engineering is a great contribution to mankind. This paper proposes a real-time collection method of location information of e-commerce logistics based on sorting threshold.

2 General architecture of real-time collection of logistics location information in e-commerce

The idea of acquisition method of business logistics location information is to deploy the information acquisition node by adjusting the sensor node mechanism, and obtain the location information of e-commerce logistics according to the information exchange mode between e-commerce logistics vehicles and information acquisition nodes. After collecting the information of e-commerce logistics vehicles, the information is packaged into data packets and transmitted to the sink node. The sink node transmits information to the platform management centre according to the requirements of the e-commerce logistics platform management centre. According to the received data, the platform management centre analysed the situation of the electronic commerce logistics vehicles, and obtained the positioning information of the electronic commerce logistics (Martín et al., 2018).

The architecture of real-time acquisition method for logistics location information of e-commerce is composed of vehicle, wireless sensor and platform management centre. As shown in Figure 1, information transmission between units is realised through network.

Sensor nodes with wireless communication modules can communicate with e-commerce logistics vehicles equipped with on-board units. The vehicle information of e-commerce logistics can be transmitted to the information collection node through information exchange (Wang et al., 2018).

2.1 Information acquisition and preprocessing

The key equipment for collecting positioning information of e-commerce logistics is sensor nodes. Generally, sensor nodes have wake-up mode and sleep mode. Under the working state, sensor nodes cover and collect information of the surrounding e-commerce logistics vehicles, and send request packets. If the information to be sent exists in the message buffer, it will send with the request package (Xin et al., 2017). After receiving the request package issued by sensor nodes, e-commerce logistics vehicles transmit basic information such as driving direction, vehicle ID, driving speed, license plate and vehicle type to sensor nodes. If the vehicle receives the request package repeatedly within a specified time, it will not respond. After collecting the positioning information of e-commerce logistics, the information gathering node transmits the information to the sink node in a multi-hop way.

Figure 1 Overall framework of location information acquisition for e-commerce logistics (see online version for colours)

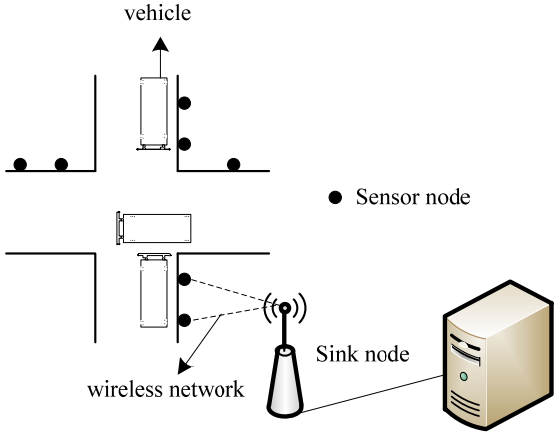
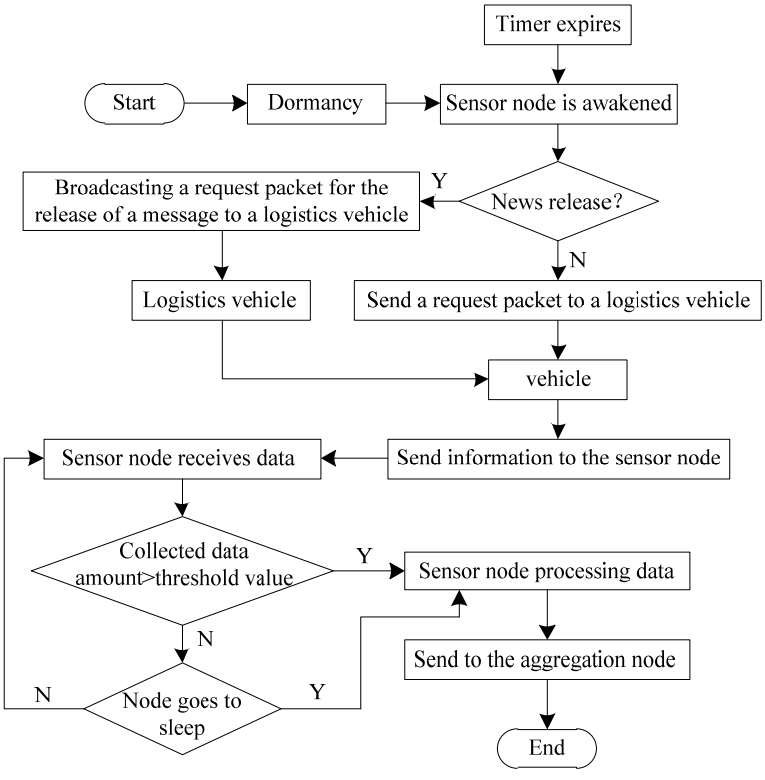


Figure 2 Logistics vehicle information acquisition process



2.1.1 Processing flow of sensor nodes

After waking up the sensor node, the e-commerce logistics vehicle can complete the acquisition task with the sensor node. The data transmission, data processing and data acquisition flow of the node are shown in Figure 2.

