



Optimization Analysis of Public Policy Online Voting System Based on Data Mining Algorithm

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Abstract. Correct decision-making and effective implementation of public policies will bring positive results to the development of the economy and the advancement of society. Errors in decision-making or improper implementation will bring certain negative effects. In a sense, the issue of public policy is the most important issue of a country's legislation and judiciary, and it is also the main method used by the authorities to safeguard the interests of the people. With the development of the Internet, a lot of information can be effectively processed through computer network technology, so information feedback has become the goal that people pursue, and the online voting system is one of the products. In this paper, a network online voting system is specially designed for public policy formulation and decision-making. The association rules algorithm in the data mining algorithm is introduced, and the system can exclude the user IPs who voted repeatedly. Through the algorithm statistical data results, the voting rate and voting items can be found. The algorithm also optimizes the statistical process of voting results, making voting data processing more convenient and accurate. After the system is tested, the operational reliability of the system in this paper is also verified.

Keywords: Data Mining Algorithm · Association Rule Algorithm · Public Policy · Online Voting

1 Introduction

Traditional voting methods generally use questionnaires, and the statistical results are also manually operated, which will consume a lot of time. Internet technology has brought a lot of convenience to people. When designing an online online voting system, you can enter the system through a network connection to conduct voting operations and vote. The process is simple and quick to generate poll results.

Now, many scholars have conducted in-depth research on the public policy network voting system. For example, a professor believes that public policy is a plan to deal with social and public issues, achieve political goals, and distribute social interests. The online voting system developed for public policy provides a voting channel for the whole

people, which ensures the fairness and rationality of the policy [1, 2]. A voting system designed by a scholar can obtain various information of voting users, such as the city where the voting user is located and the number of voters in the city where the voting user is located, and the system can also count the total number of votes in each city [3]. Compared with the traditional voting system, the online voting system designed by a scholar uses the convenience of network computing. The system uses the features of advanced performance, fast vote counting, safety and reliability. If the system is applied to public policy voting, it can be involve the public in the policy decision-making process [4]. Although the research results on the public policy online voting system are good, many functions of the system still need to be improved.

This paper firstly analyzes the concept of data mining, and proposes the algorithm of association rules, and then analyzes the functions of voting registration, query and result statistics that the public policy online voting system needs to have. Then use the development tools to design the system, introduce the function modules of the system in detail, and finally propose the implementation method of non-refresh voting, and carry out the response test and concurrency test of the system.

2 Analysis of Related Algorithms and System Requirements

2.1 Data Mining Algorithms

The role of data mining is to first identify the knowledge patterns that need to be extracted (belonging to mining tasks). In the real application process, knowledge patterns that meet the requirements of various types of users must be able to be extracted. Therefore, it is particularly emphasized that the role of data mining software must be rich, and the types of patterns to be extracted must be enriched should be more extensive [5].

The actual feature of data mining is to find and discover valuable information through approximately massive data, provide enterprise information utilization efficiency, and achieve profit growth [6]. The lucrative rewards obtained through data mining technology are almost inevitable.

The data set is preprocessed. In order to reduce the difficulty of writing mining algorithms, it is necessary to reduce the dimension and transform the preprocessed data. The implementation of dimensionality reduction is only to reduce the number of variables, the data itself does not change, and the vector space of the data is easier to solve. To transform data, the following factors must be determined, and the purpose of mining, knowledge analysis operations and the use of mining tools must be clarified. The transformation of data mainly involves changes in the organizational structure of the data, and finally achieves a data format that is easier to mine [7, 8].

Using data association rules to realize data mining means to find the association rules with the minimum confidence and support for a given (user), and the collected data comes from the database. The itemset $X \cup Y$ that conforms to the $X \implies Y$ association rule must belong to the frequent itemset, and the confidence of the association rule ($X \implies Y$) can be calculated by using the support of the frequent itemsets X and $X \cup Y$ [9].

$$S(X) = \|\{t \in D | x \subseteq t\}\| / \|D\| \quad (1)$$

$$C(X \Rightarrow Y) = S(X \cup Y)/S(X) \quad (2)$$

Among them, S represents support, C represents confidence, and D represents transaction.

2.2 Demand Analysis of Public Policy Online Voting System

The voting system sets a certain topic and publishes it on the Internet. At the same time, users with voting rights are required to register to obtain the identity granted by the voting system. Through this identity, the voting content is selected, the system completes the counting of votes, and provides external Visual data chart. And provide query service for every voting record. Anyone can query each voting process and trace the entire voting behavior [10].

