Multi Agent Based High School Physics Network Course Automatic Generation System

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Abstract. The construction of online courses is the key to the modernization of education. Due to the backwardness of the application means of the existing network course automatic generation system, the network course automatic generation takes a long time and the function of the network course is less perfect. In order to solve the problems such as long time and imperfect function of high school physical network course automatic generation, this paper puts forward the design and research of high school physical network course automatic generation system based on multi-agent. Take high school physics as the research subject, determine the principles that need to be followed in the automatic generation of online courses, build the automatic generation framework of online courses, design the database of online courses, construct and configure multi-agent according to the automatic generation requirements of online courses. The multi-agent value decomposition stage and the multi-agent communication mechanism design stage enable the multi-agent to have the corresponding function of automatically generating network courses, which can automatically generate the required high school physics network courses. The experimental data shows that after the application of the design system, the minimum time spent for automatic generation of online courses is 16 s, and the maximum value of functional perfection of online courses is 99%, which fully proves that the application performance of the design system is better.

Keywords: High school physics · Automatic generation · Online courses · Reinforcement learning · Multi-agent

1 Introduction

At the end of the last century, advanced information technologies such as network technology, Web Services, IPv6 and so on continued to emerge, and went deep into various industries. The development trend characterized by extensive application of information technology appeared in life, education, scientific research, national defense, urban construction and other fields. Education informatization was proposed under this background. Network education and network resource construction are the key to information education. Vigorously promoting the construction of network courses not only meets the

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requirements of information technology, but also meets the needs of popular education and lifelong learning. ICT in education requires continuous reform of educational ideas, enrichment of educational means, innovation of teaching methods, and transformation of the interrelationship between the four elements (teachers, students, textbooks, and media) in the teaching structure, namely, the transformation of teacher centered teaching into student-centered teaching, and the transformation of collective face-to-face teaching of teachers into inquiry learning and collaborative learning guided by teachers. The teaching of fixed course content has changed to the extensive application of a variety of learning resources and learning environments [1]. The informatization of education in colleges and universities requires the addition of informatization equipment, the use of informatization means, the development of informatization classroom teaching and practical teaching in education related fields and departments, and the realization of informatization in the whole process and in all directions of education. The purpose is to spread new educational ideas, establish new teaching models, improve educational quality, improve educational environment, and cultivate innovative talents in the new century, realize the modernization of education.

"Curriculum informatization is the key content and way to realize education informatization". The carrier of curriculum informatization is the network, and the main component is network education. Network education has broken the traditional curriculum model. In addition to the training of students at school, it also meets the requirements of distance education, adult education, autonomous learning, exchange learning, personalized learning, and special education. The construction of educational informatization resources requires the transformation of traditional curriculum resources into network resources. The curriculum form, curriculum subject, teaching environment, learning environment and teaching media are different between them. Network education is the main method to solve the problem of unbalanced allocation of teaching resources in traditional education, and promote the realization of popular education, universal education and lifelong learning. With the development of information education, online education has also had a comprehensive and rapid reform and development. Various online courses have sprung up like mushrooms, and various course websites have emerged as the times require. More and more colleges and education related units have joined the ranks of developing and launching online course websites. Due to the high level of professional technology required for website development, most of the websites of online courses are currently developed by the course responsible units or teachers who contact professional companies or professional technicians for pre production and post maintenance. Therefore, the actual production, development, operation and maintenance process involves the difficulty and speed of communication between both parties. At present, the demand for online courses is large, the construction speed is slow, the teaching mode is outdated, the curriculum is difficult to modify, maintain, update, the development efficiency is low, and the operation and maintenance cost is high. Therefore, the majority of online course teachers urgently need an automatic generation system for online courses, which can automatically generate the required course website by defining the website structure and setting the plate columns by themselves. It is also able to update and maintain the generated course website in terms of data addition and deletion, online evaluation, message interaction, homework submission and correction [2].

