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Application Research of Banker Algorithm in Teaching Arrangement in Independent College

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Abstract: Independent colleges are an important part of private higher education. There are many kinds of elective courses for undergraduates. Students are multi-disciplinary and have a large number of students across the grades. The limited resources at the end of the semester are facing enormous challenges. The banker algorithm is a dynamic strategy to eliminate deadlock algorithms. It can effectively and reasonably arrange the resources already in the system. This paper mainly discusses the application of the algorithm in the course scheduling system for the elective course classroom arrangement, so that each classroom can get full and reasonable application.

1. Introduction

Curriculum arrangement is an important and arduous important day-to-day management in academic management. It is actually a process of assigning time resources and teacher resources to each course. With the continuous development of modern education, independent colleges have opened more and more public elective courses to expand students' knowledge. [1] The public elective course has the characteristics of variable number of courses and many design classes. Therefore, it is especially important to arrange classrooms for elective courses in the course scheduling system. This article focuses on the classroom arrangements for more and more public electives in independent colleges.

The banker algorithm is a typical algorithm used in the operating system to solve the deadlock problem, mainly to solve the problem of how to rationally arrange resources [2]. The classroom arrangement applied to the independent college elective course is mainly to systematically judge whether the classroom resources can meet the requirements of the course and class size, and finally find a solution that can satisfy all the applications.

2 data structure in the banker algorithm

There are three important matrices in the banker's algorithm, namely the maximum demand matrix $Max[M,N]$, the assigned matrix $Allocation[M,N]$, and the demand matrix $Need[M,N]$. Their relationship is the demand matrix $Need[M,N] = Max[M,N] - Allocation[M,N]$, the data structure of the banker algorithm is described as follows:

(1) Maximum demand matrix $Max[M,N]$, $Max[i][j]$ in the operating system environment is expressed as the maximum demand quantity of R_j resources for process P_i , where the largest demand matrix $Max[M,N]$ is an M Row N rows of matrix [3];



(2) Allocation matrix Allocation[M,N], Allocation [i][j] in the operating system environment indicates that the number of R j resources has been obtained for the process Pi, where the allocation matrix Allocation[M,N] is an M row N a matrix of columns;

(3) Demand matrix Need[M,N], Need[i][j] in the operating system environment indicates the number of R j resources required for the process Pi, where the demand matrix Need[M,N] is an M row N a matrix of columns;

(4) The available resource vector Available, one containing M elements

Array vector, the value of the array vector represents the amount of resources available for a class;

(5) Finish[i] indicates whether the resource has an identification vector, and the Linux operating system environment indicates whether the system has sufficient resources to allocate to the process Pi;

(6) Work[i] represents the number of resources vector. In the Linux operating system environment, the number of Rj resources required to continue the operation of the process Pi can be supplied. Set Requesti

Is the Pi request vector of the process [5].

3 Description of the banker algorithm

An convention [2] : two vectors $X = (x_1, x_2, \dots, x_n)$, $Y = (y_1, y_2, \dots, y_n)$, $X \leq Y$ if and only if $x_i \leq y_i$ ($i = 1, 2, \dots, n$). When a process proposes a resource application Pi, the banker algorithm first modifies the data structure to perform resource allocation according to the following procedure under the premise of ensuring $P_i \leq N_i$ and $P_i \leq \text{Available}$:

$$\begin{aligned} \text{Available} &= \text{Available} - P_i \\ \text{Allocation} &= \text{Allocation} + P_i \\ \text{Need} &= \text{Need} - P_i \end{aligned}$$

Then execute the security algorithm, if the security detection is passed, the resources are formally allocated, otherwise the following process is performed to change the data structure back to the original value:

$$\begin{aligned} \text{Available} &= \text{Available} + P_i \\ \text{Allocation} &= \text{Allocation} - P_i \\ \text{Need} &= \text{Need} + P_i \end{aligned}$$

The security algorithm simulates the execution of future processes. If the process can be fully run, the system is safe, otherwise it is not safe. Two additional work vectors are set in the security algorithm: 1) the vector $W = (w_1, w_2, \dots, w_m)$, where w_j ($1 \leq j \leq m$) represents the remaining number of j-th resources in the simulation run, the initial value is equal to av_j 2) Vector $F = (f_1, f_2, \dots, f_n)$, indicating whether the process can be completed, where f_i ($1 \leq i \leq n$) can have two states FALSE, TRUE, TRUE indicates that the process can be completed, FALSE indicates Not completed yet, the initial value is FALSE. There are two steps in the security algorithm: STEP1, STEP2, and the function of STEP1 is to find the security that can get enough resources to complete successfully.

The function of the whole process Pi and STEP2 is to perform security detection [4], and judge whether the system is safe by checking whether there is a process that cannot be completed.