There are various voting systems, starting with the approval voting system. The approval voting system stipulates that voters can only vote on the candidate voting objects once. It can also be regarded as a binary voting method. Voting items, voters only have a choice of yes or no for a certain alternative, and the final voting result is measured by the number of votes obtained by the alternative. The functions of the system are as follows:

Online voting registration: In the voting system, the voter needs to complete the confirmation and identification of the identity, and convert the physical identity into a digital identity. This identity will ensure that no secondary delivery occurs during the voting process, that is, a physical identity has only one vote. To avoid the phenomenon of multiple deliveries and abuse of voting.

Online voting query: This requirement means that each voting process can be reviewed, and the voting behavior of voters can be tracked. It is necessary to ensure that each data submitted to the voting system must have a valid public-private key pair signature to ensure the uniqueness of the identity. In the case of data auditing, each voting data can be traced back to the application's registered vote people.

Online voting statistics: Count the voting data to form the determination results of the current voting issues, and display them in the form of data charts, and output the final data visually.

3 Design of Online Voting System for Public Policy Network Based on Association Rules Algorithm

3.1 System Development Tools

In the development process, due to the limitations of development conditions, the compatibility of client browsers is mainly considered, and the compatibility of other platforms is not considered too much. The specific development platforms and tools used are shown in Table 1.

3.2 System Module Design

Figure 1 shows the four functional modules of the system, which are described as follows:

Table 1. Development Tools

project	tool
server operating system	Windows 7 Ultimate
server database	Microsoft SQL. Server 2005
Integrated Development Environment	Microsoft Visual Studio
web server	IIS 6.0
client operating system	Windows XP SP2
	Linux Ubuntu
Client browser	Internet Explorer (IE)
	Google Chrome
	Mozilla Firefox

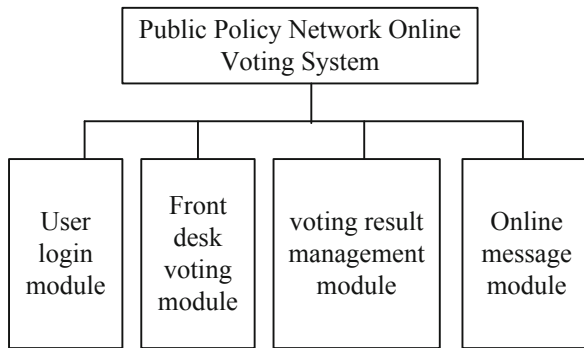


Fig. 1. System function modules

3.2.1 User Login Module

The main function of the user login module is to verify the identity of the administrator, so as to realize the management function that only the administrator can use. Does the administrator enter the username and password, and if the login is successful, some information about the vote can be maintained. In order to prevent illegal users from using brute force to crack the password, the system only allows the administrator to enter the wrong user name and password three times. After more than three times, the system will lock the current user for 24 h. 24-h system, the system automatically unlocks.

3.2.2 Front-End Voting Module

The front-end voting module displays the list of options in the current voting item. When the option list is displayed, the system needs to determine the selection mode of the current voting item. If it is a single-choice mode, each option will be displayed as

a radio button; if it is a multi-selection frame, each option is displayed as a checkbox frame. Voters can select voting items from these options and submit them.

When the user submits the voting result, the system will check according to the anti-swiping mechanism configured in the system, and use the association rule algorithm to prevent the same IP from voting repeatedly. If it is found that the number of votes of the same IP address in the same time period reaches the maximum set by the system, the user is not allowed to vote. When the voting is successful, the system will modify the reference number of the voting item and add voting records to count the voting results and prevent vote brushing.

3.2.3 Voting Result Management Module

The voting result management module mainly realizes the functions of statistics of voting results and data processing of association rules. After the voting result management module is performed, a list of all voting items will be displayed in the voting result management interface. The administrator can filter by the voting item classification and the current status of the voting item, and the voting item list only displays the required voting items. After selecting the voting item, the system will enter the voting result statistics interface, which will display the total number of people participating in the voting item, the voting data and the voting rate of each voting option. If you want to view the detailed record of voting, you can click “Detailed Record” to enter the voting record page of the voting item, which displays the detailed information of all voting records of the current voting item. Voting records cannot be deleted by any user to prevent administrators from modifying data illegally. When deleting voting items, the system will delete these records together. To use the statistical data outside the system, the user can export the statistical results to a file or print them.

3.2.4 Online Message Module

A message board is a common interactive service on the Internet. It is an interactive website that allows voters and voting system administrators to communicate with each other, and also allows more people to participate. It is a platform that provides interactive communication for the system. Compared with the forum, the message board does not need to register, it can publish information at any time, it is fast and convenient, users can leave a message directly, and can also make requests and questions, and the system administrator can reply to the message after collecting relevant information.