The construction of online courses in foreign countries has developed earlier. At present, there are many mature teaching management software development platforms, such as EduCommons system, Sakai system and Moodle system. From the perspective of application, there are few automatic generation systems for online courses in China, and there are few software development platforms that integrate information based curriculum design mode and high-level website design. The automatic generation system of online courses has high application value and great demand, but few high-level products have been developed. At present, the online course automatic generation system based on fuzzy clustering and the online course automatic generation system based on FCM clustering are widely used in China. The quality of the generated online courses is poor, so the design of the high school physics online course automatic generation system based on multi-agent is proposed. According to the characteristics of online course website and the needs of users, B/S mode is adopted to realize the automatic generation of online course. Multi-agent can transform the problem of automatic generation of online courses into a Markov decision process of limited distributed observations, which simplifies the automatic generation of online courses to the maximum extent. Through multi-agent training stage, multi-agent value decomposition stage, multi-agent communication mechanism design stage, combined with the specific needs of users to automatically generate high school physics online course.

2 Design of Automatic Generation System for High School Physics Network Course

2.1 Automatic Generation Architecture Building Module of Online Courses

Take high school physics as the research subject, determine the principles that need to be followed in the automatic generation of online courses, build the automatic generation framework of online courses, and provide support for the subsequent module design.

To establish the principles of online curriculum design, we should refer to the principles of traditional teaching courses, and also combine educational theories, educational objectives under the new situation, and specific curriculum characteristics. Under the information education environment, the curriculum culture has undergone transformation, focusing on the construction of teaching research community and teaching community; Curriculum research insists on returning to the life world, integrating with humanism, and moving towards reflective practice; The quality evaluation system of curriculum construction is improved, from a single quality view to a diversified quality view, and from an academic quality view to an adaptive quality view, which will help to improve the overall quality of subject teaching and promote the sustainable development of the curriculum [3].

From the perspective of comprehensive quality assessment of system design, this paper proposes that the development of modern online courses should follow the following three principles, as shown in Table 1.

At present, there are mainly two operation modes of network application software: C/S mode and B/S mode. The former is more troublesome to upgrade and maintain, while the latter is easy to expand applications and upgrade and maintain. Therefore, it

Table 1. Principles for Automatic Generation of Online Courses

ranking	principle	Content description
1	Principle of directionality	Online courses must achieve certain teaching and education goals. The automatic generation system must be able to design online courses that can construct learning tasks according to certain teaching goals, organize students to explore collaborative learning, guide learners to achieve dynamic learning activities, and achieve the expected learning results
2	Principle of universality	Online courses are open to public learning. Learners' knowledge level, learning ability and learning characteristics are different. The system design should take into account the universality of the audience. The way of knowledge organization and presentation should be flexible, and the establishment of knowledge modules should take into account the development
3	Human nature principle	Learners are the main body of cognition and active constructors of knowledge meaning. Website design and development should be integrated with humanism. The development concept should change from curriculum based to personality based. Each module should be arranged according to students' basic learning ability and actual needs. The content should be practical, consistent with learners' cognitive laws, and provide services for students

has developed rapidly and been widely used in recent years. Based on the characteristics of online course website and user needs, the online course automatic generation system in this paper adopts B/S operation mode. Users can enter the website to browse and access the course content by sending a request to the web server through the browser on the client side. Based on the principles shown in Table 1, combined with B/S operation mode and multi-agent technology, an automatic generation framework of online courses is built, as shown in Fig. 1.

The system adopts a three-tier structure of user layer, business layer and data layer. Among them, the user layer provides a user interface for user operation, and users can fill in data, send requests, and view required information; The business layer is located between the user layer and the data layer, which acts as a bridge for data transmission. The BusinessFacade class is defined in this system to realize the specific business functions of this layer; The data access layer provides access to external systems such as databases, mainly involving ADO.NET database access technology. The DataAccess class is defined in this system for implementation [4].

The above process completed the construction of the automatic generation framework of online courses, laying a solid foundation for subsequent research.

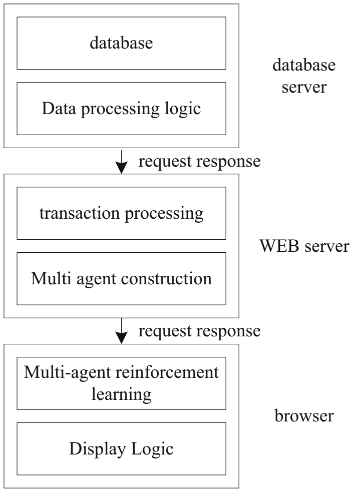

Fig. 1. Schematic diagram of automatic generation framework of online courses

2.2 Database Design Module

Through the analysis of the system function, the following data demand information is summarized according to the requirements of the automatic generation system of online courses in this paper:

One administrator can manage multiple students/columns/information /links/assessments/assignments/posts;

One student can be managed by multiple administrators;

One student can access multiple columns/information/links /assessments/assignments/posts;

One column/information/link/evaluation/assignment/post can be managed by multiple administrators;

One column/information/link/evaluation/assignment/post can be accessed by multiple students.

