# Research on the Design of Online Teaching Platform of College Dance Course based on IGA Algorithm

Yunyun Xu
Hunan First Normal University
Cheng Nan Academy
Changsha, 410002, China

***Abstract*—As a comprehensive art form, dance plays an integral role in developing the overall quality of students. However, with the increasing progress of IT technology, the traditional classroom-based teaching mode of dance course can no longer adapt to the current educational environment. This research designs an e-teaching platform system for college dance lessons based on the IGA algorithm (Improved Genetic Algorithm, IGA). First, it establishes a mathematical model of artificial intelligence questions and then proposes the functional design of an online teaching platform for college dance course based on the IGA algorithm. The feasibility of the proposed online teaching platform system of college dance course based on the IGA algorithm is validated via a number of testes. When the iteration count is 500, the success rate of the IGA algorithm reaches 99%; when the iteration count is 100, the average fitness is 0.929; when the iteration count is 100 times, the moderate calculation value is 0.936. While for the traditional Genetic algorithm (GA), the results are 88.6%, 0.73, and 0.752, respectively. By comparing with the traditional teaching mode based on GA algorithm, the proposed method based on IGA algorithm is obviously superior in many aspects.**

***Keywords—Online teaching; improved genetic algorithm; college dance course; intelligent test set; simulated annealing***

## I. Introduction

With the progress of distance internet teaching, scholars in China and foreign countries have been thinking about the reform of traditional classroom-based teaching mode of art courses [1]. Therefore, the establishment of an online teaching platform system of dance course is particularly important for the future development of college dance course teaching [2]. In general, online teaching in colleges and universities in China is still in the early stage. Therefore, it is of great practical significance to propose an online teaching platform for art courses [3]. The genetic algorithm is a computational model that finds the optimal solution or approximate solution by simulating the evolution process. It has the advantages of being able to solve complex, multi-constrained problems and seek global parallel solutions [4]. Genetic algorithm has attracted the focus of many scholars because of its ability to cope with the questions in the platform, initialize the population, and perform genetic evolution to accurately group the questions [5]. However, genetic algorithms can easily fall into a state of premature maturity. In this study, the genetic algorithm is improved to obtain the IGA algorithm and the improved algorithm is used to design a mathematical model of the test problem, so as to enrich and improve the online dance teaching system in universities. Meanwhile, the current research on online dance teaching in universities in China mainly focuses on the level of online dance teaching promotion, while the innovation of this study lies in detailing the strategies and methods to carry out, which are highly operable and close to the teachers of dance in universities, which will provide new ideas for the construction of online platforms for teaching art courses.

## II. Related Work

Genetic Algorithm (GA) is a novel algorithm developed rapidly in recent years. Aiming at the low accuracy of traditional methods in evaluating the quality of university mathematics classes, Yang Yun proposed a genetic algorithm-based quality evaluation method for the reform of university mathematics teaching model. The results revealed that the goodness of fit of the modified genetic algorithm exceeded 90%, and the error was significantly reduced to 0.01-0.04 [6]. In order to improve the search speed and achieve the effect of short-term optimization, Y Zhang et al. summarized various intelligent algorithms used in the current research of related research groups, and proposed a computing method of group parallel evolution. The results showed that the algorithm can prevent the results from falling into the prematurity and has strong convergence in the group experiment [7]. Dong-Jie Li's team proposed a calculation method CGA that combines chaos algorithm and genetic algorithm, in order to overcome the defects that BP neural network is likely to drop into local minimum and converge slowly in the process of gesture action recognition. Simulation results showed that the proposed algorithm can improve real-timeliness and accuracy of gesture recognition. [8]. Hua Wang and Lingwei Wang proposed an improved classical genetic algorithm to address the instability of the traditional computer network system caused by many factors such as the huge system. The simulation experiment results indicated that the algorithm can improve the fluency of the algorithm, thereby improving the availability of the network and reducing the occurrence of error in the network [9]. Aiming at current problem of college English course arrangement in China, J Xu proposed an improved genetic algorithm. Experimental results indicated that the proposed algorithm improved the convergence speed and individual diversity, and prevented the results from easily falling into local optimum. [10].

Online teaching has become more and more important, and there are many ways to improve the existing problems of online teaching. Wang designed a control system for a web-based distance learning platform. According to the experimental results, the average computing time of resource scheduling consumed by the system is 32.34 ms, which is 12.6% and 23.7% faster than the other two traditional methods, respectively [11]. For the purpose of improving the prediction of professional education evaluation results, Gao et al. proposed a simulated annealing algorithm on the basis of simulated annealing fish swarm algorithm. According to the results, the forecasting system of professional education lesson assessment performance constructed based on simulated annealing algorithm can effectively predict the examination results [12]. To improve the detection of word sequences within the English classroom, Deng Bowen designed an analytical model on the basis of group encoding and modified genetic algorithm. It was demonstrated that the model well achieved subsequent sub-learning target tasks, indicating strong reliability [13]. In order to play the role of virtual reality technology in college dance course teaching, Shi discussed the application of VR technology in dance course education [14]. The MC Tsai's team proposed a computer curriculum design method based on the actual teaching methods of AL and ML, and the results showed that this metheology usefully improved learning outcomes and learning participation of online computer courses [15].

The above research fully shows that genetic algorithm has been widely used in many fields, and there are also many researches on online teaching platforms. However, there are still a variety of problems that need to be solved when combining genetic algorithm with online teaching platform system for university dance course. Therefore, the research will improve GA algorithm to obtain the IGA algorithm, and embed the algorithm into the universities e-dancing teaching platform system.

