

Design and Development of Intelligent Search Algorithm Teaching Software

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Abstract: Artificial intelligence (AI) is a subject that uses computer to simulate human intelligent activities to solve problems in the late 1950s. It is widely used in expert system, machine translation, speech recognition, character recognition, computer vision. Robots, video games, etc. At present, colleges and universities at home and abroad generally set up artificial intelligence courses, and has become one of the core courses of computer related majors. Since artificial intelligence is a comprehensive interdisciplinary subject, its research involves many subjects and fields such as brain science, neurophysiology, psychology, cognitive science, cybernetics, information theory, system theory, etc. With the characteristics of many knowledge points, wide involvement, abstract content and strong theory, learners need to have a good mathematical foundation and strong logical thinking ability. Artificial intelligence involves many knowledge of mathematical logic, some appear difficult to understand, making teachers and students in the process of teaching and learning seem more difficult. In order to enable students to better understand the basic concepts and principles of artificial intelligence, master the basic technology and cutting-edge contents of artificial intelligence, broaden the scope of knowledge, inspire ideas, to lay a more solid foundation for future research and application in related fields. In order to improve the teaching quality of the introduction to artificial intelligence, we should coordinate the teaching and learning. Combining with the teaching practice, the teaching software of intelligent search algorithm is developed in Microsoft Visual Studio 2005 environment with C++ language. The A* algorithm, simulated annealing algorithm and genetic algorithm demonstration program and verification program are designed. The core codes of these algorithms are provided to facilitate students to carry out independent experimental design of each algorithm.

1. Introduction

In order to meet the needs of the development of artificial intelligence technology, colleges and universities at home and abroad have generally set up artificial intelligence courses, and have become one of the core courses of computer related majors. Since 1996, our university has opened an introduction course of artificial intelligence for undergraduates majoring in computer science and technology, automation and mechanical automation. Professor Wang Wangling of our school also compiled the textbook artificial Intelligence and its Application in 2005, published the 2nd edition of the textbook in 2008, and produced the complete electronic teaching plan and teaching video.

Because artificial intelligence is an interdisciplinary subject, it involves many abstract theories and complex algorithms in the teaching process, and the contents of the teaching materials are too theoretical. The application examples in the textbook are only the paper talk on the books, so the students in the course of learning the introduction to artificial intelligence feel as if they are learning mathematics and algorithms, and often have a feeling of fear. In order to solve the above problems, it is difficult to meet the requirements of enlightening and instructing students if we only rely on the teacher to explain in class and use PPT to do the demonstration. In order to better achieve the teaching objectives, improve the introduction of artificial intelligence course The quality of teaching, the coordination of the bilateral relationship between teaching and learning, the students from a feeling of fear, into a useful and interesting feeling, according to the existing artificial intelligence courses in teaching and practice experience and methods.

The General structure of Teaching Software. The intelligent search teaching experiment system is an experimental CAI system for the teaching materials of artificial Intelligence and its Application (2nd Edition). The system is designed to provide a simple and friendly user interface for students to use the system. It can realize the process demonstration and contrast of different intelligent search algorithms, and provide the function of independent design experiment. In order to enable students to learn and master some intelligent search algorithms, the structure of the intelligent search teaching experiment system is shown in figure 1, including A * algorithm, simulated annealing algorithm, genetic algorithm, etc. Job management and system help 5 modules.

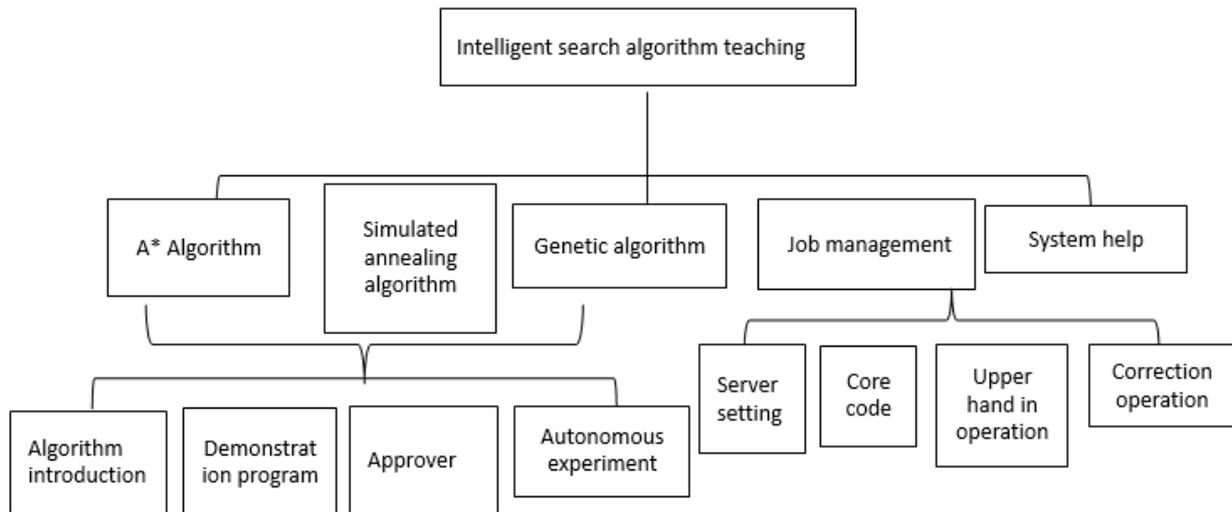


Fig. 1 The overall structure of the teaching experiment system

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In figure 1, the algorithm, simulated annealing algorithm and genetic algorithm module are introduced, and the demonstration program, verification program and autonomous experiment module of each algorithm are also provided.

