Common Algorithm Analysis of University Network Course Selection System

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Abstract. Elective algorithm is the key of elective system. To guarantee fair results, high efficiency and secure system, it’s very necessary to design a set of reasonable elective algorithms. In this paper I put forward Fairness Algorithm and realized it in this paper, which can guarantee the results’ fairness, the system’s security and practicality in the situation of large number of students, curriculum complex, and long-term periods of elective. The innovation point of this paper is to study the algorithm of online course selection from many aspects, such as the fairness of online course selection, the safety of course selection, and the complexity of algorithm design.

Introduction

Network elective college teaching management system is an important part. With the network elective system, teaching management personnel can be detached from the arduous task of educational affairs, greatly improving work efficiency. At present, the network elective system in all colleges and universities has the problems of network congestion at the peak elective courses, difficulty in ensuring the fairness of elective courses and unequal degree of hot and cold courses. With the further progress of the credit system, the mutual recognition of the credit system in colleges and universities, the number of courses and the number of students participating in the course selection are all greatly increased. The fairness and fairness of the course selection system are getting more and more attention from the students. How to design a good algorithm to solve the existing problems of course selection system, which is a common concern.

Basic Principles of Course Selection Algorithm

In the network elective process, due to teacher, time, classroom resources constraints, so the students cannot fully meet the requirements of course selection. However, students often have a tendency to choose courses. As a result, some courses may be “full” and may exceed the existing ability to start courses. However, the number of course selections in some courses is “very small”, which is lower than the minimum number of courses started. Therefore, we should design a reasonable and fair course selection algorithm to meet the needs of teaching management. A high efficiency, fair and reasonable elective course algorithm should meet the following basic conditions:

1. According to the teaching plan, the successful completion of course selection.
2. System performance and stability, good security, fast operation, high efficiency.
3. Managers easy to operate, simple. Data sorting, backup, information release can be done easily.
4. As much as possible to meet the aspirations of students, each student has equal opportunities for course.
5. Algorithm design should not be too complicated, so as to avoid difficulties, excessive system overhead.
Network Elective Course Commonly Used Algorithm and Analysis

Based on the above basic principles, we analyze the commonly used elective algorithms from aspects of content, result, complexity and security. Commonly used network elective algorithm what? General induction into the following categories:

(1) First Come First Service Algorithm

The so-called first-come first-served algorithm similar to the ticketing system, who first come first to buy tickets, ticket sales so far. The first landing elective system has priority to the power of course selection, elective results directly into the elective results table. A class to limit the number of candidates, then the class automatically stop the class.

The algorithm designed elective system elective results and elective time, who first landing system there is most likely to choose their own course of satisfaction. Therefore, the result is not fair.

In terms of security, the algorithm may cause network access problems. Because there are not many popular courses offered in each school, in order to choose their favorite course, the favorite teacher will rush to surf the Net for electives at the beginning of the open elective course, triggering unexpected peak traffic. Bring great pressure to the system load, cause the service quality to drop, and cause the system to crash in severe cases.

The principle of the algorithm is simple, the system is easy to implement. In addition to the performance of system operation and hardware configuration, but also with the number of courses and the number of courses related to the number of elective courses, the limited number of courses may lead to peak visits, the operation of the system security risks. If the course count is small, the number of courses, hardware configuration, the system can run smoothly.

The above analysis shows that the first-come, first-served course selection algorithm has higher performance requirements for the system, may lead to peak visits, and the elective results are not fair.

(2) Professional Priority Algorithm

The algorithm is divided into pre-selection and screening of two stages. In the preselection stage is not limited to the number of electives, students can choose. After the preselection, the results of the elective course are analyzed. If the elective number of the course does not exceed the limited number of the course, all the selected courses will be selected and the result will be written into the formal elective result table. If you exceed the limit set number of candidates, then screening. The screening principle is: the professional students have higher priority than foreign students, senior students have a higher priority than junior students. Professional and grade information is reflected in student ID numbers. The specific process shown in Figure 1.