## III. Design Method of Online Teaching Platform of College Dance Course based on IGA Algorithm

### A. *Research on Artificial Intelligence Test Questions and Establishment of Mathematical Models of Test Questions*

The problem research of artificial intelligence group volume refers to the problem of seeking the best answer or near-optimal answer under the restriction of multiple constraints [16]. Combined with previous studies on the reform of online courses in universities, this research assumes that the target test paper must meet the following attributes: Question type (QT), Number of questions (NQ), Difficulty of exam paper (Difficulty of exam paper), DP), knowledge point (KP) and discrimination (Distinction of test papers, DI). Therefore, the mathematical model of the quiz problem involved in this paper can be defined as $M$.

$$M = \{QT, NQ, DP, KP, DI, EP\} \tag{1}$$

From the above equation, it can be seen that the question of the examination paper is a six-tuple question, and the mathematical model matrix of the test paper is established according to this question as follows.

$$m = \begin{bmatrix} a_{1,1} & \cdots & a_{1,5} \\ \vdots & \ddots & \vdots \\ a_{t,1} & \cdots & a_{t,5} \end{bmatrix} \tag{2}$$

Where $t$ represents the count of questions in the examination paper, $a_{t,1}$, to $a_{t,5}$ represent the $t$ attributes of the first question, respectively.

On the basis of summarizing actual teaching experiences of college dance courses and combined with the mathematical model of the test problem, the constraints required for the test set are set as follows.

Constraints QT, which stipulates that the question types of the test questions must be composed of fixed test question types.

Constraint NQ, which specifies an overall number of questions on the test paper.

Constraints DP, set according to the subject requirements of the candidates, specifies the difficulty level of the examination paper. The difficulty level can be calculated according to the ratio of the difficulty of all test questions to the total score. The formula is as follows.

$$DP = \Sigma_{i=1}^{r} P_i \times C_i \big/ \Sigma_{i=1}^{r} P_i \tag{3}$$

Where $r$ is the total number of item IDs in the test paper, $C_i$ is the difficulty coefficient of the $i$-th item ID, and $P_i$ represents the actual score of the $i$-th item ID .

Constraints KP stipulates the knowledge points and scope of the examination paper for the corresponding course, in order to help the teachers to have an accurate understanding of the students' mastery of the knowledge points. In this study, the knowledge point coverage is calculated based on the percentage of knowledge point scores. Assuming that the total number of knowledge points examined in the test paper is $d$, the formula for calculating the coverage rate of knowledge points is as follows $KP_i$.

$$KP_i = KS_i \big/ \Sigma_{i=1}^{r} KS_i \tag{4}$$

$$\sum_{i=1}^{d} KP_i = 1 \tag{5}$$

Where $KP_i$ represents the percentage of the score of the $i$ th knowledge point in the mark of the examination paper, and $KS_i$ represents the mark of the $i$ th knowledge point.

Constraints DI, based on which the teacher can master the specific learning status of students. The formula of the discrimination degree DI is calculated as follows.

$$DI = \Sigma_{i=1}^{r} Q_i \times P_i \big/ \Sigma_{i=1}^{r} Q_i \tag{6}$$

Where $Q_i$ represents the discrimination coefficient of the first $i$ question, $P_i$ represents the actual score of the first question, and DI is the overall discrimination.

The choice of the fitness function (FF) directly affects the convergence speed of the IGA algorithm and even determines whether it can find the optimal solution. In this study, the IGA algorithm has satisfied the constraints of the question type QT and the number of test questions NQ at the beginning of the initial population design. Therefore, the remaining constraints affecting FF include the difficulty of the DP test paper, the knowledge points of KP and the discrimination of the DI test paper.

The weight of the above four influences is $W_i(i \le 4)$. The difference between the anticipated and realized value of the constraints corresponding to different test papers is expressed as $dv_i(i \le 4)$: In conclusion, the $f$ equation for the objective function of present study is as follows.

$$f = \sum_{i=1}^{4} dv_i \times W_i \tag{7}$$

$$\sum_{i=1}^{4} dv_i = 1 \tag{8}$$

It can be concluded that the tinier the value of $f$, a closer the outcome of individual evolution is to the expectation. Hence, in order to obtain the individual best solution in a group volume, the required objective function $f$ value must be as small as possible. Meanwhile, assuming that the fitness scores reflect the evolution of the individual positively and ensure that the time complexity of calculating the fitness function is small, the calculation formula $f$ of the relationship between the objective function and FF is proposed as follows.

$$g = 1/1 + f \tag{9}$$

Where $g$ represents the FF of the grouping problem.

*B. Design Scheme based on IGA Algorithm*

The core component of the online teaching platform of college dance course is artificial intelligence. Through previous researches, it is found that the traditional genetic algorithm (GA) has excellent performance in solving multi-constraint combinatorial optimization problems [17-18]. Therefore, the GA algorithm is adopted to address the artificial intelligence quiz problem in this paper. When the GA algorithm realizes the process of intelligent paper grouping, it is often prone to fall into precociousness and has weak local search ability. Therefore, this study improves the GA algorithm to obtain IGA algorithm, and carries out the mat lab simulation experiment to demonstrate the feasibility of the IGA algorithm. The results indicate that the IGA algorithm proposed in this study performs outperforms in terms of test composition.