2.1.2 Dynamic awakening/dormancy strategy

Wireless sensor has a wide range of applications, and has great application value and commercial value. Wireless sensor networks are deployed in unmanned or harsh environments to collect information at the same time. It is difficult to replace the batteries of sensor nodes in these environments. Therefore, the main problem in the application of wireless sensor networks is to prolong the lifetime of wireless sensors and improve the utilisation of nodes in the network (Qin et al., 2018).

Nodes entering dormancy state can save energy, and the lifetime of nodes can be prolonged by wake-up/dormancy strategy.

The real-time acquisition method of location information of e-commerce logistics can be divided into several stages in a day. Based on the acquisition results, the node adjusts the vehicle flow of the e-commerce logistics vehicle, and takes it as the basis of the node wake-up/sleep mechanism.

According to the set period, the sensor node collects the positioning information of the electronic commerce logistics. Setting T represents the collection period of the sensor node, and its calculation formula is as follows:

$$T = T_s + T_w \tag{1}$$

In the formula, T_w represents the working time of the node; T_s represents the sleeping time of the node.

Setting sampling period T remains unchanged, real-time acquisition method of location information of e-commerce logistics adjusts the working time T_w and sleeping time T_s of nodes according to the flow of logistics vehicles:

$$T'_w = \begin{cases} T_w + \Delta t & Q > Q_{max} \\ T_w & Q_{min} < Q < Q_{max} \\ T_w - \Delta t & Q < Q_{min} \end{cases} \tag{2}$$

In the formula, T'_w represents the working time of the adjusted nodes; Δt is the set constant; Q represents the traffic flow, describing the total number of logistics vehicles collected by the nodes in the sampling period; $[Q_{min}, Q_{max}]$ represents the changing range of traffic flow.

2.2 Logistics vehicle tracking and information release

2.2.1 Logistics vehicle tracking

Vehicle tracking describes that according to the relevant instructions issued by the management centre of the e-commerce logistics platform, the sink node transmits the instructions of the management centre to the sensor node. According to the instructions, the sensor node transmits the information of the relevant logistics vehicles to the

management centre of the e-commerce logistics platform (Lo and Kuo, 2017b; Anagnostopoulos, 2016). The process of logistics vehicle tracking is in Figure 3.

Figure 3 Logistics vehicle tracking process

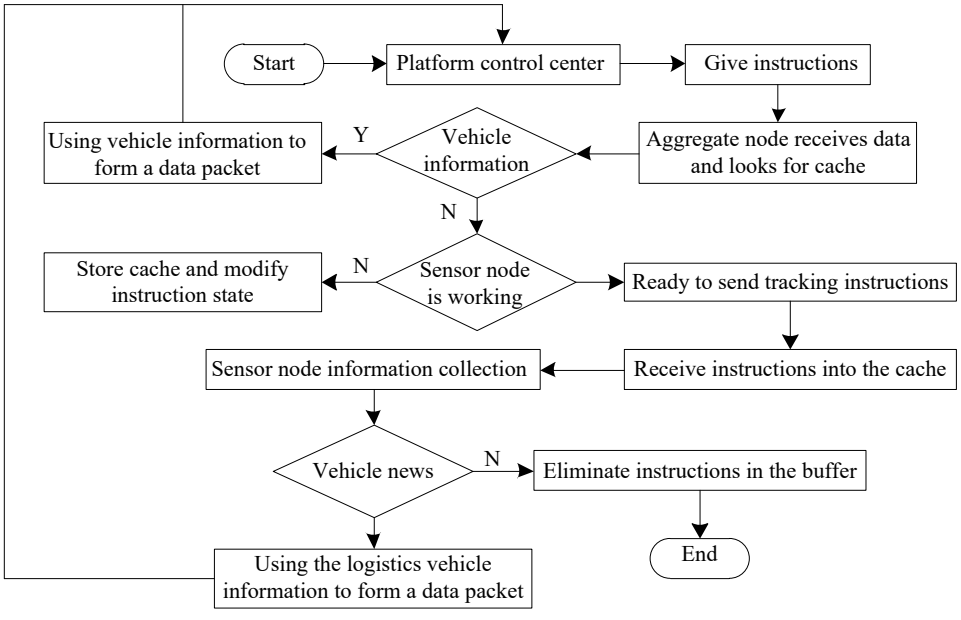
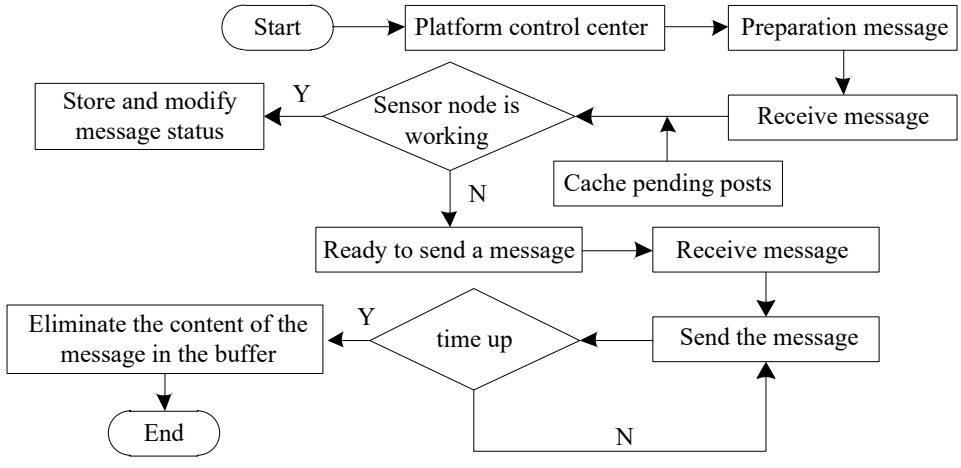


