

Research on Patriotic Emotional Cultivation and Practical Teaching Mode of Civic and Political Science Courses in Colleges and Universities under the Perspective of Red Classic Architecture

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Abstract: Patriotic emotional education is crucial to the ideological and moral enhancement of college students. This paper utilizes the red classic building to innovate the practical teaching mode of the ideological and political courses in colleges and universities. The construction of the 3-dimensional model of the red classic building is completed through the way of color conferring and mapping. And from the structure optimization and material optimization to improve the model fidelity, improve the students experience immersion. The A-star algorithm is introduced into the 3D campus roaming navigation system of the red classic buildings, and the heuristic estimation function is used to plan the optimal roaming path, which enhances the effect of patriotism inculcation among students. The results show that the A-star algorithm obtains a high adaptability of 2.09 in about 13 iterations, and the path planning effect is better than the comparison algorithm. The experimental class using the 3D campus roaming teaching method of red classic buildings significantly outperforms the control class in the comparison of the three dimensions of patriotism emotion as well as the overall emotion at the level of 0.001.

Keywords: red classic buildings; A-star algorithm; heuristic estimation function; patriotic emotion; civic practice

1. Introduction

As a very important course in higher education, ideological and political theory in colleges and universities is an important platform for cultivating students' political literacy and ideological and moral quality [1]. In today's social context, the new era requires that ideological and political theory courses in colleges and universities should be integrated into the spirit of the times, actively cultivate students' patriotic emotions and ideals, and guide students to establish a correct view of history, values and worldview [2-4]. Patriotic emotion is students' emotional identity and loyalty to their families and motherland, which is one of the traditional virtues of the Chinese nation [5]. As an important content of ideological and political theory courses in colleges and universities, the integration of patriotism emotion is of great significance for the overall development of students and the future development of the country [6-7].

Based on this, the cultivation of patriotism emotion and the practical teaching mode of ideological and political courses in colleges and universities under the perspective of red classic architecture has become one of the urgent problems to be solved in the current education in colleges and universities [8-9]. Socialism with Chinese characteristics has entered a new era, and the promotion and inheritance of red genes has become the main social theme at present [10]. As an important part of college



education, ideological and political theory courses in colleges and universities should become the main position for cultivating students' red genes [11-12]. By deeply excavating the red classic buildings and integrating the red gene into the teaching of ideological and political theory classes in colleges and universities, the ideological and political literacy of students can be effectively enhanced, the patriotic sentiment and sense of responsibility of students can be strengthened, and the all-round development of students can be promoted [13-16].

For the patriotic education function of red classic buildings, and the need for the cultivation of patriotic feelings in the ideological and political courses of colleges and universities. This paper integrates red classic buildings and campus culture resources through artificial intelligence technology to create a 3D campus roaming navigation system for red classic buildings. Construct a three-dimensional model of the red classic building from multiple perspectives, such as color-material-adding peripheral sketches and so on. Optimize the visual effect of the model by using plug-ins and virtual engine to improve the realism of the model. Use A-star algorithm to realize the search and optimization of roaming paths, and adopt heuristic estimation function to calculate the optimal distance from the starting point to the building nodes, so as to improve the patriotic emotional content of the paths.

2. Integration of Civics and Patriotism in Colleges and Universities Based on Red Classic Architecture

2.1. The embodiment of patriotism education function of red classic buildings

Immersive learning refers to the learning process that provides learners with a near-real learning environment through virtual reality technology, and learners improve their literacy and skills through a high degree of participation, interaction, and rehearsal. Architecture belongs to a material form, has unique aesthetic value, and can truly bring people a sense of immersive experience. Classical red buildings are the ruins and remains of famous people's former residences left in the process of revolutionary struggle, witnessing one revolutionary historical event after another. Therefore, in addition to the actual recording function, classical red buildings also have strong revolutionary, ideological and propaganda functions, which can strengthen the functions of remembrance, commemoration and education. With the unique temperament of classic red buildings, excavating the historical events and stories of people behind these buildings, creating an immersive experience platform, restoring one historical scene after another, and motivating college students to participate in experiential activities can not only make college students feel like traveling through time and space and immersing themselves in the realm of the real world, but also make college students have unforgettable memories of the red culture. Undoubtedly, classic red buildings are high-quality, unique patriotic educational resources, which can effectively echo the characteristics of immersive learning. It is for this reason that Civic Education should pay more attention to the educational value of classic red buildings.