Chromosome coding is designed by means of piecewise real number coding. Taking the pre-class thinking test paper of the course "Latin Dance in College" as an example, there are five MCQs, three fill-in-the-blank questions, and two short-answer questions in this test paper. The chromosome code of the test paper is shown in Table I.

TABLE I. THE CHROMOSOME CODES OF EXAM PAPERS FOR THE COURSE OF "COLLEGE LATIN DANCE"

| Type of question | Topic ID no. |
|---|---|
| MCQs | 3; 16; 72; 26; 42 |
| Fill -in-the-blank questions | 86; 28; 34 |
| Short answer questions | 2; 48 |

In the above table, the question type is the chromosome of the test paper, and the question ID number corresponding to each question type is the chromosome code of the test paper.

After the chromosome is encoded, the population will be initialized. To avoid individuals with high level of similarity between topics and the poor quality of the papers, this study will delete the initialized population and the genetic evolution of the offspring, until only one individual remains. Before initialization, it is necessary to calculate individual similarity $S_{PQ}$, and preset the threshold $T$ of individual similarity. According to previous research, the $T$ value of this study is set to 35%. If the calculation value $S_{PQ}$ is $S_{PQ}$ greater than the set $T$ value, it needs to delete the individual; if the $S_{PQ}$ value is less than the set $T$ value, keep the individual. In this way, it can be ensured that the value between the next generation populations $S_{PQ}$ is less than the set $T$ value, and this method can prevent the algorithm from falling into local convergence in the early stage. In the calculation of the value $S_{PQ}$, the method of information entropy calculation is adopted, which is expressed as below.

$$H(k) = -\frac{\sum_{i=1}^{l}\sum_{j=1}^{n} p_{ij} \log p_{ij}}{l} \tag{10}$$

Where $k$ represents the number of individuals; $l$ represents the number of individual genes; $n$ represents the number of alleles available for selection $\{g_1, g_2, \cdots, g_n\}$; $p_{ij}$ represents the j-th allele in each individual $P$. Therefore, the similarity between $S_{PQ}$ individuals is $Q$, which can be expressed as follows.

$$S_{PQ} = 1/1 + H(2) \tag{11}$$

Where $H(2)$ represents the information entropy between $P$ & $Q$ individuals.

After the design of the initialized population is completed, the selection operator needs to be designed, and the direction of the population genetics mainly depends on the selection operator algorithm. At present, the most commonly used method of selection operator algorithm is the roulette selection method. The approach can determine if the individual is transmittable for the following generation based on the individual fitness value applied in the odds ratio. The benefit of roulette selection method is that the individual with better fitness has a high percentage of being selected for evolution, and those with poor individual fitness have a small percentage of being selected for evolution. The process is illustrated in the chart below.

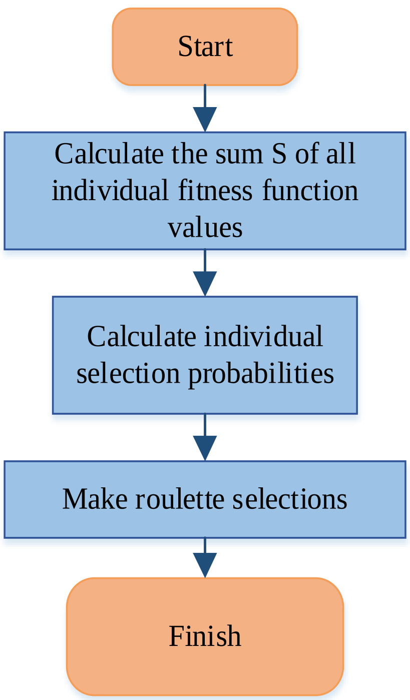



Fig. 1. Roulette Selection Flow Chart.

The calculation formula of the sum S of the individual fitness function values in Fig. 1 is as follows.

$$F = \sum_{i=1}^{n} f_i \tag{12}$$

Here, $f_i$ stands for the fitness function value of the $i$ th individual.

The formula for calculating the probability of individual selection is as follows.

$$P_{si} = f_i / F \tag{13}$$

Although the roulette selection method can make excellent individuals obtain high genetic probability, but there is also the possibility that excellent individuals are not inherited. At present, the selection operator algorithms that are widely used include the optimal individual preservation method and the sorting selection method. This research will combine the advantages of the above methods, and choose the offspring based on the IGA algorithm and combining the roulette selection method and the ranked selection method. The specific process is to use the ranked selection method to set the top 15% of individuals for inheritance, and then use the roulette wheel to select the remaining individuals.

Traditional GA algorithm is prone to fall into precociousness and has weak local search ability [19-20]. To address these drawbacks of the traditional GA algorithm, acceptance probability will be added to the IGA algorithm to perform simulated annealing of the crossover variant operation individuals in the study. The searching capaability of the GA algorithm is improved. The detailed formula is as follows.

$$p = 1, f(old) < f(new) \tag{14}$$

$$p = \exp\left[-f(old) - f(new)/T_t\right], f(old) \geq f(new) \tag{15}$$

Where $f(old)$ is the old individual, $f(new)$ is the new individual, and $T_t$ is the temperature at time $t$. If the new test paper from the group shows that the individual is better, then this individual will be selected for iteration; if the new test paper produced by the group shows the individual is poor, a certain probability P will be selected for subsequent iterations.

The temperature $T$ decreased with time $t$. The initial temperature is set as $T_0$, and the specific calculation formula of the temperature drop is as follows.

$$T_{t+1} = \beta T_t \tag{16}$$

Where $\beta$ is a constant, which will be set to 0.95 in this study.

