Research on Bluetooth Positioning Technology of Books in University Smart Library Based on RFID

Zhang Jing
Wuhan University of Technology Library, Wuhan, China, 430070
jingzhang_hank@whut.edu.cn

Liu Lin
Wuhan University of Technology Library, Wuhan, China, 430070, fvtzxp4k0r@sina.cn, Corresponding author

ABSTRACT

In order to improve the Bluetooth positioning ability of university smart library books, a Bluetooth positioning method of university smart library books based on RFID is proposed. A big data analysis model for Bluetooth positioning of university smart library books is constructed. The data fusion processing of Bluetooth positioning of university smart library books is realized through subspace compression, and the statistical features of Bluetooth positioning data of university smart library books are extracted. The Bluetooth positioning identification of university smart library books and the optimized retrieval of library information are realized through fuzzy optimization and semantic feature analysis methods. The user tag matrix joint subcontracting detection method is adopted. The output load of Bluetooth positioning of university smart library books is obtained. The Bluetooth positioning and feature clustering of university smart library books are realized by using grid block clustering analysis method, and the optimization construction of Bluetooth positioning of university smart library books is realized by combining RFID. The simulation results show that this method has better information retrieval performance and stronger semantic recognition ability, which improves the Bluetooth positioning level of books in university smart library.

CCS CONCEPTS

• **CCS –> Computing methodologies –> Modeling and simulation –> Model development and analysis –> Modeling methodologies**;

KEYWORDS

RFID, University wisdom library, Information sharing, Bluetooth positioning, User label

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1 INTRODUCTION

With the development of the construction of smart libraries in colleges and universities, the optimized Bluetooth positioning of books in smart libraries in colleges and universities is constructed, and the query and retrieval capabilities of smart libraries in colleges and universities are improved through the integration of library information service scheduling and big data integration, thus improving the Bluetooth positioning level of books in smart libraries in colleges and universities. This paper studies the Bluetooth positioning of books in smart libraries in colleges and universities, constructs a statistical feature analysis model of information sharing in smart libraries in colleges and universities by using semantic information analysis and feature optimization detection, and optimizes the Bluetooth positioning of books in smart libraries in colleges and universities through big data fusion scheduling. The related research on the optimization construction method of Bluetooth positioning of books in smart libraries in colleges and universities has attracted great attention [1].

The construction of Bluetooth positioning of university smart library books is based on the optimization design of information commons parameters of university smart library. The Bluetooth positioning analysis of university smart library books is carried out by using statistical information analysis combined with multi-source feature distributed fusion method, and the Bluetooth positioning design of university smart library books is realized by using semantic similarity detection method[2]. The design methods of Bluetooth positioning of university smart library books mainly include similarity semantic analysis, fuzzy optimization control, statistical analysis, and so on. The Bluetooth positioning fusion parameter identification model of university smart library books is established. To realize the construction of Bluetooth positioning of university smart library books, however, the traditional methods have poor semantic retrieval ability and poor accuracy of library information[3]. In view of the above problems, this paper puts forward the construction method of Bluetooth location of books in university smart library based on RFID. Firstly, the big data analysis model of Bluetooth positioning of university smart library books is constructed, and the data fusion processing of Bluetooth positioning of university smart library books is realized by subspace compression, and the statistical features of Bluetooth positioning data of university smart library books are extracted. Then, by fuzzy optimization and semantic feature analysis methods, the Bluetooth positioning identification of university smart library books and the optimized retrieval of library information are realized. Grid block clustering analysis method is adopted to realize the feature clustering of university smart library books under Bluetooth positioning, and RFID is combined to realize the optimized construction