2.2. Effective Path of Teaching Reform of Civics Classes in Colleges and Universities under the Vision of Patriotic Education

Based on the vision of patriotism education, the use of red classic buildings to promote the deepening of the reform of the teaching of the ideology and politics course in colleges and universities, an effective path that is to innovate the form of ideology and politics education, in the red classic buildings of the immersive experience, to enhance the students' knowledge and understanding of the spirit of patriotism. Traditional patriotism education is mostly based on theoretical education, meetings, conversations and other forms, with little effect. In the context of the reform of the teaching of the Civic and Political Science class, through the innovation of red classic buildings as a carrier of patriotism education, students can be brought to a full range of patriotism education, recognizing the contributions made by the revolutionary martyrs for national independence, while comparing the hard-won happiness of life, so that students feel the strength of the motherland, and make it clear that the individual efforts of the country's wealth and strength of the role of the important. Specifically, the following points can be practiced.

First, the introduction of the red classic building culture, strengthen the campus culture construction, play the hidden cultural education function. School culture is a value system formed in the long-term practice of a school, internal members to reach a unified consensus, specifically expressed in the school philosophy, values, behavioral norms, etc., focusing on the school's overall spirit of schooling and development direction. College students have been influenced by campus culture for a long time during their study and life on campus, so the implicit nurturing role of campus culture helps to improve the effectiveness of patriotic education. Campus culture construction focuses on the integration and

penetration of red classic building culture and other patriotic education content, you can show the construction history of the red classic buildings on the campus walls, as well as the revolutionary events that occurred in the red classic buildings and other content, this way is more likely to be accepted by the students, eliminating the students to the mandatory preaching of the resistance to the students in the unknowingly and gradually understand the spirit of patriotism embedded in the red classic buildings. This way is easier for students to accept.

Second, the introduction of new media technology, looking for more resources related to classic red buildings, innovative patriotism education methods. Under the background of the network era, new media has gradually become an indispensable part of contemporary college students' daily study and life, and students can conveniently obtain all kinds of information and learning resources on the Internet. Therefore, the introduction of new media platforms in the teaching of ideological and political courses in colleges and universities, with the help of online platforms for students to push the resources related to the red classic building, to carry out patriotic education, to further broaden the channels of patriotism education, and to enhance the fun and novelty of education. For example, schools can fully utilize new media such as WeChat, Weibo, Tik Tok and other new media in patriotism education to provide knowledge related to red classic buildings in a way that is pleasing to students, implement patriotism education, and enhance the effectiveness of education. For example, a network patriotism base is opened in the new media platform, and the major red classic buildings in China are visited online through the network, breaking the constraints of objective conditions and meeting the patriotism learning needs of students in the Civics and Political Science course.

2.3. Red classic building model analysis

2.3.1. Visual image modeling

On the basis of geometric shape modeling, in order to make the building present a more realistic effect in the virtual environment, it is necessary to model the visual image of the red classic building. First of all, the red classic building model is given color, combined with the on-site photographs and 3D panorama, and material mapping is used to give material to different objects. Among them, transparent material mapping can be used for window and railing textures to avoid the model being too large. Secondly, the red classic architectural model around the sketches to add, can be added directly in the model, add as much as possible with the real scene, if the sketches are more complex, can be used in two-dimensional or three-dimensional material mapping way to complete.