Since the IGA algorithm is an evolutionary algorithm, this study sets two conditions for the algorithm. If the result satisfies either one of the conditions, it can be judged to be terminated, and then the result is output, that is, the algorithm is completed. The detailed process is illustrated in Fig. 2.

### C. *Functional Design of Online Teaching Platform of College Dance Course Based on IGA Algorithm*

To solve the problems existing in the dance course online teaching platform in colleges and universities, intensive research was conducted, and the results showed that the students' uneven foundation in the subject directly affects their enthusiasm for learning the course. Since this research marks and categorizes the online teaching materials, the students are able to choose course materials at different difficulty levels, and implement hierarchical and classified learning. Based on the requirements of the online teaching platform of college dance course, a functional framework of college dance course online teaching platform based on IGA algorithm is designed, as shown in Fig. 3.

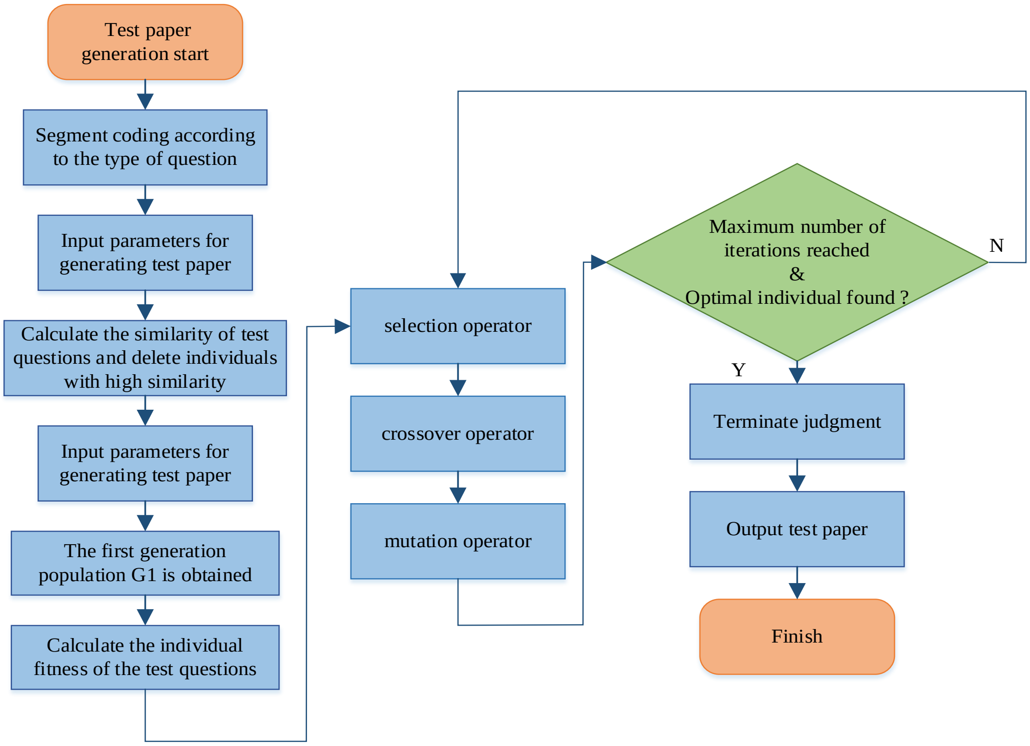



Fig. 2. Group Volume Flow Chart based on Improved Genetic Algorithm.

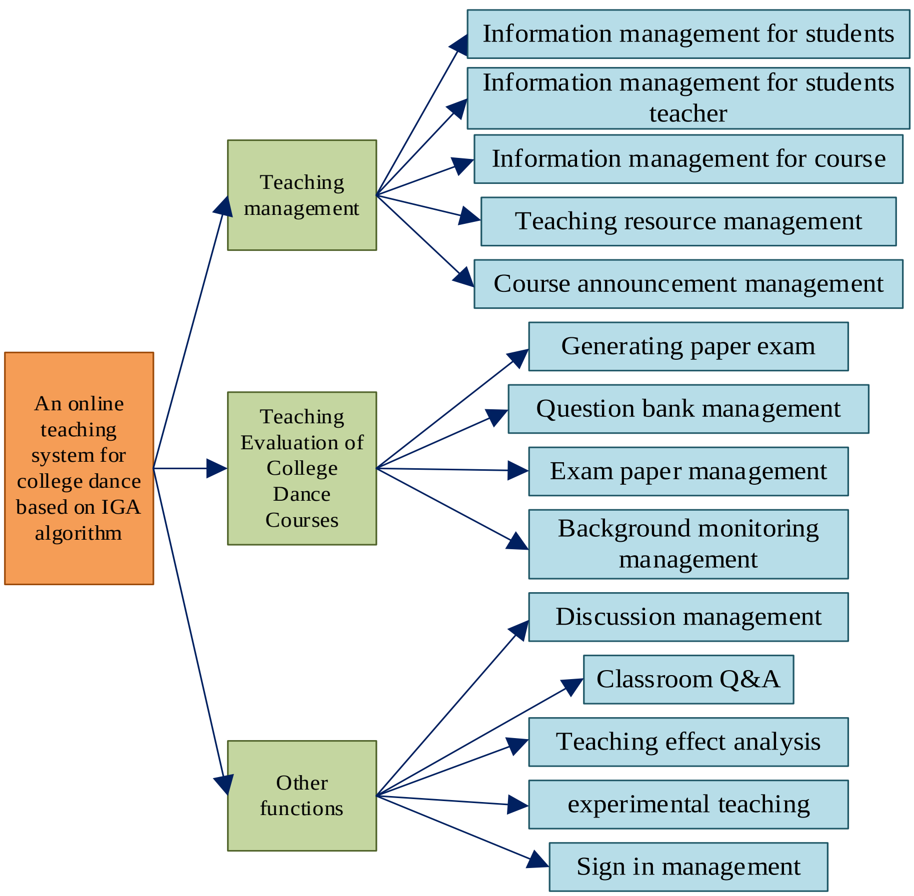



Fig. 3. Functional Framework of College Dance Course Online Teaching System.