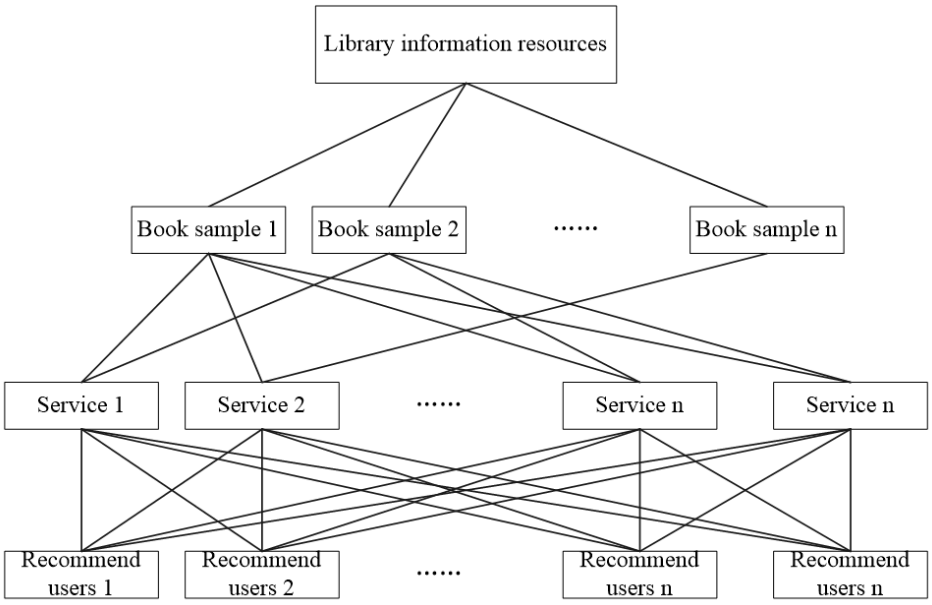


Figure 1: Node distribution model of information sharing in smart libraries of colleges and universities

of Bluetooth positioning of university smart library books. Finally, the simulation test shows the superior performance of this method in improving the Bluetooth positioning ability of books in smart libraries of colleges and universities.

2 BIG DATA MODEL AND CHARACTERISTIC ANALYSIS OF BLUETOOTH POSITIONING OF BOOKS IN UNIVERSITY SMART LIBRARY

2.1 University smart library books bluetooth positioning big data model

In order to realize the optimization design of Bluetooth positioning of books in smart libraries in colleges and universities, it is necessary to build a big data analysis model of Bluetooth positioning of books in smart libraries in colleges and universities[4], and schedule the information sharing space of smart libraries in colleges and universities by combining the design method of multi-dimensional sensor node model, and get the node distribution model of information sharing in smart libraries in colleges and universities as shown in Figure 1

According to the node distribution model of university smart library information sharing shown in Figure 1, the spatial balance control of university smart library information sharing is carried out according to different negotiation protocols, and the fitness parameter fusion model of university smart library information sharing is obtained by using priority ranking method[5]. By using DPI self-correlation data detection method, the energy balance control parameters of university smart library information sharing are as follows:

$$\begin{aligned} E &= E_{Tx}(l, d(n_i, n_j)) + E_{Rx}(l) + E_{Tx}(l, d_j) \\ &= l(E_{elec} + \varepsilon_{fs} d^2(n_i, n_j)) + lE_{elec} + l(E_{elec} + \varepsilon_{fs} {d_j}^2) \\ &= 3lE_{elec} + l\varepsilon_{fs}(d^2(n_i, n_j) + {d_j}^2). \end{aligned} \tag{1}$$

By subspace compression, the data fusion of Bluetooth positioning of books in university smart library is realized, and the fuzzy statistical parameter set of information commons in university smart library is extracted, and the steady-state characteristic value of data interaction in information commons in university smart library is obtained as follows:

$$SNKR_i = (3/2)\left|\sigma^4/\gamma\right| \lambda SNR_i^2 \tag{2}$$

Through the ambiguity detection method, the historical operation and maintenance control of Bluetooth positioning of books in smart libraries in colleges and universities is carried out, and the joint feature distribution function of information fusion in smart libraries in colleges and universities is obtained by using the data packet detection method:

$$\begin{aligned} J_m(U, V) &= \sum_{k=1}^{n} \sum_{i=1}^{c} {\mu_{ik}}^m (d_{ik})^2 x_i \\ &= x_{i\min} + cx_i \cdot (x_{i\max} - x_{i\min}) \end{aligned} \tag{3}$$