1) introduction of algorithm. The main function of the algorithm introduction sub module is to introduce to students the characteristics of intelligent search algorithms, such as A * algorithm, simulated annealing algorithm, genetic algorithm and so on.

2) Demo program. The main function of the demo sub module is to show the search process and results of each algorithm for solving the 8-digit problem / tsp. At the same time, you can click "next", "continue / pause" and so on. View the status of temporary variables during the running of the algorithm.

3) Verification procedure. The main function of the validate sub module is to set the size of a given problem and some parameters of the algorithm Setting, testing the effect of intelligent search algorithm on different scale problems, and the effect of parameter setting on the performance of the algorithm, and showing the performance of different algorithms to solve the same problem for comparison.

4) Independent experiment. The main function of the autonomous experimental sub module is to carry out the autonomous experimental design of each algorithm according to some algorithm core codes provided by the system, and to solve some difficult problems such as the shortest path problem, tsp problem, Flow shop scheduling problem and so on.

Homework management module is mainly for students to upload experimental reports and

program source code, as well as teachers to correct the homework. In addition, the system help module includes system overview, system installation and uninstall instructions, server configuration instructions, system usage instructions and technical support.

2. A*algorithm

Experimental design and implementation of intelligent search algorithm. A * is a heuristic search method, which is widely used in network routing algorithm, robot search, artificial intelligence, game design and so on.

Heuristic search is to use the heuristic information related to the problem to search, to reduce the scope of search and improve the efficiency of the search. This search process using heuristic information is called heuristic search method. In the heuristic search process, to sort the Open table, a method is needed to calculate the degree to which the node to be expanded has the hope of reaching the target node. People always hope to find the most promising node to the target node priority extension. A* algorithm is generally based on the size of the evaluation function $f(n)$ to arrange the order of the state to be extended, each time the minimum value of $f(n)$ is selected to expand. $f(n)=h(n)+g(n)$

Where $g(n)$ is the actual cost of initial node to n node, $h(n)$ is the estimated cost of optimal path from n node to destination node, and $h(n) \leq h^*(n) / h^*(n)$ is the cost of optimal path from n node to destination node.

Demo program. Aiming at the problem that the heuristic information is not intuitionistic, it is difficult to understand the change of open table and Closed table, and the state of the problem is complex, a demonstration program of A * algorithm is designed to solve the problem. Demo program has the function of displaying Open table and Closed table, and can show the change of each state intuitively.

3. Independent experiment.

In order to enable students to solve some practical problems by using the A * algorithm, some homework problems such as missionary and savage problems, maze problems, shortest path problems and so on are designed. At the same time, the experiment help also provides some core codes in the A* algorithm, which enables students to download these core codes, and on the basis of these codes, they can learn and master the A * algorithm through the process of modifying the code. Because the intelligent search teaching software is developed in C language in the Microsoft Visual Studio 2005 environment, so through the design experiment On the basis of the introduction to artificial intelligence, students can be more familiar with the Microsoft Visual Studio 2005 environment and the application of C language.

In the verification program of simulated annealing algorithm for solving TSP problem, by clicking the "random add" button and setting the number of cities, the coordinate positions of n cities can be randomly generated in the "map" box. Thus, the simulated annealing algorithm can solve the TSP problem of different scales, and can also empty the "map" box by "reset" button. After clicking the start button, the final result of the simulated annealing algorithm is obtained in the map box, that is, the travel route of n cities, and the best solution, worst solution and average solution quality are displayed above the map. And by selecting different new solution generation functions, Four parameters, namely initial temperature, cooling rate, minimum temperature and iterative step number, are set to compare the different generation functions and the effects of different parameters on the performance of the simulated annealing algorithm. In addition, the lower left side of the validate "status" prompt to show "stop" and "in the calculation" program execution information. In the experiment of autonomous design of simulated annealing algorithm, some design assignment problems such as TSP problem, vehicle routing problem and Flow Shop problem are given. To enable students to modify their own code on the basis of the simulated annealing algorithm core code provided by the system In order to better grasp the essence of simulated annealing algorithm.

4. Genetic algorithms

Genetic algorithm (GA) is a widely used and efficient random search algorithm based on biological natural selection and genetic genetics. It was first proposed by Professor Holland of Michigan University in the 1960s. In this algorithm, the optimization problem is regarded as the evolutionary process of organisms in nature, and the optimization is achieved by simulating the genetic law of biological evolution in nature. In recent years, genetic algorithm has been widely used in job scheduling and sorting, reliability design, vehicle routing and scheduling, group technology, equipment layout and distribution Traffic problems and so on.

In the experiment of autonomous design of genetic algorithm, some design tasks such as solving tsp problem and Flow Shop problem by students' autonomous application of basic genetic algorithm and improved genetic algorithm are given. It also provides the core code of genetic algorithm, which is convenient for students to use it.

5. Summary

In this paper, the author discusses the design and development of the teaching software for the introduction of artificial intelligence with the aim of cultivating excellent courses. The teaching experiment system meets the requirements of college teaching in the 21st century. It can not only support teachers to improve the level of modernization of teaching means, but also meet the needs of students. By using the teaching experiment system, the students can better grasp the basic concepts, basic theories and techniques of intelligent search algorithm in artificial intelligence, be familiar with the application of Microsoft Visual Studio 2005 and C language, and improve their practical ability. Achieve this The expected teaching effect of the course.

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