A block diagram of the design of the online dance teaching platform can be seen in Fig. 3 and summarizes the specific needs of the system into three parts.

In the first part, the functional requirements of the management module of the online teaching system include four blocks, namely classroom instructor management, dance teaching resource management, elective student management and background administrator. The specific content is to label and classify the teaching videos and teaching courseware of dance course. Among them, the label attributes are divided by grading settings. For example, teachers can set the first-level labels of the course by themselves, such as course theme, difficulty level of knowledge points, etc. Then, it is subdivided into second-level labels under the first-level label. For instance, the difficulty level of knowledge points is divided into three second-level labels: easy, medium, and difficult. Through the label classification of different teaching resources, the classification results of each label are obtained, so that students who choose this course can accurately select teaching resources from the classified teaching resources according to their own needs.

In the second part, the functional requirements of the evaluation module of the online teaching system of dance course in universities refer to using the IGA algorithm to realize the system artificial intelligence group test and provide the background monitoring. First, the IGA algorithm can effectively solve the optimization problem of artificial intelligence, so as to help teachers conduct targeted pre-class thinking tests for students, unit quizzes in the course, and organize online exams. Second, teachers can monitor students' learning, exams, and sign-in situations through the background.

In the third part, the functional requirements include answering questions in college dance classes, sign-in management, etc. Teachers are able to combine major functions of the dance course online teaching system with the functions of the third part so as to realize the role of supporting teaching.

The IGA algorithm proposed in this study has the following features, its incorporation of acceptance probabilities for simulated annealing of individuals after cross-variance operations, which can effectively reduce the problem of results falling into a local optimum at an early stage, is a major feature of this study to optimise the search capability of traditional GA algorithms.

IGA algorithm-based online teaching platform of college dance course runs on a computer with 2.3GHz, Intel Core i5 processor. The framework design adopts the B/S architecture design mode, the front-end framework adopts Bootstrap, and the back-end framework adopts Springboot. The software is implemented in Java language, combined with Intellij idea 2019, maven3.6.1 and other development tools.

## IV. Implementation and Testing of the Online Teaching Platform of College Dance Course based on the IGA Algorithm

### A. *Experiment on the Performance of the Teaching Platform based on IGA Algorithm*

The data set used in this experiment is randomly generated by the loop of the randperm function in Matlab. There are 570 test questions in the generated dataset, including 300 theoretical questions, 120 basic movement test questions, 90 work performance questions, and 60 choreography questions. The specific data set is shown in Table II.

According to the test question design and Table II, it can be concluded that the questions ID from 1-300 are theoretical questions, each question is three points; 301-420 questions are basic movement test questions, each question is 10 points; 421-510 questions are work performance questions, each question is 20 points; 511-570 questions are choreography questions, each question is 20 points. The difficulty coefficient of the test questions is randomly generated, including four kinds of difficulty, among which 0.0-0.25 represents easy, 0.26-0.5 represents medium difficulty, 0.51-0.75 represents difficult, and 0.76-1 represents very difficult. The knowledge points of the test questions are set to 10 types. The discrimination coefficient ranges from zero to one. If the discrimination degree of the test question is less than 0.2, it means that the gap between the test questions is small, which cannot reflect the real level of the students.