Described separately as follows: STEP1: REPEAT

Find a safe process Pi that satisfies the condition " $f_i == \text{FALSE}$ and $N_i \leq W$ ";

IF (found)

THEN { $W = W + A_{Li}$; $f_i = \text{TRUE}$; }

UNTIL (not found);

STEP2:

IF (existing $f_i == \text{FALSE}$)

The THEN system is not secure;

ELSE system security;

4 banker algorithm application

The course scheduling system is an indispensable part of the university. Its content is very important for the school's decision makers and managers. With the expansion of colleges and universities and the increase of student courses, the resources of the school are limited. [5] It is more complicated to arrange courses in the traditional manual management mode. Therefore, it is very important for the University Academic Affairs Office to make all the current elective students complete the course in a limited time and return all the applied resources. Here, two vector resources (resource total) and available (remaining resources) are introduced, as well as two matrices Max (maximum demand per process) and Allocation (quantity assigned to each process). Together they constitute the state of the system's allocation of resources at any one time [1] [2].

The vector model is: assume that the total amount of classroom resources is 1, 5 fixed multimedia classrooms (classrooms with a maximum of 100 people), 2 or 3 fixed multimedia classrooms (classrooms with a maximum of 80 people), multimedia lab 2 One (a classroom with a maximum of 50 people) and one studio (digital) (a classroom with a maximum of 20 people), namely the vector Resource (5, 3, 2, 1). The selected courses are Linux Getting Started, Mysql Application Development, Jquery, and the number of students selected by the students are: 380 in software development direction, 570 in Internet finance development direction, and 120 in soft test technology. The request is the largest. Demand Max.

The banker algorithm is applied to the college scheduling system, which mainly allows the system to judge whether the existing classroom resources can meet the needs of the students in class, and find a reasonable solution, which is not a security sequence, and does not fall into a deadlock. According to the investigation and research on the actual situation, it is obvious from the data given above that if the course arrangement is unreasonable, the system is likely to have a deadlock. Such an arrangement is not feasible, so it is necessary to design a reasonable one. Program. The author's design idea is as follows:

(1) First arrange for one of the students to take classes, and then release the resources after the students finish the class, so that students who choose other courses can allocate enough resources to complete the task normally. Because the number of people who choose the first course is 380, and there are 5 R1 classrooms, and can sit up to 100 people, and there are 3 R2 classrooms, up to 80 people, so you can assign R1 resources to the P1 process. 3, so that 80 people still have no resources allocated, and then allocate 1 R2 resource to process P1, so that it is just allocated, and the resources are fully utilized. R3 resources and R4 resources do not need to be allocated here. Process P (1 is shown in Table 2).

(2) After allocating resources to process P1, there are 2 R1 resources, and 2 R2 resources, namely vector Available (2, 2, 2, 1), and the number of people who choose the second course. For 570 people, even if all the remaining resources are allocating to the process P2 is not enough, so only a part of the resources can be allocated to the process P2, and after the process P1 is executed and the resources are released, it is allocated to the process P2. This will complete the task normally. For the first time, the process P2 is assigned two R1 resources, one R2 resource is allocated, and the R3 resources and R4 resources are not allocated (as shown in Table 2), so that 290 individuals are not allocated in the process P2, and the process P1 is released. After the resource, the R1 class resource can be allocated to three processes P2.

(3) At this time, the R1 resources have been allocated, there is one R2 resource, two R3 resources, and one R4 resource, because the number of people in the third class is 120. First, allocate 1 R2 class resource to process P3. The remaining 40 people in process P3 do not allocate resources, and then assign R3 class resources to the process (as shown in Table 2), so that process P3 can complete the task normally. From the above design ideas, we can get the matrix Max as shown in Table 1. From the above design ideas, we can get the matrix Max as shown in Table 1.

Table 1 Matrix Max (maximum demand per process)

$$P1=\{3,1,0,0\}$$

$$P2=\{5,1,0,0\}$$

$$P1=\{0,1,1,0\}$$

Where the Max (2, 1) element value is 5, indicating that the process P2 is on the resource.

The maximum demand for R1 is five, and the matrix Allocation is shown in Table 2.

Table 2 Matrix Allocation (number assigned to each process)

$$P1=\{3,1,0,0\} ;$$

$$P2=\{2,1,0,0\};$$

$$P1=\{0,1,1,0\};$$

Since the second course has not been allocated enough resources, another matrix is required: each process requires a resource (Need), and it can be seen that Need=Max-A, and the matrix Need is as shown in Table 3. . Table 3 Matrix Need (required resources)

$$P1=\{0,0,0,0\} ;$$

$$P2=\{3,0,0,0\};$$

$$P1=\{0,0,0,0\};$$

From the data in the above table, it can be seen that the resources in the system and the classrooms of the courses offered are allocated and the resources are fully utilized. This is an application of the banker algorithm.

5 Summary

The above is the introduction of the banker's algorithm and its application in the university course scheduling system, and designs a reasonable course scheduling program, thus avoiding the situation of deadlock and fully and rationally utilizing the resources of the school. The banker algorithm is a dynamic strategy to avoid deadlock. The advantage of the banker algorithm is that it can effectively and reasonably arrange the existing resources of the system. Compared with other algorithms, the restrictions are less and the utilization of resources is improved. Therefore, in the college scheduling system, the classroom arrangement is fully utilized, and the algorithm can ensure that all customers are satisfied within a limited time. And the traditional genetic algorithm may converge to local optimum under the condition of improper selection of moderate function, but not global optimal. For dynamic data, it is difficult to find the optimal solution by genetic algorithm.

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