Through the analysis and demand summary of the above system functions, more than 10 data items have been designed, some of which are shown in Table 2.

The background database of the system should include administrator information, student information, column information, "information" information, link information, evaluation information, homework information, posting information and other relevant information, and ensure the safety, integrity and standardization of the data. The SQL Server background database designed in this system is JPKCMdf, which defines more than ten data tables, including ADMIN, STUDENT, BLOCK, INFO, LINK, TEST, HOMEWORK, and ARTICLE. Due to space constraints, it will not be detailed.

The above process completes the database design and provides support for the subsequent multi-agent construction.

Table 2. Data Item Information Table

number	data item	information
1	Administrator Information	User ID, password, authority, email, phone, etc.
2	Student information	User ID, password, student number, name, grade, department, major, class, etc.
3	Column information	Column ID, name, type, display method, etc.
4	Information	Information ID, title, category, creator, creation time, content, additional information, etc.
5	Link Information	Link ID, address, name, etc.
6	Evaluation information	Evaluation ID, title, description, release time, end time, number of problems, etc.
7	Job information	Assignment ID, name, teacher, start time, end time, content, status, etc.
8	Post information	Post ID, title, content, publisher, publishing time, etc.

2.3 Multi Agent Construction Module

Agent, as its name implies, is an entity with intelligence. Its English name is Agent.Based on the cloudAIAs the core, build a system of stereoscopic perception, global collaboration, accurate judgment, continuous evolution and openness. Multi agent can transform the problem of automatic generation of online courses into a Markov decision-making process with limited distributed observation, which can simplify the automatic generation of online courses to the greatest extent. Therefore, this section constructs and configures multi-agent [5].

There are many independent agents in the multi-agent system. Each agent can independently perceive and collect information about the environment. These agents share the same environment and often serve a common goal. The interaction process between multi-agent and environment is shown in Fig. 2.

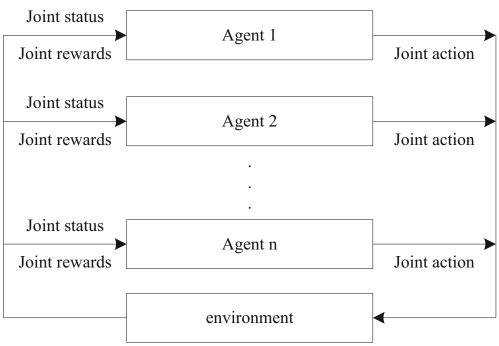

Fig. 2. Schematic diagram of interaction process between multi-agent and environment

From the perspective of one of the agents, the interaction process is not very different from that in the single agent system. However, because the environment is shared, each agent can execute actions into the environment, and the transfer of environment state is not only determined by one agent, but also determined by all agents. For example, agent in Fig. 2 n status of s_t^n, possibly with agent 1 to n all relevant. This mutual influence and coupling makes the analysis and optimization of multi-agent systems more complicated than that of single agent systems.

From the perspective of a single agent, the multi-agent system does not have the Markov property, but from the perspective of the combination of all agents, that is, if the multi-agent as a whole is regarded as a super agent, the Markov decision process of a single agent can be extended to the multi-agent system. Assume that the number of multi-agent in the system is n, then the joint state space can be expressed as $S = S^1 \times S^2 \times \cdots \times S^n$, where, S^i represent agent i state space; The joint action space can be expressed as $A = A^1 \times A^2 \times \cdots \times A^n$, where, A^i represent agent i space for action. At the moment t, federation status $s_t \in S$ in joint action $a_t \in A$ will be changed and transferred to s_{t+1} the transfer probability is determined by the joint state probability transfer function of the environment, and the expression is

$$P = S \times A \times S \tag{1}$$

In Formula (1), P it represents the transition probability.