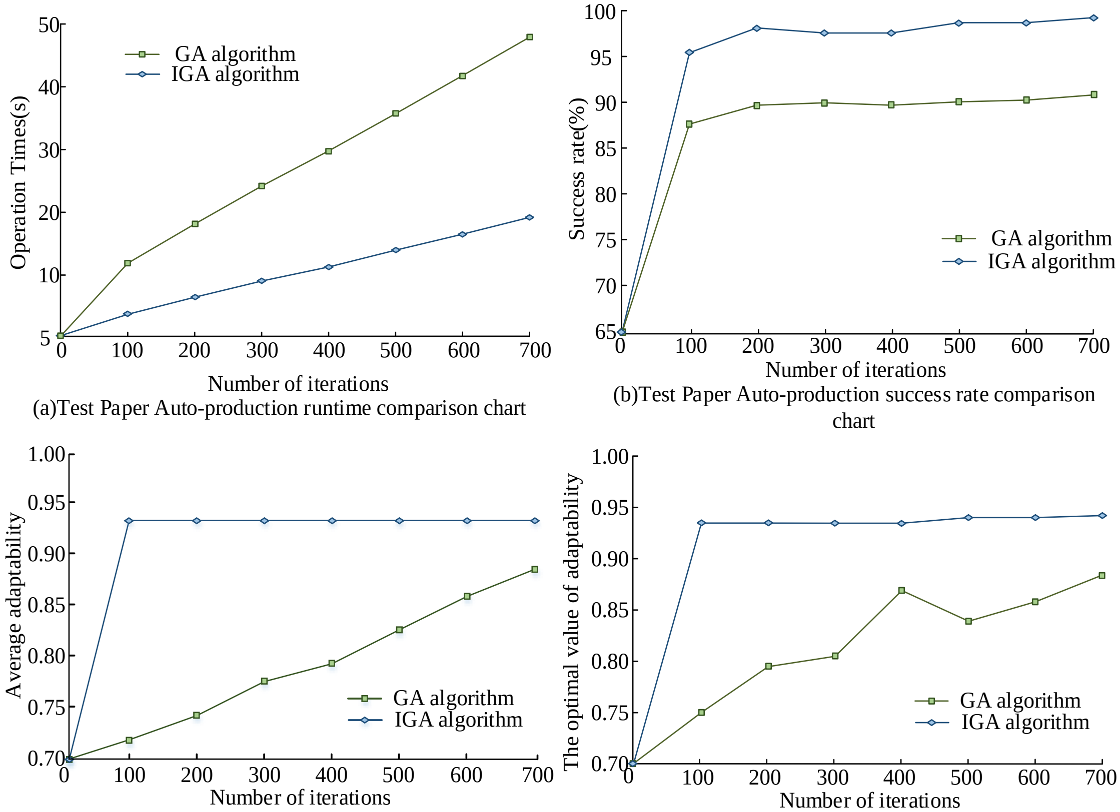
This study will compare four aspects, including running time, success rate, average fitness, and optimal fitness. Through the comparative analysis, the performance of the IGA algorithm in the paper grouping is studied. After the experiment, the comparison results of the traditional GA algorithm and the IGA algorithm obtained are shown in Fig. 4.

The above picture shows the difference between the genetic algorithm and the IGA algorithm. It can be seen from Fig. 4(a) that in the process of creating papers, the running time of the traditional genetic algorithm increases with the number of iterations. Although the running time of the IGA algorithm also increases with the number of iterations, its growth rate is significantly slower and the overall running time is shorter compared with the traditional genetic algorithm. From Fig. 4(b), it can be seen that the number of iterations is 100, the success rate of the traditional genetic algorithm is about 86.7%, while the success rate of the IGA algorithm is as high as 95.3%. There is no significant change in the success rate between the two algorithms as the number of iterations increases. When the iteration count reaches 500, the success ratio of traditional genetic algorithm is stable at 88.6%, while the success rate of the IGA algorithm is as high as 99%. In short, the success rate of the IGA algorithm is higher.

From Fig. 4(c), it can be seen that the average individual fitness of the IGA algorithm stabilizes at 0.929 when the number of iterations reaches 100, while the average individual fitness of traditional genetic algorithm is only 0.73. The average individual fitness of the traditional genetic algorithm increases significantly with the number of iterations. Comparing the two algorithms, it is clearly seen that the IGA algorithm has higher average individual fitness and requires less iterations.

TABLE II. EXPERIMENTAL TEST DATA SET TABLE FOR THE IGA ALGORITHM-BASED TEACHING PLATFORM

| Question ID | Type | Score | Difficulty _ | Knowledge point | Distinction |
|---|---|---|---|---|---|
| 1 | 1 | 3 | 0.34 | 6 | 0.42 |
| 2 | 1 | 3 | 0.68 | 1 | 0.31 |
| 3 | 1 | 3 | 0.91 | 10 | 0.67 |
| 4 | 1 | 3 | 0.22 | 5 | 0.41 |
| 5 | 1 | 3 | 0.47 | 2 | 0.38 |
| ... | ... | ... | ... | ... | ... |
| 570 | 4 | 20 | 0.86 | 9 | 0.49 |




(a)Test Paper Auto-production runtime comparison chart

(b)Test Paper Auto-production success rate comparison chart

(c)Fitness mean comparison chart

(d)Optimal fitness value comparison chart

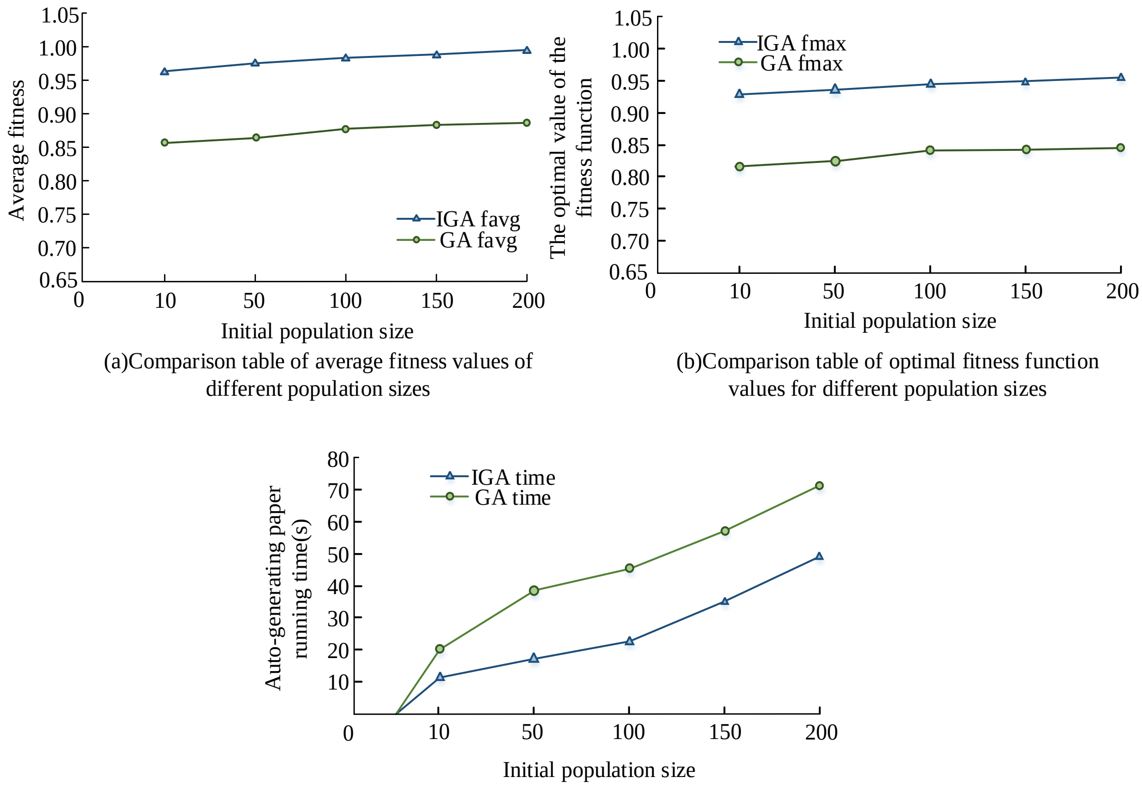
Fig. 4. Comparison between GA Algorithm and IGA Algorithm.