Figure 4 Information release process



2.2.2 Message publishing

Logistics information issuance is an important means, which has the functions of facilitating the drivers of logistics vehicles, improving the transport efficiency of e-commerce logistics, and avoiding traffic jams. E-commerce logistics location information real-time collection method uses e-commerce logistics to transmit service

information or road condition information to logistics vehicles through sensor nodes. Its information release process is in Figure 4.

3 Real-time acquisition method of positioning information for e-commerce logistics based on ranking threshold

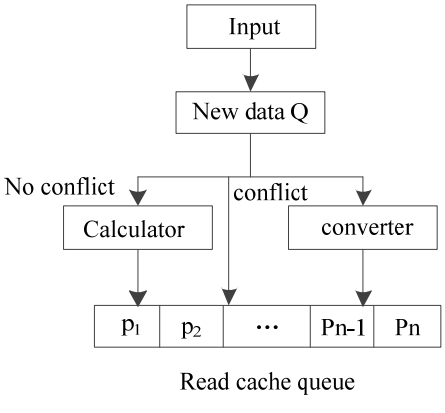
3.1 Cleaning of information

E-commerce logistics positioning information cleaning framework is mainly composed of two parts, data processing and data output, the above two parts are implemented simultaneously (Alomar and Cox, 2016). Data processing is to remove dirty data in the collected positioning information of e-commerce logistics, remove redundant data, and determine the expiration time of tag data in e-commerce logistics platform. When the expired label data exists in the cache queue, the authenticity of the label corresponding to the expired data is judged by a comparator, and the output data is transmitted to the management centre of the e-commerce logistics platform.

3.1.1 Data processing

Data processing consists of read buffer queue, conflict detection mechanism, converter and reader. The data processing structure of real-time acquisition method of positioning information based on sorting threshold is shown in Figure 5.

Figure 5 Data processing structure



The main task of reading queue is to store tag data of location information of e-commerce logistics processed by computer. Its storage format is (EPC, RSSI, timestamp, N, expiretime). The expiretime represents the expiration time of tag data in e-commerce logistics platform, EPC represents the EPC code value of tag, timestamp represents the expiration time of tag data in e-commerce logistics platform, and RSSI represents the strength of the reader that transmits the signal to the tag.

Conflict detection mechanism is used to detect the existence of duplicate tag data Q. Reader is used to obtain tag data of e-commerce logistics location information, and the same data is detected in the read cache sequence to determine whether there is conflict

(Wang et al., 2016). If there is a conflict, the N value corresponding to the conflict label data P is calculated. When N = 1, the new label data Q must be processed by the computer, and the expiretime and N value of the label data P in the cache queue are changed to satisfy the following formula:

$$P(\text{expiretime}) = Q(\text{expiretime}) \tag{3}$$

$$P(N) = P(N) + 1 \tag{4}$$

In the formula, Q(expiretime) represents the default value. If there is no conflict, the data Q is processed by the converter and inserted into the read buffer queue in the required format.