Using adaptive optimization method, the automatic negotiation control model of Bluetooth positioning of books in university smart library is extracted, and the associated feature solution of information fusion in university smart library is obtained:

$$\sum_{i=1}^{c} \mu_{ik} = 1, k = 1, 2, \ldots, n \tag{4}$$

Using the method of resource optimization and fusion control, the joint feature distribution function of Bluetooth positioning of books in university smart library is obtained as $U^T = U^{-1}, V^T = V^{-1}, D \in$

$R^{m\times M}$, and $D = [\sum 0]$the autocorrelation semantic distribution of information commons in university smart library is obtained as follows:

$$x_{n,G} = x_{n,G} + \Delta x_i \tag{5}$$

By calculating the semantic similarity feature function of the information commons data of the university smart library, the fuzzy feature distribution set of the information commons of the university smart library meets the following requirements:

$$X^{(2)} = \{x^2(1), x^2(2), ..., x^2(9)\} = \{2, 1, 4, 8, 6, 3, 9, 5, 7\} \tag{6}$$

It can be known that the output joint control parameters of Bluetooth positioning of university smart library books meet $\overline{X^{(2)}} = \{10\}$. When the rules set of information sharing space distribution in university smart library is set as $X^{(3)} = \{x^3(1), x^3(2), ..., x^3(8)\} = \{4, 1, 3, 8, 7, 6, 2, 9\}$, the output fusion result of information sharing space in university smart library is obtained as $\overline{X^{(3)}} = \{5, 10\}$. According to the above analysis, the joint parameter identification model of Bluetooth positioning of books in university smart library is obtained[6-8].

2.2 Bluetooth positioning integration of books in university smart library

By subspace compression, the data fusion of Bluetooth positioning of university smart library books is realized, and the statistical features of Bluetooth positioning data of university smart library books are extracted. With the popularity of book tags and time weights as constraint parameters[9], the data link layer information of Bluetooth positioning node of university smart library books is forwarded, and the information sharing data forwarding matrix of university smart library is obtained.

$$P = E[d_k X_k] = E\begin{bmatrix} d_k x_{0k} \\ d_k x_{1k} \\ \vdots \\ d_k x_{Lk} \end{bmatrix} \tag{7}$$

The extended characteristic components of information sharing header information in university intelligent library are as follows:

$$P_{\text{AOMDV}} = (1 - P_d)^2 \left\{1 - \left[1 - (1 - P_e)^n (1 - P_d)^{n-1}\right]^m\right\} \tag{8}$$

Using the method of user-label matrix joint subcontract detection, the output load of Bluetooth positioning of books in university smart library is obtained as follows:

$$\begin{aligned} r(t) &= \sum_i \sum_{j=0}^{N_f-1} \sum_{l=0}^{L-1} b_i \alpha_l p(t - iT_s - jT_f - c_j T_c - \tau_l) + \omega(t) \\ &= \sum_i \sum_{j=0}^{N_f-1} b_i p_h(t - iT_s - jT_f - c_j T_c - \tau_0) + \omega(t) \end{aligned} \tag{9}$$

Where

$$p_h(t) = \sum_{l=0}^{L-1} \alpha_l p(t - \tau_{l,0}) \tag{10}$$

In addition, $Z_2 = \sum_{w\in W} \hat{q}^w (p_I - \gamma\hat{\theta} - \int_0^{\sum_{w\in W}\hat{q}^w} (\rho + e^{-\mu x})dx)$ is the data tag monitoring set for Bluetooth positioning of books in smart libraries in colleges and universities. Through the joint analysis of tag popularity and time weight, the data sampling delay is obtained:

$$lastDelay = \mathbf{DELAY_{req}} - DELAY_{sum} \tag{11}$$

According to the distribution characteristics of information spatial distribution storage nodes in university smart library, information fusion is realized, and Bluetooth positioning of books in university smart library is constructed [10].