According to the setting of formula (12), when the fitness calculation value is higher, the individual test papers obtained by the grouped papers are better. From Fig. 4(d), we can observe that when the iteration number reaches 100. Optimal value of the individual fitness of the traditional genetic algorithm is about 0.752, while that of the IGA algorithm is about 0.936. The results show that the optimal values of individual fitness for the two algorithms both increase with the iteration number. Comparing the optimal value of individual fitness of the traditional genetic algorithm and the IGA algorithm, the individual value of the individual fitness of the test papers grouped by the IGA algorithm is obviously greater as compared with the GA algorithm, which stabilizes at about 0.94 when the number of iterations is only 100. In short, the IGA algorithm performs better in terms of the best value of individual fitness of test papers.

To sum up, compared with the traditional genetic algorithm, the IGA algorithm proposed in this study has significantly improved the functions in all the above four aspects, indicating that the IGA algorithm can effectively improve the success rate, speed, memory consumption and the ability to produce quality papers in a short period of time in the online teaching platform for university dance.

### *B. Comparative Experiments on the Performance of the Teaching Platform System under the Conditions of Different Parameter*

This study conducted a comparative analysis of the performance of online teaching platform system under the condition of different parameters. Considering the common characteristics of the GA algorithm, the size of the initial population will affect the results of the test. The initial population size was set to five different parameters, including 10, 50, 100, 150 and 200. Then, the comparison of fitness average (favg), the optimal value of the fitness function (Maximum Fitness value, fmax) and group volume uptime of the traditional genetic algorithm and the IGA algorithm are shown in Fig. 5.




(a)Comparison table of average fitness values of different population sizes

(b)Comparison table of optimal fitness function values for different population sizes

(b)Comparison table of running time of different population sizes

Fig. 5. Performance Comparison of Teaching Platform System under Different Parameters.

As can be seen from the above figure, the size of the initial population has various degrees of influence on the three aspects of the algorithm. From Fig. 5(a) and 5(b), it can be seen that while the size of the initial population increases, both favg and fmax increase, indicating that the quality of the groups is better. However, as seen in Fig. 5(c), the time required to create a volume increases significantly as the size of the initial population increases. In summary, when the size of the initial population is at a value of 150, the quality of the rolls is excellent and the time required for the rolls is short, indicating the best value for the initial population.

Fig. 6 shows the relationship between the crossover probability ( $P_c$ ) and the individual fitness of the IGA algorithm. As $P_c$ increases, the value of A shows a trend of rising first and then falling. When the $P_c$ value is 0.8, both IGA $f_{avg}$ and IGA $f_{\max}$ reach the maximum value, indicating that when the $P_c$ value is set to 0.8, the quality of the test papers produced by the IGA algorithm is the best.

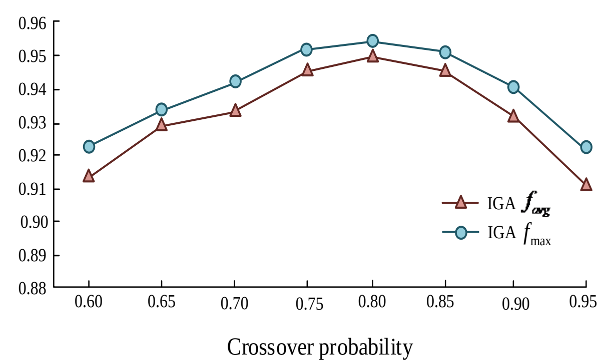



Fig. 6. Comparison of Different Cross-Probability Experiments.

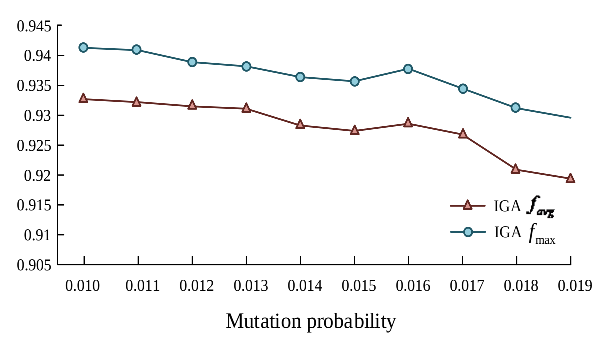



Fig. 7. Comparison of Mutation Probability.