2.3.2. Overall model optimization

Overall model optimization is divided into model structure optimization and model material optimization. Among them, model structure optimization can be done by using Optimize Helper plug-in. In the red classic building virtual modeling, the component types are many and complex, so after the model is built, it needs to be streamlined, the practice is to use the merging algorithm to merge the adjacent planes, which not only makes the total number of surfaces of the building model has been streamlined, but also on the overall visual effect of the building model has less impact on the change of the model, and model material optimization needs to be used in the engine for the VPR. VPR virtual engine through the "picture editing" command on the building material baking color modification, object color adjustment, such as the model scene of plants, vignettes and other focus on optimization, so that the virtual scene is more realistic, conducive to the next step of the virtual visualization experience.

2.4. Route planning

In the 3D campus roaming navigation system of red classic buildings, the path planning function is realized by the artificial intelligence algorithm module, which adopts the A-star algorithm for path searching and optimization. The A-star algorithm provides students with the optimal visiting path suggestions by combining the actual cost and heuristic estimation.

2.4.1. A-star algorithm

The A-star algorithm optimizes the search process by means of a heuristic estimation function $h(n)$. Assume that the graph search model used in the algorithm has a set of nodes V , a set of edges E , a starting point s and a goal point t . Each node n has a cost function $f(n)$ as shown in equation (1).

$$f(n) = g(n) + h(n) \quad (1)$$

Where: $g(n)$ is the actual cost from the starting point to node n ; $h(n)$ is the heuristically estimated cost from node n to the target node.

The operation procedure of A-star algorithm is as follows.

1) Initialization: first, the actual cost from the starting point to the starting point is assigned to 0, i.e., $g(s) = 0$. Second, assign the cost function $f(s) = h(s)$ of the starting point. Finally, add the starting point to the development list Open List.

2) Cyclic operation: firstly, select the node n with the smallest $f(n)$ from the Open List, secondly, move it to the Closed List Closed List. lastly, for each neighboring node m , compute its cost as shown in Equation (2).

$$g(m) = g(n) + w(n, m) \quad (2)$$

Where: $g(m)$ is the actual cost from the starting point to node m ; $g(n)$ is the actual cost from the starting point to the current node n ; and $w(n, m)$ is the weight of the edges between node n and node m .

Based on the computation results, if m is not in the open list and the new $g(m)$ is smaller, $g(m)$ is updated and $h(m)f(m)$ is computed sequentially as shown in equation (3).

$$h(m) = \sqrt{(x_m - x_t)^2 + (y_m - y_t)^2 + (z_m - z_t)^2} \quad (3)$$

$$f(m) = g(m) + h(m) \quad (4)$$

Where: $h(m)$ is the heuristic estimation function, which represents the estimated cost from node m to target node t , and usually adopts the Euclidean distance algorithm; (x_m, y_m, z_m) is the coordinates of node m in the three-dimensional space; (x_t, y_t, z_t) are the coordinates of the target node t in 3D space; $f(m)$ is the total cost function, which represents the total cost from the starting node m to the target node t , and is the sum of the actual cost $g(m)$ and the heuristic estimation $h(m)$; and $g(m)$ is the actual cost function, which represents the actual cost from the starting point to node m .

Finally, if m is still not in the open list, it can be added to the open list Open List.

3) Termination condition: the algorithm ends when the target node t is placed in the Closed List. At this point, the shortest path is constructed by backtracking the chain of parent nodes.

2.4.2. Path planning implementation

The realization of path planning relies on the 3D environment data provided by the 3D model building module. In practice, nodes (e.g., buildings at entrances, intersections) and edges (e.g., roads, corridors) of the campus are extracted from the 3D model to construct Fig. $G(V, E)$. Each node represents a critical point in the campus, and the edges represent passable paths between these critical points, whose weights can be distances, times, or other relevant costs. With this data of nodes and edges, the path planning algorithm is able to compute the optimal path from the starting point to the goal point in a 3D environment and display it to the students in real time in the student interface module.