3 OPTIMIZATION OF BLUETOOTH POSITIONING OF BOOKS IN SMART LIBRARIES OF COLLEGES AND UNIVERSITIES

3.1 Bluetooth location information feature retrieval of books in university smart library

By fuzzy optimization and semantic feature analysis methods, the Bluetooth positioning and identification of books and the optimized retrieval of library information in university smart libraries are realized. By adopting the method of information spatial distribution fusion scheduling in university smart libraries [11], the quantitative regression analysis characteristic quantity of information sharing in university smart libraries is described as follows:

$$Q = \frac{C_1 \sum_{i=1}^{k} \exp\left[-S_2(V_i - \mu)^2\right]}{1 + \exp\left[-S_1 \sum_{i=1}^{k} w_i (T_i - V_i)\right]} \tag{12}$$

Where, C_1,S_1,S_2 are the big data distribution constant of operation and maintenance for Bluetooth positioning of books in smart libraries in colleges and universities, and the distribution of fusion tag popularity, trust relationship and time weight is [0, 0.46, 0.83, 0.358, 1], V_i represents the joint distribution set of operation and maintenance for Bluetooth positioning of books in smart libraries in colleges and universities. From the perspective of semantic features, the grid scheduling function of information commons in smart libraries in colleges and universities is obtained:

$$Z_2 = \sum_{w\in W} \hat{q}^w \left(p_I - \gamma\hat{\theta} - \int_0^{\sum_{w\in W}\hat{q}^w} (\rho + e^{-\mu x})dx\right) \tag{13}$$

Wherein, $\hat{\theta}$ represents the global efficiency of information commons fusion in university smart libraries; α is a constant, $\gamma\hat{\theta}$ represents the fuzzy association feature quantity of information sharing and fusion in university smart libraries. According to different semantic distribution, the joint feature analysis model of information sharing

in university smart libraries is expressed as follows:

$$\begin{aligned}
&\max \quad \Theta_{Q_i} = \frac{a_{Q_i}}{a_{Q_i}+c_{Q_i}} \\
&\max \quad \Theta_{E_i} = \frac{a_{E_i}}{a_{E_i}+c_{E_i}} \\
&\max \quad \Theta_{C_i} = \frac{a_{C_i}}{a_{C_i}+c_{C_i}} \\
&S.t. \quad Q_i \geq Q_{th} \\
&\quad E_i \geq E_{th} \\
&\quad C_i \leq C_{th} \\
&Q_{jk} \geq 0, E_{jk} \geq 0, C_{jk} \geq 0 \\
&\sum_{j=1}^{N_j} x_{jk} = 1, \forall i, 1 \leq k \leq M, 1 \leq j \leq N_j
\end{aligned} \tag{14}$$

In the above formula, Θ is called the weighted control factor of Bluetooth location information feature retrieval of university smart library books. According to the above analysis, the Bluetooth location information feature retrieval model of university smart library books is constructed [12].

3.2 Bluetooth positioning of books in university smart library

The method of grid block clustering analysis is used to realize the feature clustering under Bluetooth positioning of university smart library books. Combined with RFID, the optimization of Bluetooth positioning of university smart library books is realized, and the benefit index of information commons in university smart library is set as $Q_i(i = 1, 2, \ldots, N)$. Through directional clustering, the game equilibrium optimization function of Bluetooth positioning of university smart library books is obtained:

$$Q_i(P) = \frac{(e_i - P_i)\left[\rho(N-2)+1\right] - \rho \sum\limits_{i \neq j} (e_j - P_j)}{(1-\rho)\left[\rho(N-1)+1\right]} \tag{15}$$

By the historical operation and maintenance association of Bluetooth positioning of university smart library books, using RFID joint feature decomposition, the state function of Bluetooth positioning optimization of university smart library books is obtained