Fig. 7 shows the relationship between the mutation probability ( $P_m$ ) and the individual fitness of the IGA algorithm. The results show that the best mark of the individual fitness and the average fitness of the group test $P_m$ show a downward trend as the value increases. When the $P_m$ value is 0.01, both IGA $f_{avg}$ and IGA $f_{\max}$ reach the maximum value, indicating that when the $P_c$ value isset to 0.1, the quality of the test paper produced by the IGA algorithm is the best.

In the IGA algorithm proposed in this study, the inclusion of a simulated annealing process allows it to effectively reduce the problem of results falling into a local optimum at an early stage and improve the success rate of the grouped volumes, which is the aim of this study to optimise the search capability of the traditional GA algorithm.

### C. Performance Testing of the Online Teaching Platform System

To validate the feasibility of the online teaching system of college dance course based on IGA algorithm in actual operation, the teaching platform system will be functionally tested in this study. The functional test environment of the teaching platform system will run on a computer with 2.3GHz, Intel Core i5 processor. Functional tests will be conducted on the student function block and the teacher function block.

As can be seen from Table III, when the number of system visitors is 50, the response time of the traditional GA-based online teaching platform is 0.812 seconds, with a central processor occupancy of 6.06%. When the number of visitors to the system was 400, the response time of the online teaching platform based on the IGA algorithm was 6.158 seconds, with a central processor occupancy rate of 89.32%.

The system property of university dance online teaching platform based on IGA algorithm can directly reflect whether it meets the design request or not. In the performance testing environment of this experiment, JMeter 5.4.1 software will be used to automate the test in Win10 environment and Fiddle software will be used for script recording. The number of visits to the system is tested, and the specific operation is to simulate the number of concurrent users in the actual running process of the teaching platform. The test results are shown in Table IV.

As can be seen from Table IV, when the number of system visitors is 50, the response time of the online teaching platform based on the IGA algorithm is 0.532 seconds and the CPU occupation rate is 8.12%. When the number of system visitors is 400, the response time of the online teaching platform based on IGA algorithm is 5.52 seconds and the CPU occupancy rate is 68.12%, showing qualified performance in the number of visitors. The comparison with the conventional algorithm in Table III shows a significant improvement in response time, percentage of central processor occupation and balanced response time.

The online teaching platform based on IGA algorithm proposed in this study can meet the requirements of 400 users at the same time, indicating that the system meets the design request.

TABLE III. PERFORMANCE TEST TABLE OF ONLINE TEACHING PLATFORM OF COLLEGE DANCE COURSE BASED ON GA ALGORITHM

| **Number of concurrent users** | **response time/s** | **CPU usage/%** | **Balanced response time /s** |
|---|---|---|---|
| 50 | 0.532 | 4.06 | 0.01064 |
| 100 | 1.201 | 8.21 | 0.01201 |
| 150 | 1.989 | 16.42 | 0.01326 |
| 200 | 2.654 | 24.52 | 0.01327 |
| 300 | 3.992 | 47.31 | 0.01330 |
| 400 | 5.52 | 68.12 | 0.01380 |

TABLE IV. PERFORMANCE TEST TABLE OF ONLINE TEACHING PLATFORM OF COLLEGE DANCE COURSE BASED ON IGA ALGORITHM

| **Number of concurrent users** | **response time/s** | **CPU usage/%** | **Balanced response time /s** |
|---|---|---|---|
| 50 | 0.532 | 4.06 | 0.01064 |
| 100 | 1.201 | 8.21 | 0.01201 |
| 150 | 1.989 | 16.42 | 0.01326 |
| 200 | 2.654 | 24.52 | 0.01327 |
| 300 | 3.992 | 47.31 | 0.01330 |
| 400 | 5.52 | 68.12 | 0.01380 |

## V. CONCLUSION

This research designs an online teaching platform system for college dance course based on IGA algorithm. In the research, the mathematical model of the intelligent question-making problem is applied, and the constructed model is verified. The results show that the success rate of the online teaching platform system for college dance courses based on IGA algorithm is 99% when the number of iterations is 500 times; when the number of iterations is 100, the average fitness is 0.929; when the number of iterations is 100 times, the moderate calculation value is 0.936. However, for the traditional GA algorithm, the results are 88.6%, 0.73 and 0.752, respectively. By comparing the GA algorithm and the IGA algorithm, the mathematic model of the test-setting problem based on the IGA algorithm is obviously superior to the GA algorithm in all aspects. At the same time, the research shows that the crossover probability and mutation probability are respectively $P_c$ = 0.8. When the number of visitors to the system is 50, the response time of the online teaching platform based on the IGA algorithm is 0.532 seconds, and the CPU occupancy rate is 8.12%. Compared to traditional genetic algorithms, the IGA algorithm proposed in this study shows significant improvements in all four of these areas, indicating that the IGA algorithm can effectively improve the success rate, speed, memory consumption and the ability to produce high quality papers in a short period of time on an online university dance teaching platform. Although the method proposed in the study can provide teachers and students with functions such as personalized teaching, intelligent test detection and teaching evaluation, the system lacks real-time monitoring of students' learning behavior and corresponding data analysis, so the follow-up research will conduct further research on this problem.

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