Research on the Application of Ant Colony Algorithm in University Teaching Management Service System

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Abstract. The ant colony algorithm is based on the real ant colony foraging behavior research algorithm, based on the ant colony algorithm university teaching management service system, through the development of one-click automatic course scheduling, drag-and-drop Manual course scheduling, the multi-mode, service-oriented perspective to promote college teaching management, greatly improve the efficiency of college teaching management services, fully adapt to the intelligent college teaching management environment. Based on the ant colony algorithm, this paper analyzes the background of the application of ant colony algorithm in university teaching management service system, and puts forward the application strategy of ant colony algorithm in University Teaching Management Service System.

Keywords: Ant Colony algorithm; University; Teaching Management Service System; Application Research

Biologists have found that the behavior of individual ants is interacting with each other. In the process of ants' movement, they can leave a substance called pheromone on their path, which is the carrier of information transmission and communication between individual ants. The integrated educational administration platform, based on the micro-service structure and centered on "service", provides educational administration management, educational administration evaluation, experimental and practical teaching management, and other educational services for colleges and universities, to meet the management needs of school year system, Credit System and school year/credit mixed system, to help students individualize the training of one-person-one-case, and to carefully manage the teaching "high quality".

1 Application background of ant colony algorithm in University Teaching Management Service System

Many scholars have done a lot of work to improve the performance of ant colony algorithm. Dorigo et al. then proposed the ant colony system (ACS). The rule of state transition of ant selecting city is improved, the pheromone is released after traversing only the ant that finds the optimal path at present, and the pheromone concentration on the path is reduced in the course of transition, and the premature convergence to the same path is avoided. MMAS algorithm, the pheromone concentration on the path is limited to \( t \) min. In the range of
TMAX, the initial value of pheromone on each path is set to T Max, and P is smaller, so more feasible solutions can be found in the initial stage. This algorithm is one of the best models for solving discrete optimization problems such as TSP. The hybrid ant colony algorithm proposed by Gambardella et al, and the fast ant system proposed by Taillard et al all improve the optimization ability of ant colony algorithm under certain space complexity as far as possible, and widen the application fields of ant colony algorithm.

In the implementation of ant colony algorithm. The value of ραβ and other parameters determines the balance between the searching speed and the convergence speed. Dorigo et al obtained the best parameter setting of AS algorithm when a = 1, β = 5, ρ = 0.5, while in ACS algorithm α = 0.9, β = 2, ρ = 0.1. Jiang Lingyan et al analyzed the effect of αβρ on the performance of the algorithm, and pointed out that the algorithm has better performance when α ∈ [0.1,0.3] , β ∈ [3,6] , ρ ∈ [0.1,0.3] .

Guttjahr et al firstly proved the convergence of graph-based ant colony algorithm (Gbas) and improved GBAS/tdev and GBAS/TDLB algorithms. Stuezle and Dorigo proved that a kind of ant colony algorithm when the number of iterations tends to infinity, the algorithm can guarantee to find the global optimal solution. The convergence rate of ant colony algorithm is analyzed by Huang Han et al and ACS. Sun Tao and others have made a preliminary study on the convergence of a class of simple ant colony algorithm. Ding Jianli and others use genetic algorithm to generate better initial distribution of pheromones, and then use ant algorithm to find the exact solution. In this way, the cooperation effect of ant colony algorithm and the evolution effect of genetic algorithm can complement each other, and win-win both in time and optimization.

It is characterized by distributed computing and positive feedback mechanism. The distributed computing enables multiple computers to perform simultaneous computations, increasing the speed of the solution, and the positive feedback mechanism enhances the role of pheromones in searching for optimal solutions faster and saving time. Strong robustness, just a little change to the model, can be optimized for other types of problems. In order to improve the performance of the algorithm, it is easier to use in combination with other heuristic. Information can be exchanged between individuals, and the communication overhead increases less. Although the ant colony algorithm has been applied to many practical problems and has many advantages, it also has some disadvantages: the long initial search time of the algorithm affects the search efficiency. The pheromone of each path is the same at the initial time. Only with the increase of time and the positive feedback of information, can the difference of each path be reflected and the optimal solution be obtained. But this process usually takes a long time, especially in solving large-scale optimization problems, which takes a long time and affects the efficiency.

2 Functions of teaching management service system in colleges and universities

2.1 Student status management

The school educational administration office and the second-level teaching management unit can track students’ comprehensive information during the school term through the student status management function of the educational administration management information system, including the basic personal information at the time of admission, retirement, promotion, transfer of Major, graduation and other changes in status information, and the above information for daily maintenance.
2.2 Management of lesson plans and lesson scheduling

The teaching plan is the teaching basis which the university teaching management department extracts according to the talented person training plan, the teaching management information system can realize the functions of inputting, querying, revising and printing the teaching plans of different grades and specialities, the system can automatically check each class, teacher and classroom conflict, the correct arrangement of each semester curriculum.

2.3 Management of online course selection

The educational administration management information system provides an equal and competitive platform for college students to select courses online. The educational administration office and the secondary colleges and departments set up elective courses, elective time and elective subjects in the system according to the teaching plan, in the network through the pre-election, by-election, withdrawal of the three stages, the completion of the campus network all students elective activities.

2.4 Examination and performance management

Examination is an important part of teaching management, the system can carry out the examination schedule, examination room and teacher invigilation arrangements, and automatically sum up the examination schedule, saving paper work. After the test, the system can input, revise, sum up and analyze the students' scores, and then the report forms and the list of students who need to make up or retake the test are derived according to the parameters of the average score and the highest score of students or classes.