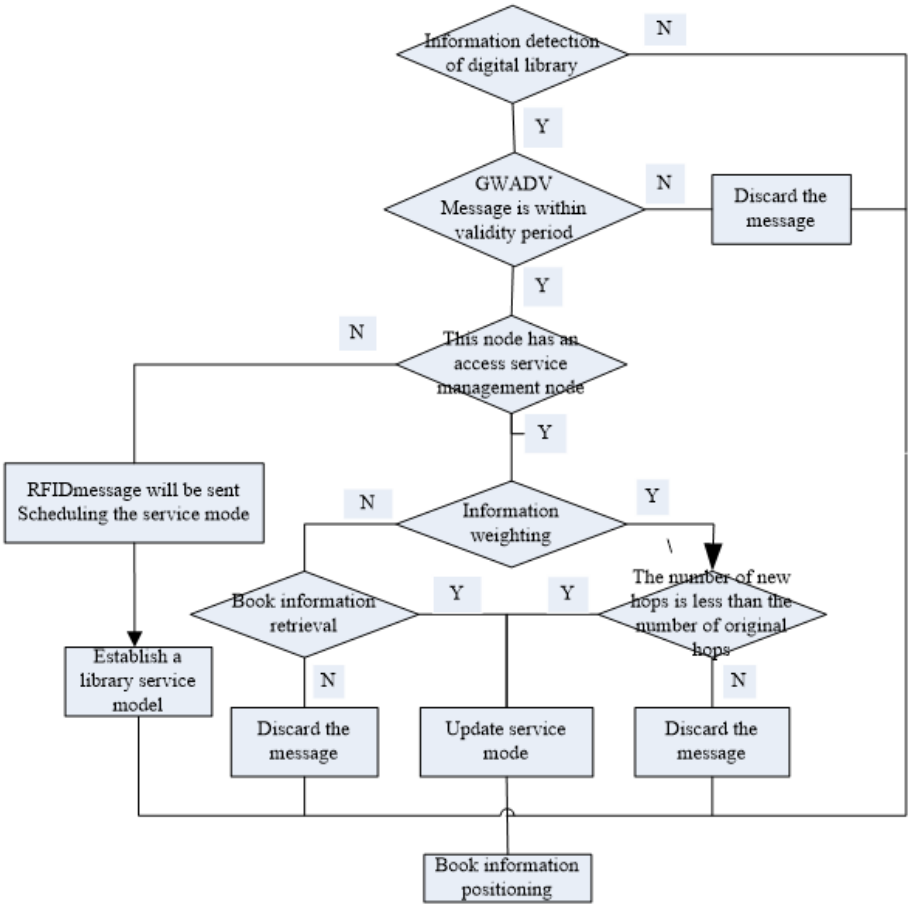


Figure 2: Implementation process of Bluetooth positioning optimization of books in university smart library

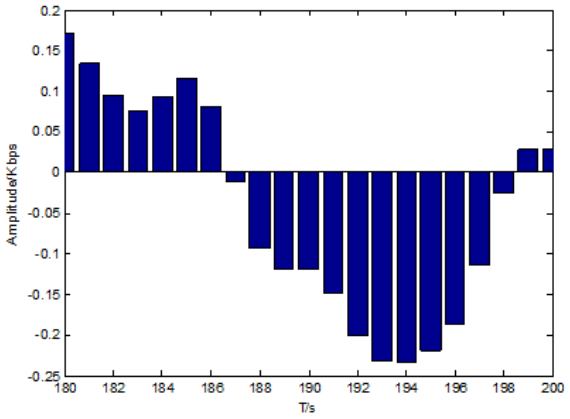


Figure 3: Bluetooth positioning information sampling of books in university smart library

as follows:

$$\begin{cases} v(\{\Phi\}) = 0, v(\{M\}) = \pi_M^D, v(\{D\}) = \pi_D^D \\ v(\{R\}) = \pi_R^D, v(\{M,D\}) = \pi_{MD}^{A_1}, v(\{M,R\}) = \pi_M^D + \pi_R^D \\ v(\{D,R\}) = \pi_{DR}^{A_2}, v(\{M,D,R\}) = \pi_T^C \end{cases} \quad (16)$$

A monitoring model of historical operation and maintenance characteristics of Bluetooth positioning of books in university smart library is constructed, and an efficient item set of Bluetooth positioning of books in university smart library is obtained.