Converting the format of the new e-commerce logistics location information read by the reader is the main task of the converter to facilitate the post-processing of tag data (Kim et al., 2017).

The expiration time of tag data in the electronic commerce logistics platform is calculated by computer. The distance-signal intensity propagation model is used to calculate the tag's process time T and process speed V. The specific steps are as follows.

Select the corresponding signal strength value RSSI of tag data collected for the first time in two consecutive times in the electronic commerce logistics platform. Let t_1 and t_2 represent the time of tag acquisition and d_1 and d_2 represent the distance between t_1 and t_2 time reader and tag respectively. The calculation formulas are as follows:

$$d_1 = 10\frac{RSSI_1 - RSSI_{d_1}}{10 - n} \tag{5}$$

$$d_2 = 10\frac{RSSI_1 - RSSI_{d_2}}{10 - n} \tag{6}$$

Let a represent the distance between the corresponding positions of the tag when it is read for the first time in two consecutive times. The calculation formula is as follows:

$$a = \sqrt{\left(d_1^2 - h^2\right)} - \sqrt{\left(d_2^2 - h^2\right)} \tag{7}$$

In the formula, h represents the distance between the tag and the reader.

Calculate the process velocity V according to a:

$$V = \frac{a}{t_2 - t_1} \tag{8}$$

$$T = \frac{L}{V} \tag{9}$$

On the basis of formula (9), the calculation formula of tagging process time T is obtained.

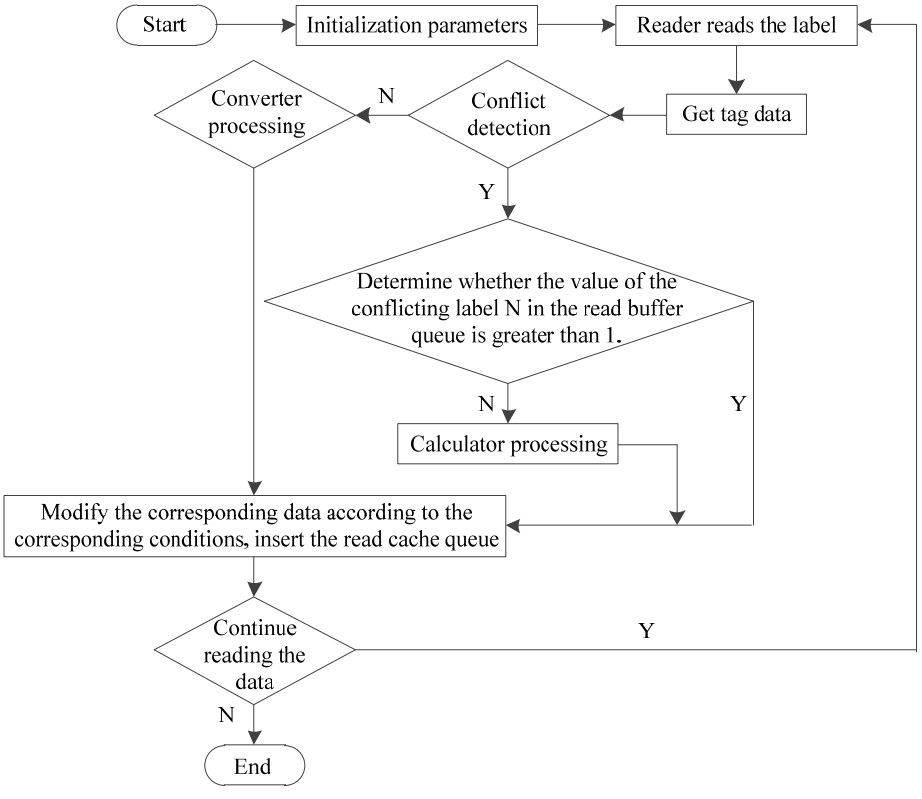
$$T = \frac{L(t_2 - t_1)}{\sqrt{\left[\left(10\frac{RSSI_1 - RSSI_{d_1}}{10 - n}\right)^2 - h^2\right]} - \sqrt{\left[\left(10\frac{RSSI_1 - RSSI_{d_2}}{10 - n}\right)^2 - h^2\right]}} \tag{10}$$

The expiretime is calculated by the following formula:

$$\text{expiretime} = \text{timestamp} + \text{T} \tag{11}$$

The calculated expiretime is inserted into (EPC, RSSI, timestamp, N, expiretime) and stored in the read cache queue.