2.5 Management of teaching quality evaluation

On the one hand, teaching administrators can systematically derive reports on students' excellent and passing rates in different subjects to analyze the quality of students' learning. On the other hand, students in the system of the message board for the school's teaching link feedback, and through the system to participate in the teaching management department organized evaluation activities to evaluate the teaching quality of teachers.

3 Design of Teaching Management Service System in colleges and universities

3.1 System network architecture design

This system is based on the Internet/Intranet Network Operation Mode, its main system functions are the network server, the front-end client uses the Web browser, the back-end server is the system service and the management core, it is often referred to as the thin client/fat server model. The functions of the server include: the realization of the functions of the system (Business Logic) , the Web services and application services to the client, the interface of the database system, etc. . Based on the micro-service technology architecture + flexible container expansion mode, a caching mechanism is introduced to ensure flexible expansion of resources, stable and efficient availability of the system, set up a fault query window, and quickly check out possible course selection failures, to achieve non-caton course selection.
3.2 System architecture design

From a developer's point of view, there is a tendency to use the b/s pattern for everything because it has a distinct advantage over other patterns. First of all, the use of standard browser in the client, no need to install client applications, can achieve zero installation, zero training, and cross-system, cross-platform capabilities. However, the content of the educational administration management system in colleges and universities is very complex, involving many aspects, managing a wide range, many modules are interactive and deal with a large amount of data, if all the B/s single mode is applied, user-friendly operation and use is difficult to solve, such as course scheduling management, its security is not as good as C/S structure. Therefore, the system architecture mainly considers three-tier C/s mode and B/s mode. The educational administration personnel's management interface uses the three-tier C/s structure, but the teacher, the student, the information inquiry, the information release and so on practical aspect is broad, the security and the interactivity is not high module uses the B/S structure, so we can take full advantage of each other.

3.3 System functional module design

The system is composed of 16 subsystems: resource management subsystem, Student Basic Information Management Subsystem, Course Plan Management Subsystem, Course Arrangement Management Subsystem, Course Selection Management Subsystem, student course selection subsystem, classroom result entry subsystem, Result Management Subsystem, examination management subsystem, student status processing subsystem, Experiment Management Subsystem, graduation and Degree Qualification Examination Subsystem, User Management Subsystem, General Inquiry Subsystem, English Test level 4-6 and computer level examination subsystem, FEE registration management subsystem.

3.4 Database design

The design of the database is mainly based on the system requirements and functional structure, in order to save all kinds of data used in the university educational administration management system, the data table in the database of university educational administration system can include the following categories: students, teachers, courses, administrators, grades, etc. The data table and field should be defined according to the frequency of information updating and using and the need of programming. In the database to create the user registration data table, student data table, teacher data table, curriculum information table, performance data table and other data tables. Considering the extendibility of the system, the database can be used as a shared database for other teaching management, and the data tables can be associated with the same name fields.

4 The application strategy of ant colony algorithm in University Teaching Management Service System

The teaching management post personnel is related to the teaching operation of the department and even the whole school. It is an important guarantee to realize the informationization construction of colleges and universities whether they can skillfully use the educational administration management information system to serve the teaching management. Therefore, colleges and universities should establish an effective training mechanism, strengthen the computer training for teaching administrators, and carry out the teaching administration system training for the new administrators, raise the level and
technical level of teaching management personnel. There are many functional departments, administrators, teachers and students involved in teaching management in colleges and universities. In the use of educational administration system, a modern means, the university administrators should first give attention and support, and promote the use of the system departments and teachers and students enthusiasm.

When developing and introducing the software of educational administration management information system, we should not only consider the comprehensiveness of the service for teaching and scientific research, but also consider the actual law of teaching management in colleges and universities. At the same time, timely collection of feedback from teaching administrators, teachers and students, and continuous modification and improvement of system functions and modules by technical personnel, to create a school to meet the actual needs of the school, in line with the characteristics of the educational administration management information system, truly achieve scientific system configuration. After the system is fully understood and put into use, colleges and universities should strengthen the implementation of the system to solve the problem that some functions are not fully effective, so as not to use manual operation when the system can be used. For example, in the field of practice and teacher management, the selection of topics and grades of graduation theses, the application and approval of teachers' transfer of courses should be managed through the educational administration system, so as to reduce the workload of teaching administrators, maximize the management efficiency of the educational administration system.

Comments on the PC side of teaching management: suitable for academic administrators. The multi-dimensional view visualization data analysis chart and the teaching quality appraisal data report, helps the appraisal teaching work to carry out in an orderly way, realizes the appraisal teaching process high-efficiency management monitoring. Evaluation and Teaching Management Mobile (small program): for students, student information, teachers, supervisors and other multi-role users. Free Evaluation, task evaluation, scanning code evaluation, classroom evaluation, evaluation process flexible and easy to use, real-time evaluation of teaching, improve the quality of teaching evaluation data. The evaluation management based on process evaluation, relying on multi-dimension evaluation index, multi-staff mutual evaluation and multi-times cumulative evaluation, provides reliable data support for improving teaching quality. It can not only control the quality of teaching process in real time, but also feed back the evaluation data to the intelligent analysis platform of teaching big data.

5 Conclusion

The application of ant colony algorithm in University Teaching Management Service System is easy to converge to the local optimal solution. This is mainly because positive feedback accelerates the deposition of pheromones. When the global optimal solution has not been found, all individuals may search for a completely consistent solution, but this is only a local optimal solution, so that the algorithm can not be further search. Although the ant colony algorithm has such defects, but as long as we find the reasons can be solved, such as appropriate addition and subtraction of pheromone positive feedback effects, and other algorithms combined. Through the analysis of ant colony algorithm, this paper provides a good foundation for the later improvement and application of teaching management service in colleges and universities.
References