At the same time, the environment will return a joint reward $r_t = \left\{r_t^1, r_t^2, \cdots, r_t^n\right\}$. In the cooperative multi-agent system, the multi-agent will optimize a common goal, so generally speaking, the environment will return the same reward for each agent, that is, the agent i rewards for r_t^i and Agents j rewards for r_t^j it is the same. The environment only considers the common impact of joint actions on the environment, but does not care about the merits of each agent's decision-making.

The multi-agent subsystem constructed above is used to transform the automatic generation problem of online courses into a distributed observation constrained Markov decision process, which can be defined as a seven tuple, expressed as

$$F = \langle S, A, P, R, Z, O, n \rangle \tag{2}$$

In Formula (2), F it represents the result of problem transformation automatically generated by online courses; R it means joint award; Z it represents the mapping function inside the observation information simulation environment; O it represents the observation information of agents.

All agents need to learn a cooperation strategy to maximize the cumulative discount reward. The calculation formula is

$$\alpha = E_{\pi_i}\left[\sum \beta^t r_t^i\right] \tag{3}$$

In Formula (3), α represents the cumulative discount reward calculation result; $E_{\pi_i}[\cdot]$ it represents the calculation function of multi-agent cumulative discount reward; β^t indicates the auxiliary parameter for cumulative discount bonus calculation; π_i it represents an agent i policy.

Through the above process, the construction of multi-agent is completed, and the problem of automatic generation of online courses is transformed into a Markov decision-making process with limited distributed observation, which facilitates the realization of automatic generation of online courses.

2.4 Implementation Module of Automatic Generation of Online Courses

Through the application of multi-agent, the realization of automatic generation of online courses can be divided into three stages, namely, multi-agent training stage, multi-agent value decomposition stage and multi-agent communication mechanism design stage [6]. After passing the above stages, the multi-agent can automatically generate the corresponding functions of online courses, and automatically generate the required high school physics online courses according to user needs.

2.4.1 Multi Agent Training Phase

At present, the mainstream multi-agent reinforcement learning methods are mainly divided into two types. One is that agents communicate before making decisions, so as to master more comprehensive information and "negotiate" a cooperative strategy. This method requires agents to learn an efficient communication strategy. Therefore, the problem is mainly from when to communicate, what to communicate. How to carry out communication in these three aspects; The other method is to use centralized training and distributed execution. Each agent only uses its own observation information to make decisions during the execution process, but all agents are trained together during the training process, so that agents can easily obtain global information and learn cooperation strategies [7]. The multi-agent training program is shown in Fig. 3.

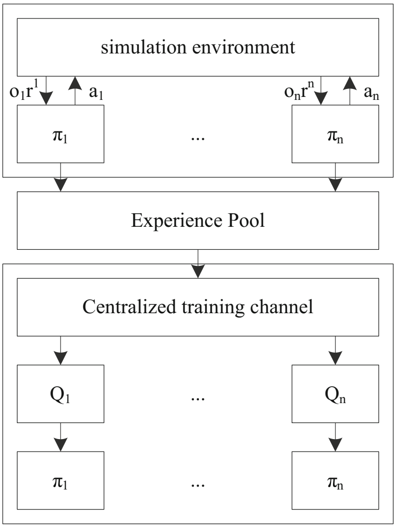

Fig. 3. Multi agent training program

Because the agent can only observe a part of the observation information in the multi-agent scene, and then make a decision based on the limited observation information, the decision is often a local optimal action rather than a global optimal action. In order to enable agents to learn a globally optimal strategy as far as possible, researchers have proposed a centralized training and distributed execution mechanism, which divides the training process and execution process of agents, making the two processes relatively independent. In the process of implementation, agents make decisions according to their local observation information, which meets the objective requirements; After the execution, all agents train together according to the global information during the training process. The advantage is that agents can not only obtain the global information for training, but also train together with other agents, making it easier for both parties to learn a cooperative strategy [8]at the same time. Figure 3 is the schematic diagram of centralized training and distributed execution mechanism. The lower part of the diagram represents centralized training, the upper part represents distributed execution, and the strategies of agents π_i, is responsible for making decisions in the execution phase to generate samples and storing the samples in the experience pool, and then its state action value function Q_i, responsible for using the global sample in the training phase π_i, update so that π_i continuously update to the global optimal strategy.