Figure 6 Data processing flow



The real-time acquisition method of location information of e-commerce logistics based on threshold ranking removes the noise existing in location information of e-commerce logistics by ranking the thresholds. The specific steps are as follows:

1 *Decomposition of wavelet packet:* according to the required decomposition level n and wavelet basis function ϕ, decompose the location signal of commercial logistics with wavelet packet, and get the number of wavelet packets.

2 *Wavelet packet tree optimisation:* determine the entropy standard, select the wavelet base based on the entropy standard, analyse the structural characteristics of the wavelet base, and use the node distribution characteristics and statistics to select the wavelet base to build the optimal tree (Chen et al., 2017b). SLM technology is introduced to optimise the wavelet packet modulation system to realise the preliminary removal of the noise of e-commerce logistics positioning information (Chen et al., 2017b).

3 On the basis of noise and signal distribution, the high frequency band proportional coefficient β and the low frequency band proportional coefficient α are selected. The ratio coefficient α in low frequency band increases with the increase of the concentrated frequency band of useful information and the ratio coefficient β in high frequency band increases with the increase of the concentrated frequency band of useless information. Threshold ranking is performed to obtain node information of wavelet packet tree in different frequency bands.

4 On the basis of the selection criteria, the threshold criteria of high frequency band, medium frequency band and low frequency band are determined, and the decomposition coefficients of wavelet packets in different frequency bands are processed by threshold criteria (Zhu and Chen, 2018).

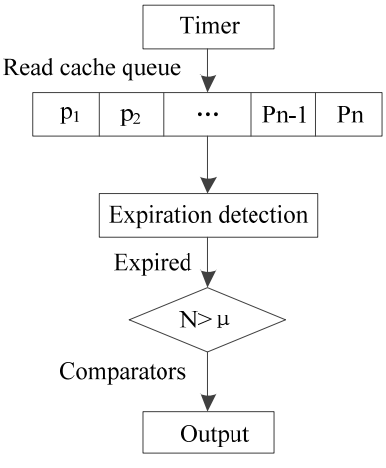
5 The decomposition coefficients of wavelet packet are processed by the method of wavelet packet reconstruction, and the location information of e-commerce logistics after de-noising is obtained.

The data processing flow of the real-time acquisition method of location information based on sorting threshold is in Figure 6.

3.1.2 Data output

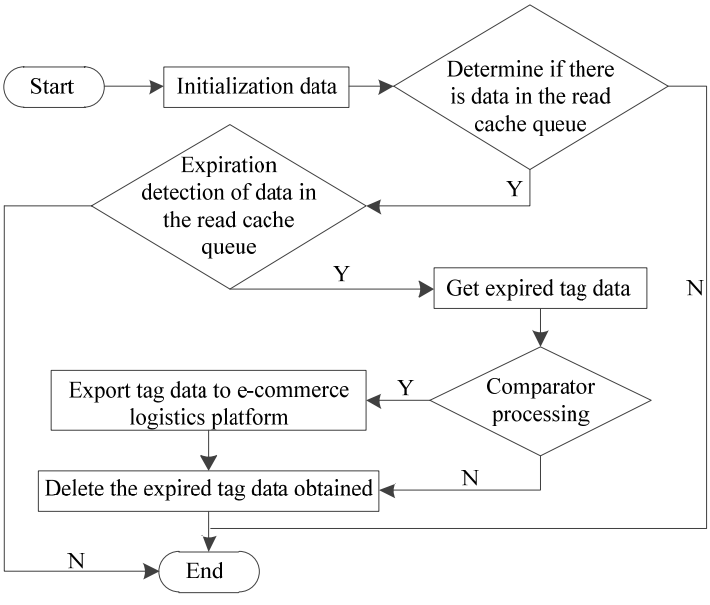
Data output structure is usually composed of comparator, timer, expiration detection and de-redundant cache queue. The specific structure is shown in Figure 7.

Figure 7 Data output structure



Through the comparator, the size of the label data between the prescribed threshold μ and the outdated detection mechanism is judged, and the authenticity of the label data is determined according to the judgment results. If the label data is true, it is transmitted to the e-commerce logistics platform (Deng et al., 2017). The data output process of the real-time acquisition method of location information based on sorting threshold is shown in Figure 8.

Figure 8 Data output flow



3.2 Real-time collection of information

The real-time acquisition method of location information of electric commerce logistics based on sorting threshold is to classify and process the location information of electric commerce logistics through mixed features, which include expected cross-entropy, document frequency, χ^2 statistics, mutual information and information gain.

3.2.1 Document frequency

Document frequency W_p describes the total number of documents with feature points, calculates the document frequency of feature items in the training set, and removes the feature items (Zhang et al., 2018) in the feature space when the threshold is higher than the document frequency of feature items.