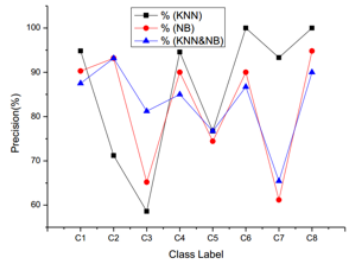
$$\hat{p}_k^w = \frac{\hat{f}_k^w}{\hat{q}^w} = \frac{\exp(-\hat{\theta} c_k^w)}{\sum_{k \in K^w} \exp(-\hat{\theta} c_k^w)} \quad (17)$$

$$\tilde{p}_k^w = \frac{\tilde{f}_k^w}{\tilde{q}^w} = \frac{\exp(-\tilde{\theta} c_k^w)}{\sum_{k \in K^w} \exp(-\tilde{\theta} c_k^w)} \quad (18)$$

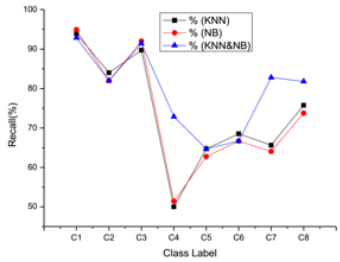
According to the above feature extraction results, the optimization design of Bluetooth positioning of books in university smart library is realized, and the implementation process is shown in Figure 2

4 SIMULATION EXPERIMENT AND RESULT ANALYSIS

The grid distribution area is 400 ×400, the sparsity characteristic distribution coefficient of library information sharing data is 0.63, the reliability distribution threshold of university smart library information sharing is 0.03, the tag popularity coefficient is 0.16, and the dimension of feature matrix is 5. According to the above parameter settings, the optimization structure design of university



(a) Relationship between the precision and the numb of texts



(b) Relationship between precision rate and number of user categories

Figure 4: Analysis of Bluetooth positioning performance of books in smart libraries of colleges and universities

smart library books Bluetooth positioning is carried out, and the big data information of university smart library books Bluetooth positioning is shown in Figure 3

Taking the Bluetooth positioning information of university smart library books collected in Figure 3 as the research object, the Bluetooth positioning design of university smart library books is carried out, and the relationship between the evaluation index parameter precision rate and related parameters of university smart library books is shown in Figure 4By analyzing Figure 4, we know that this method has a high precision in Bluetooth positioning design of books in university smart library, which improves the Bluetooth positioning ability of books in university smart library. After testing the positioning accuracy, the comparison results are shown in Table 1. The analysis table shows that the book positioning accuracy of this method is higher.

5 CONCLUSIONS

In this paper, the Bluetooth location of books in university smart library is studied, and the statistical feature analysis model of information sharing in university smart library is constructed by using semantic information analysis and feature optimization detection. In this paper, the Bluetooth location construction method of books in university smart library based on RFID is proposed. A big data

Table 1: Comparison of Positioning Accuracy

Iteration times	This method	Reference [4]	Reference [5]
100	0.934	0.675	0.722
200	0.985	0.736	0.791
300	1	0.844	0.827

analysis model for Bluetooth positioning of books in university smart library is constructed. Combined with the design method of multi-dimensional sensor node model, the information sharing space of university smart library is scheduled. With the popularity of book tags and time weights as constraint parameters, the data link layer information of Bluetooth positioning node of university smart library is forwarded, and the optimization design of Bluetooth positioning of books in university smart library is realized. The research shows that the method proposed in this paper has a high precision and improves the Bluetooth positioning level of books in university smart libraries.

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