Central-V is a basic centralized training and distributed execution algorithm. It uses Actor Critical as the infrastructure to directly train a centralized state value function $V(S)$ as a Critical, each agent maintains a policy network by itself $\pi_i(O_i)$ used for distributed decision making, and passed the $V(S)$ to calculate performance advantages $A(O_i, A_i)$ to update $\pi_i(O_i)$ the specific update gradient calculation formula is

$$\alpha = \pi \lg(A_i|O_i) \cdot A(O_i, A_i) \tag{4}$$

In Eq. (4), α it means $\pi_i(O_i)$ update gradient of; $\pi(A_i|O_i)$ it represents a state value function $V(S)$ time series difference error of, used to measure O_i down execution action A_i performance improvement.

Since Central-V is only a simple Actor Critical method, use $V(S)$ as the dominant function, the timing difference error of $V(S)$ is not enough [9]. Therefore, COMA first learns a global state action value function $Q(S, A)$ then, based on the counterfactual idea, a new dominance function is proposed, whose expression is

$$A_i(S, A) = Q(S, A) - \sum \pi_i(A_i|O_i)Q(S, (A_{-i}, A_i)) \tag{5}$$

In Formula (5), $A_i(S, A)$ it represents the dominance function.

Through the advantage function shown in Eq. (5), the agent can compare the actions that have been executed with other actions to optimize its own strategy π_i, preparing for the automatic generation of online courses.

2.4.2 Multi Agent Value Decomposition Stage

The multi-agent value decomposition method takes centralized training and distributed execution as the basic training architecture, and its core idea is to construct the individual value function of agents $Q_i(O_i, A_i)$ and global valued functions $Q_{total}(S, A)$ the expression is

$$Q_{total}(S,A) = \zeta\left[Q_1(O_1,A_1), Q_2(O_2,A_2), \cdots, Q_n(O_n,A_n)\right] \tag{6}$$

In Formula (6), $\zeta[\cdot]$ it represents the relationship between the individual value function and the global value function of the agent.

Through relationships ζ individual state action value function of agent can be used $Q_i(O_i, A_i)$ to approximate the global state action value function $Q_{total}(S, A)$ and then update it in the stage of centralized training $Q_{total}(S, A)$, via $Q_{total}(S, A)$ go through relationships ζ To update the individual value function of each agent $Q_i(O_i, A_i)$, each agent uses its own individual value function in the distributed execution phase $Q_i(O_i, A_i)$ make decisions. Therefore, most of the current value decomposition methods focus on constructing an accurate, stable and generalized functional relationship ζ to approximate a more accurate $Q_{total}(S, A)$ [10]. Centralized training stage $Q_{total}(S, A)$ use DQN to update, as shown below:

$$\Gamma(\varphi) = G\Big[Q_{total}(S,A,\varphi) - (R + \beta Q_{total}(S,A,\varphi))^2\Big] \tag{7}$$

In Eq. (7), $\Gamma(\varphi)$ it means $Q_{total}(S, A)$ update function; φ represents the update parameter; $G[\cdot]$ it represents an auxiliary function expression; β it means $Q_{total}(S, A)$ update step size.

In order to make the agent's strategy approach the global optimal strategy, ζ the structure of must meet the following conditions as far as possible:

$$\begin{aligned} \arg\max Q_{total}(S,A) =& [\arg\max Q_1(O_1,A_1), \\ & \arg\max Q_2(O_2,A_2), \cdots, \arg\max Q_n(O_n,A_n)] \end{aligned} \tag{8}$$

When the agent strategy reaches the global optimal strategy, the automatic generation performance of its online courses reaches the optimization.

2.4.3 Design Phase of Multi-agent Communication Mechanism

The core idea of the communication based method is to design a communication mechanism that allows the agent to communicate before the online course automatically generates the decision, implicitly allowing the agent to obtain the global information and the decision information of the teammates, so as to reach a cooperation strategy. Therefore, most communication based methods are committed to designing an efficient communication mechanism between agents. This mechanism needs to be designed from three aspects: when to communicate, what to communicate, and how to communicate. At present, mainstream methods directly provide a channel. When communicating, the optimal solution is to let the agent learn the communication protocol by itself, so as to intelligently determine the communication time and content.