3.2.2 Information gain

Information gain is a common criterion in the field of machine learning, which is used to measure the advantages and disadvantages of terms. Let $\{c_1, \cdots, c_l\}$ represent the set of classes in the target space, and G(t) represents the information gain corresponding to the eigenvalue t. The calculation formula is as follows:

$$\begin{aligned} G(t) = {} & \Pr(t)\sum_{i=1}^{n}\Pr(c_i|t)\times\log\Pr(c_i|t) + \Pr(\bar{t})\sum_{i=1}^{n}\Pr(c_i|\bar{t})\times\log\Pr(c_i|\bar{t}) \\ & -\sum_{i=1}^{n}\Pr(c_i)\times\log\Pr(c_i) \end{aligned} \tag{12}$$

In the formula, c_i represents the document category.

3.2.3 Mutual information

Mutual information describes the correlation between two sets of events, which is an information measure. Mutual information is a common criterion in statistical language for application modelling and word association (Zhang et al., 2017). In the process of classification of positioning information of e-commerce logistics, the correlation between category c and word t is mainly reflected.

Let A represent the total number of categories c and t; B represents the total number of categories c and t; C represents the total number of words t and c; N represents the total number of texts; I(t, c) represents the mutual information between categories c and t, and its calculation formula is as follows:

$$I(t, c) = \log \frac{A \times N}{(A + C)(A + B)} \tag{13}$$

When the value of mutual information I(t, c) is zero, it indicates that category c is not related to word t.

When there are m categories, there are m values for each word t. The average number of m values is calculated and the linear order is obtained. Generally, eigenvalues with an average value greater than 1 are selected. In order to measure the quality of the corresponding features in the process of feature selection, it is necessary to calculate the mutual information between features and all categories.

$$I_{arg}(t, c) = \sum_{i=1}^{m} \Pr(c_i) I(t, c_i) \tag{14}$$

$$I_{max}(t) = \max_{i=1} \left\{ I(t, c_i) \right\} \tag{15}$$

Formula (14) takes the average value of mutual information in all kinds of special and characteristic items, and formula (15) takes the maximum mutual information of all kinds of special and characteristic items.

3.2.4 χ^2 statistics

χ^2 statistic describes the degree of correlation between document category c and feature item w. It is assumed that document category c and feature item w satisfy χ^2 distribution. For a certain type of information, the higher the χ^2 statistic value of feature w, the more category information it has, the greater the correlation between this kind of information and feature terms (Lv et al., 2018). When the document category c and feature w are independent of each other, the χ^2 statistic is zero.

Let N represent the total number of documents in the training corpus; A represents the frequency of documents containing feature w and belonging to category c; B describes the frequency of documents containing feature w but not belonging to category c; C describes the frequency of documents that do not contain feature w but belong to category c; D describes the frequency of documents that do not contain feature w and belong to category c.

Let $\chi^2(\omega, c)$ represent the χ^2 statistics corresponding to document category c and feature w.

$$\chi^2(\omega, c) = \frac{N \times (AD - CB)^2}{(A + C)(B + D)(A + B)(C + D)} \tag{16}$$

The parameters in formula (16) satisfy the following formula:

$$N = A + B + C + D \tag{17}$$

3.2.5 Expected cross-entropy

Similar to information gain, expected cross-entropy is a probability-based method. m is used to describe the total number of categories of documents; $P(c_i|w)$ represents the probability that feature w belongs to c_i category when it appears in the text; $P(c_i)$ represents the probability that category c_i appears in the positioning information of commercial logistics; ECE(ω) represents the expected cross-entropy, and its calculation formula is as follows:

$$ECE(\omega) = P(\omega) \sum_{i=1}^{m} P(c_i|w) \lg \frac{P(c_i|w)}{P(c_i)} \tag{18}$$

Combining expected cross-entropy, document frequency, χ^2 statistics, mutual information and information gain, the hybrid feature T_h of e-commerce logistics location information is obtained. Its expression is as follows:

$$T_h = \{W_p, G(t), I(t, c), \chi^2(\omega, c), ECE(\omega)\} \tag{19}$$

Construct the classification function f(x):

$$f(x) = \operatorname{sgn}\{(w \cdot x) + b\} \tag{20}$$

In the formula, b represents the classification threshold. The mixed feature T_h is input into the classification function f(x) to classify the location information of e-commerce logistics and to collect the location information of e-commerce logistics in real-time.