As can be seen from the above flow chart, the results of student elective courses and course time has nothing to do with the major. Students have priority over courses that are the same or similar to their major

The complexity of the algorithm is related to the number of courses and the number of majors. The more courses, the more professions, the more complex the algorithm design. For example, there is one elective course called “Multimedia Technology” with a limited number of candidates of 200 and an actual number of candidates of 300. Therefore, screening of these 300 people is conducted. According to the screening principle, students in the computer science department have priority. If 120 People, the remaining 80 places, these places give priority to which department? This rule is not well established. Each semester to open hundreds of public electives, if each course should develop the appropriate screening principles, which is too complicated system design. If the course has been added, deleted and other maintenance, it is necessary to modify the program, the system maintenance workload is too large.
From an analysis point of view, the professional priority algorithm is suitable for a small range of professional courses, not suitable for the whole school of public courses.

(3) According to Voluntary Classification Screening Algorithm

The principle of the algorithm is similar to the college entrance examination, it is also the process of pre-selection and screening process is divided into two processes. In the preselection phase, each student is allowed to have several priority-based volunteer options for a course with multiple classes at the time of enrollment, up to a maximum of three volunteers. Computer processing, according to different volunteers for different treatment, first of all to meet the requirements of the first choice, for the first volunteer number exceeds the limit of the course when the number of candidates using the average probability distribution algorithm for processing, screening out the extra number; If the first volunteer is less than the number of candidates for the course, all selected. The first volunteer traversal after the second volunteer, second volunteer approach: If a course of the first volunteer number has been limited to the number of candidates, will no longer be the second volunteer; otherwise, the first volunteer the course The number of the underclasses of the class is the maximum number of the second choice volunteers, processing method is the same as the first choice. And so on, and then the third voluntary treatment.

The First Choice of the Deal. The first volunteer has the highest priority, the highest chance, most likely to be selected. The algorithm shown in Figure 2.
Second Volunteer Processing. The second volunteer will be dealt with as follows: After the first volunteer, the remaining optional M2 and the second volunteer (N2) of the course are all selected. If N2≤M2, all are selected, otherwise the process is similar to the first choice.

Average Distribution Probability Algorithm. According to the law of probability and statistics, the average distribution probability algorithm dynamically generates a “sign” that is evenly distributed and reflects the random characteristics. The final result of the course selection is determined according to the actual number of students and the capacity of the curriculum. The specific operation is:

For those courses whose number of elective students exceeds the number of recipients, random screening is conducted by the system. Each elective student in the course is assigned a random number, sorted by size, and smaller reserved. After screening, retained elective records valid. If the class is not full, these valid electives do not participate in the next round of screening, and only later applicants will be screened. (If necessary, the selection of courses will use multiple rounds of screening).

The algorithm flow chart shown in Figure 3.
The Third Volunteer to Deal With. After the second volunteer processing, there are still less than the number of people in the class, and then the third volunteer to deal with the third volunteer approach with the second choice.

Elective results and course time has nothing to do. Due to the combination of foreground elective and background processing, only when all the students finish their elective courses are they uniformed in the background. Elective courses during the course, each student has equal rights to solve the traditional first come first served algorithm may bring peak access, triggering network congestion, to ensure the safe operation of the system. Trying to take care of students’ choice of class when grading and screening, so the result is fair.

From the above analysis we can see that the various algorithms have their own advantages and disadvantages and the scope of application. In practice, according to the actual situation, choose the appropriate course selection algorithm can also be integrated into several algorithms. For example, when establishing a credit system, the courses can be classified, the professional elective courses are screened by the professional priority algorithm, the random electives are taken for the public elective courses, and the first-come-first-served algorithm can be used in the by-election stage to simplify the system design complexity.

Summary

This paper first describes the basic principles of network course selection algorithm, and analyzes and compares the commonly used several network course selection algorithms from the aspects of fairness of course selection, security of course selection, complexity of algorithm design and so on. Elected a relatively good network course selection algorithm: According to the voluntary classification screening algorithm, and it is described in detail.

According to volunteer grading screening algorithm: The algorithm uses a combination of foreground elective courses and background processing methods, that is, only when all students are finished elective, only unified treatment in the background. Classes that exceed the limit are screened by student volunteer rating. The algorithm can ensure the fairness of course selection and improve the security and usability of the system with a large number of students, complicated courses and long elective periods.

References