The early CommNet is a multi-agent reinforcement learning network structure based on communication, which combines the policy networks of all agents into a large network, allowing agents to code their own network to obtain hidden states before making decisions H_i send it out and accept the hidden state sent by other agents at the same time H_{-i} and calculate the mean value C_i so as to obtain sufficient information before making decisions H_i, and the average value of other agent information C_i, get a new hidden state H_i. At the same time, in order to prevent inconsistent communication results caused by a single communication, CommNet uses multiple communications to ensure consistent communication policies. Specifically, in the j Step, agent i the hidden state of is calculated as

$$H_i^{j+1} = \zeta_i\left(H_i^j, C_i^j\right) \tag{9}$$

In Eq. (9), H_i^j it refers to the communication section j-one step agent i hidden state of; C_i^j it refers to the communication section j-average value of information of other agents in step 1.

CommNet allows agents to hide their own state every time H_i in this way, the agent only learns the communication content, but has no time to learn communication. In many cases, communication is often unnecessary, because agents can make decisions based on their own observation information, and do not need the communication information of other agents. In addition, the information sent by some agents is likely to be redundant and noisy, which will interfere with the intelligence. So IC3Net designed a door ξ communication action is obtained g_i, determine the agent i whether communication is needed at present, and then in the communication phase g_i, for agents i the specific processing method is

$$C_i^j = \frac{1}{n-1}\sum H_i^j \cdot g_i^j \tag{10}$$

In Eq. (10), due to g_i It is a binary number. When it is 0, the agent i wipe out the communication information of.

After the above three stages, multi-agent can automatically generate the corresponding functions of online courses, and can automatically generate the required high school physics online courses in combination with the specific needs of users.

3 Design System Application Performance Test

3.1 Multi Agent Task Target Adaptive Configuration

The design system takes multi-agent as the core, and realizes the automatic generation of high school physics network curriculum through the cooperation of multi-agent. In order to ensure the normal performance of the application of the design system, it is necessary to adaptively configure the task objectives of multi-agent to provide some convenience for subsequent experiments.

In order to guide different agents to explore to take advantage of different task target rewards, it is necessary to guide different agents to explore task targets belonging to different clusters. Because agents have a tendency to use all the targets they have explored, they need to build an adaptive task target allocation model $W_\psi(i, k)$ to the agent i and mission objectives k score the relationship between them, and conduct macro-control according to this score to judge whether to run the agent to discover this task target. This research design proposes an adaptive target allocation algorithm, which uses the self-monitoring learning theory to purposefully divide the task targets according to the historical running conditions of agents. The task target adaptive configuration of multi-agent is shown in Fig. 4.

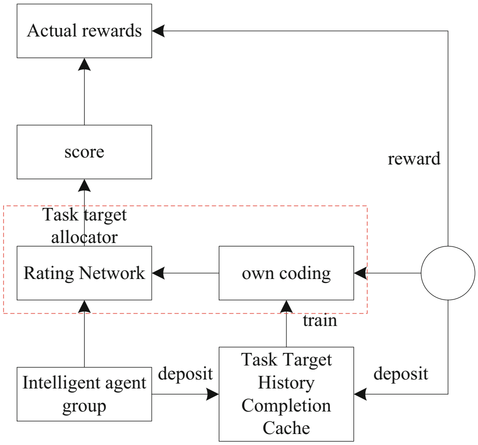

Fig. 4. Schematic diagram of multi-agent task target adaptive configuration

If the agent i stay t access to external task objectives in the environment at all times k, the task will be k status information for s_k input from encoder to get intermediate results χ_k, and then calculate the task target status code through the scoring network χ_k and agent number i the score of this combination, and calculate the actual reward that the agent should get, the expression is

$$r_{i,t} = W_{\psi}(i, k) * \delta * s_k * \chi_k \tag{11}$$

In Eq. (11), $r_{i,t}$ it represents an agent i stay t access task objectives at all times k actual rewards obtained; δ represents a weight super parameter.

After completing a series of operations $\langle \chi_k, i \rangle$ update to the task target history completion cache. At the end of each episode, the central controller will call the task target history to complete the data training task target adaptive allocation network model in the buffer area.

3.2 Analysis of Experimental Results

On the basis of the above multi-agent task target adaptive configuration results, the comparison experiment of the automatic generation of high school physics online courses is carried out with the automatic generation system of online courses based on fuzzy clustering and the automatic generation system of online courses based on FCM clustering as comparison system 1 and comparison system 2. In order to intuitively display the application performance of the design system, the time consumption of automatic generation of online courses and the perfection of online courses' functions are selected as evaluation indicators. The specific analysis process of experimental results is as follows:

3.2.1 Time Consuming Analysis of Automatic Generation of Online Courses

The time consumption for automatic generation of online courses obtained through experiments is shown in Fig. 5.