4 Experiments and discussion

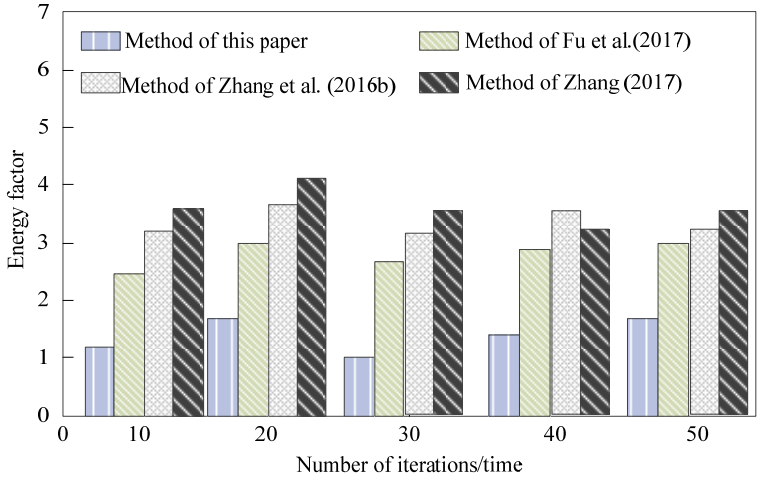
In order to verify the overall effectiveness of the real-time acquisition method based on sorting threshold, and realise the accurate detection of the method in this paper, it is necessary to conduct a comparative experiment on the real-time acquisition method of e-commerce logistics positioning information. Firstly, the experimental data should be preprocessed. Before the experiment, 50 groups of e-commerce logistics data were randomly collected as sample data, and any group was selected as initial simulation parameters to verify the effectiveness of the proposed method. In order to ensure the accuracy and reliability of the experiment, the length of the experiment is set as 10. Too short experimental data will reduce the accuracy, while too long experimental data will reduce the accuracy of the data. The experimental environment of this test was AME Phenom(tm)4810 Processor 2.6ghz, 2GB of memory, and simulated processing was

conducted on Matlab platform. The experimental indicators are energy consumption factor, information transmission delay and user satisfaction of different methods. Energy consumption factor can directly reflect the energy consumption of the method, information transmission delay can directly reflect the real-time performance of the method, and user satisfaction can further reflect the quality of the method. Therefore, the above three experimental indicators are selected. The comparative experiment of simulation is carried out. The real-time acquisition method of positioning information of e-commerce logistics based on ranking threshold was used as the experimental group, and the methods of Fu et al. (2017), Zhang et al. (2016c) and Zhang (2017) were used as the experimental control group.

4.1 Experiments on energy consumption factor

Firstly, the comparative experiments of energy consumption under different conditions are carried out. θ represents the energy consumption factor. The higher the energy consumption factor is, the higher the energy consumption of the method is. Four different methods are tested by the energy consumption factor θ. The test results are shown in Figure 9.

Figure 9 Energy consumption factors for four different methods (see online version for colours)

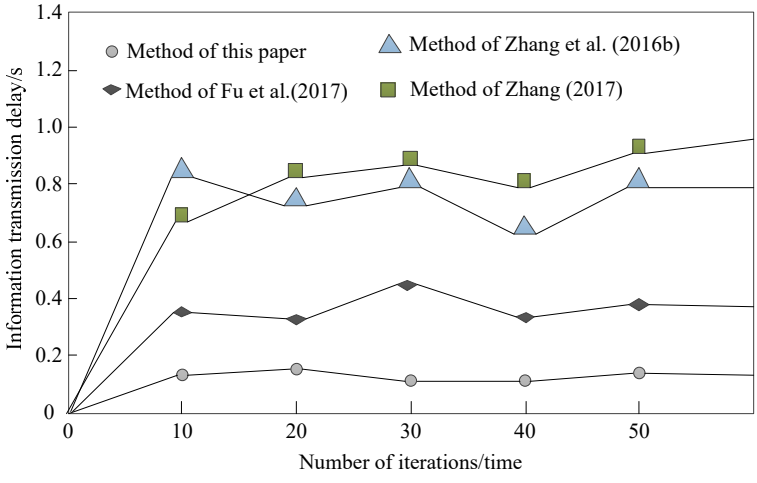


As can be seen from Figure 9, after several experiments, the energy consumption factor of the real-time acquisition method based on sorting threshold is always lower than 1.8, while the energy consumption factor of other methods is between 2.4 and 5.1, which is significantly higher than that of the method in this paper. The lower the energy consumption factor, the lower the energy consumption of e-commerce logistics location information acquisition method. Through the experimental data, it can be proved that the real-time location information acquisition method based on sorting threshold has lower energy consumption. This is because this method can adjust the sensor node mechanism according to the flow of e-commerce logistics vehicles, reduce the node energy consumption, so as to realise the control of energy consumption collection.