4 System Implementation and Testing

4.1 Implementation of no Refresh Voting

In order to ensure the effect of no-refresh voting during voting, the AJAX technology of C# is used, and the UpdatePanel control is used to put all the components of the entire voting part into the ContentTemplate tag of the control, including the candidate’s photo, name, and affiliation, votes and voting buttons. After clicking the voting button on the system page, a new page is automatically generated and returned to the user, but this

refreshes the page. Using the UpdatePanel control, because the voting button is in the control, the data can be returned in the background code without updating the page. The data newly passed to the browser also only needs to update the control that gives the prompt, and the rest of the page sections are not updated. This completes the no-refresh vote.

4.2 System Test

4.2.1 Response Speed Test

Test method: The voting process mainly relies on the AJAX non-refresh process of JS, so it is mainly necessary to test the response speed of this set of JS. To test the response speed of JS, either rely on external software or rely on JS itself. Relying on external software, such as using the WatiN automated testing tool, write a C# program to automatically click on each function of the browser, time it, and measure the response speed. But such a huge amount of engineering, for the cost of the system, the cost performance is low. Depends on JS itself to output the moment when the event has just started, and output the moment again after the event is completely over. It does not take into account the time from the user's click to the start of the JS response, there is a certain error, but the time for the corresponding JS process can be measured, which is cost-effective, so this method is used.

Test result: When the user clicks an option, the earliest corresponding JS side is in the "onclick" event function. So the moment should be output at this moment. To output the time, use the "(new Date().getTime)" method of JS to obtain the time, and use the "console.log()" method to output it in the console. Originally, the "onclick" event is only bound to the "vote(x)" method, and an anonymous function is created here. The anonymous function first outputs the moment, and when the "vote(x)" method is called, does not affect the process. For the convenience of review, after calling the "vote(x)" method, output the time again, and the total running time of the "vote(x)" method can be known from the outside world.

4.2.2 Concurrent Access Quantity Test

Test method: The test technology for the number of concurrent accesses is relatively mature. Use the "ab" stress test tool of the Apache server to conduct concurrent tests to test the number of requests processed by the server per second.

Test results: The test displayed by the "ab" stress test tool is shown in Fig. 2. According to the test results of the number of concurrent accesses, when the number of concurrent users is 100, the minimum request time is about 0.37ms, and the average request time is about 0.42 ms, the maximum request time is about 0.45ms; when the number of concurrent users is 1000, the average request time is about 0.54ms. As the number of concurrent users increases, the time the system takes to request a user will also increase. The request time is within the controllable range set by the system to meet the user's concurrent operation requirements.

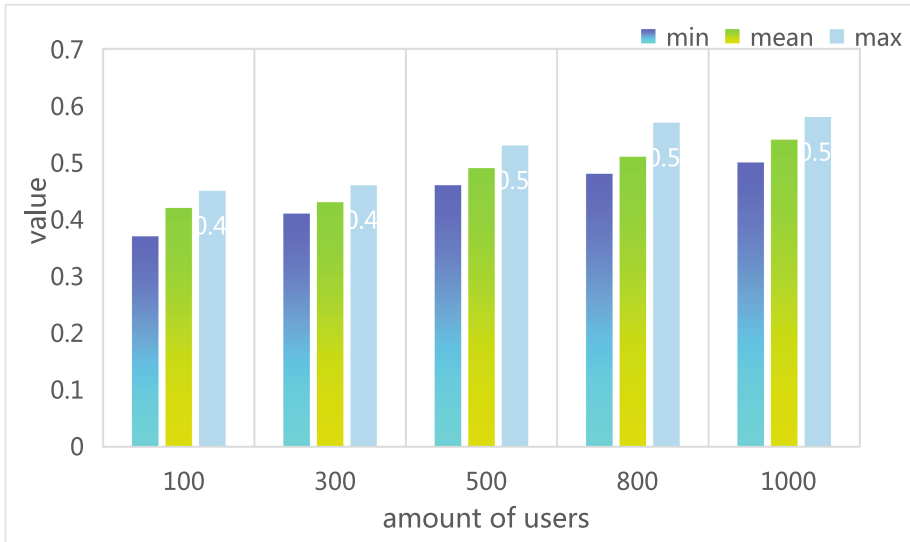


Fig. 2. Concurrency test results

5 Conclusion

This paper uses the association rule data mining algorithm in the design of the public policy online voting system, through which the voting data can be counted. After the system design is completed, the response performance and concurrency performance tests are carried out. The results show that the system can run normally and meet the needs of users. Users can enter the system to participate in the implementation of public policy, and system administrators can also improve the level of voting management by processing voting results through the system.

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