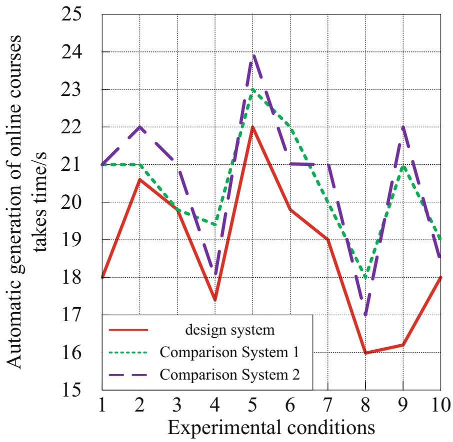

Fig. 5. Schematic diagram of time consuming for automatic generation of online courses

As shown in the data in Fig. 5, under different experimental conditions, the automatic generation time of online courses obtained by the design system is much lower than that of comparison system 1 and comparison system 2. Under the eighth experimental condition, the minimum automatic generation time of online courses obtained by comparison system 1 is 18 s, while the minimum automatic generation time of online courses obtained by comparison system 2 is 17 s. The minimum automatic generation time for online courses obtained under the eighth experimental condition was 16 s. The results show that under the specific experimental conditions, the designed system has achieved remarkable improvement and efficiency in the automatic generation of online courses.

3.2.2 Analysis on the Perfection of Online Course Functions

The degree of functional perfection of online courses obtained through experiments is shown in Fig. 6.

As shown in the data in Fig. 6, under different experimental conditions, the functional perfection of online courses obtained by the design system is much higher than that of comparison system 1 and comparison system 2. Under the background of the seventh experimental condition, the maximum functional perfection of online courses obtained by comparison system 1 is 85%; under the background of the seventh experimental condition, the maximum functional perfection of online courses obtained by comparison system 2 is 90%. Under the background of the seventh experimental condition, the maximum degree of functional perfection of online courses obtained by the design system is 99%. In this particular experimental condition, the designed system has made remarkable progress and improvement in the function of online course.

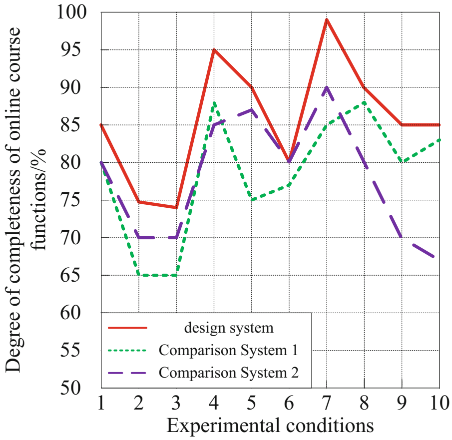

Fig. 6. Schematic Diagram of Functional Perfection of Online Courses

4 Conclusion

Online courses have the advantages of friendly interface, intuitive image, and multiple stimulation channels, which can help learners to play their initiative, and help to organize information and construct meaning. The need of network course construction is the requirement of information education. Network courses have the following advantages: First, flexible interaction. Traditional classroom interaction is poor. Except for a few questions and answers, it is difficult to accommodate in-depth communication in time and space. During online learning, real-time communication, discussion and interaction can be realized between teachers and students and between students through online question and answer system, BBS, FAQ and online collaborative learning system; The second is the asynchrony of teaching and learning. School education has its time limit and limitations, which cannot meet the internal requirements of education popularization and lifelong education. Network teaching has no time and space restrictions, knowledge space has unlimited extension, and learning time is completely free. Learners can design personalized curriculum and schedule; The third is the universality of learning information. In the process of online learning, the object of learning information service is students. Students can expand their learning according to the resources recommended by teachers, or choose learning resources in cyberspace individually, which not only enriches learning resources, but also helps students to cultivate their active learning ability. In order to meet the needs of high school physics teaching, this paper proposes the research on the design of the automatic generation system of high school physics network courses based on multi-agent, which shortens the time consumption of the automatic generation of network courses, improves the functional perfection of network courses, and provides effective system support for the generation of network courses.

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