4.2 Information transmission delay experiment

The information transmission delay determines the efficiency of positioning information acquisition in e-commerce logistics. The lower the value of information transmission delay, the higher the sensitivity and efficiency of the proof method. Comparing the information transmission delay of four different methods in the process of transmitting positioning information in e-commerce logistics, the test results of four different methods are shown in Figure 10.

Figure 10 Information transmission delays of four different methods (see online version for colours)

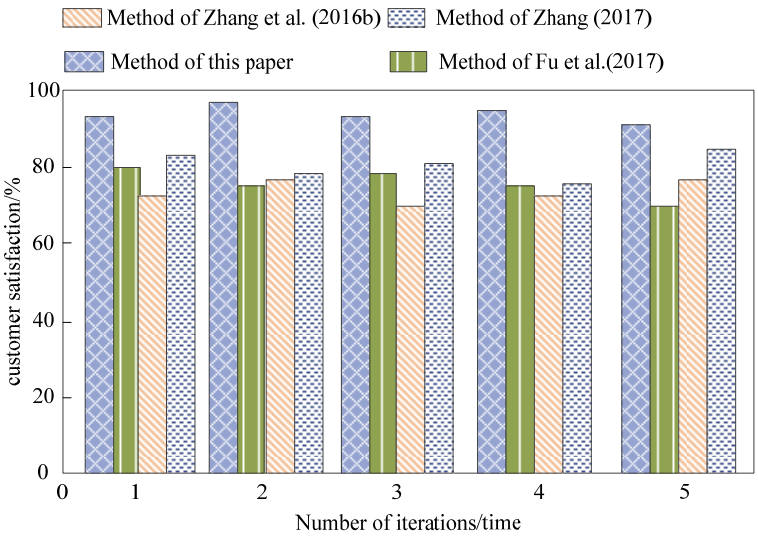


It can be seen from Figure 10 that in multiple iterations, the transmission delay of the real-time acquisition method based on sorting threshold is always less than 0.2 s, while the transmission delay of other methods is between 0.38 and 0.9, which is significantly higher than this method. It can be proved that this method has high efficiency. This is because the real-time location information acquisition method based on sorting threshold can eliminate the redundant data in the location information of e-commerce logistics by using a comparator, eliminate the interference of noise on the location information transmission, reduce the information transmission delay, and better realise the real-time location information acquisition.

4.3 User satisfaction experiments

Taking customer satisfaction as an evaluation index, the higher the test results are, the higher the customer satisfaction is, and the higher the quality of positioning information collected by the method is. The test results of four different methods are shown in Figure 11.

Figure 11 User satisfaction with four different methods (see online version for colours)



From the analysis in Figure 11, it can be seen that the user satisfaction of the information collected by the real-time acquisition method based on sorting threshold is always above 90%, while the user satisfaction of other methods is all below 80%. The higher the user satisfaction, the higher the quality of information collected by the presentation method. The experimental data show that the method has high user satisfaction and the collected location information is of good quality. This is because this method introduces sorting threshold method to remove redundant data and expired data in the information, and classifies and processes the e-commerce logistics positioning information with mixed characteristics, so as to improve the quality of information and enhance user satisfaction.

5 Conclusions

1 E-commerce can bring convenience to people's daily life and work transactions. Logistics distribution is an important step in the process of e-commerce transactions. Collection of positioning information of e-commerce logistics is a hotspot of current research.

2 Aiming at the problems of high energy consumption, low real-time performance and low quality of information acquisition in real-time acquisition of location information of e-commerce logistics, a real-time acquisition method of location information of e-commerce logistics based on ranking threshold is proposed.

3 By deploying information acquisition nodes, the framework of e-commerce logistics positioning information acquisition is constructed. Redundant data in e-commerce logistics positioning information are removed by comparator. A real-time method of collecting e-commerce logistics positioning information based on sorting threshold is proposed. The e-commerce logistics positioning information is classified and

processed by mixed features to complete e-commerce logistics positioning information.

4 The experimental results show that the energy consumption factor of the proposed method is less than 1.8, the information transmission delay is less than 0.2, and the user satisfaction is more than 90%.

5 In the course of the experiment, because of the setting of the experimental environment parameters, the experimental environment is different from the real environment. The experimental results deviate from the actual results, but do not affect the experimental conclusions. In order to get more accurate experimental results, it is necessary to verify the positioning information of the commercial logistics based on the ranking threshold. The time acquisition method is optimised and studied.

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