3. Civic and Patriotic Cultivation Practice in Colleges and Universities Based on Red Classic Buildings

3.1. Comparative experiments on path planning with different algorithms

3.1.1. Comparison of adaptation

The campus roaming path planning effect of 3D red classic buildings will directly affect the cultivation level of students' patriotic emotion in the practice of Civics courses. In this section, a comparison experiment is set up to compare the A-star algorithm with other group intelligent bionic

algorithms to verify its performance and path planning quality. In order to objectively evaluate the quality of the planned paths, the paths computed by the algorithm are plotted, and the data such as its road length, number of buildings, average corner, average obstacle distance and adaptability are used as a reference for comparison.

Taking the 80*80 roaming space as an example, the effective 3D red classic buildings in this spatial scale exist partly concentrated and partly dispersed characteristics, which can better verify the path planning effect of the algorithms. Figure 1 shows the adaptation values in the path planning process of different algorithms. In the process of 125 iterations, the path adaptation degree of the ACO algorithm changes slowly, always maintained between 0.00-0.75, and does not show a convergence trend. The BFO algorithm is able to find paths with fitness close to 1.00 after the 50th iteration under the effect of the dispersion mechanism, but the convergence effect is not obvious. The bidirectional ACO algorithm converges faster and finds a path with fitness greater than 2 after about 30 iterations, which is because the bidirectional search accelerates the path-finding efficiency of the ant colony, thus accumulating pheromones quickly to reach convergence, but convergence is toward a locally optimal solution. GA algorithm generates effective solutions with higher adaptation degree in the initial path, but it is difficult to complete the final convergence. PSO algorithm's adaptation degree changes are more unstable, and it is difficult to converge. A-star algorithm is able to generate effective paths quickly in about 13 iterations, and obtains high path adaptation degree (2.09) in the early stage of iteration, and disperses in time to get the paths with optimal adaptation degree, and it has fast convergence speed. The A-star algorithm can be used to quickly realize the campus roaming path planning of 3D red classic buildings.

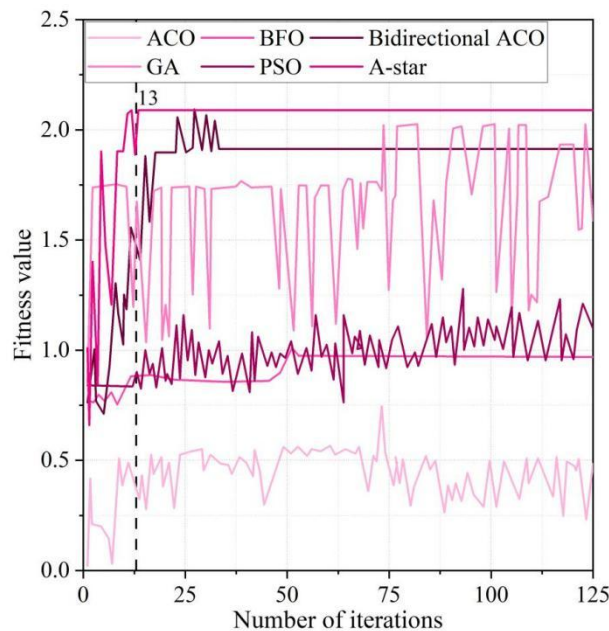


Figure 1. Fitness values in the path planning process of different algorithms

3.1.2. Comparison of path planning simulation results

Table 1 shows the average performance statistics of different algorithms for 125 experiments in 80*80 environment. Among them, the A* algorithm obtains the smallest path adaptation (0.289), but the path length is moderate and the balance of the individual constraints is poor, which does not meet the requirements of multi-constraint roaming paths. The ACO algorithm obtains a path with poorer values for the length (49.884m), the average angle of turn (52.117°), and directly leads to a lower adaptation value (0.484), and the number of generations of convergence is equal to the maximum number of iterations (125). The BFO algorithm is better in all values in comparison and obtains a higher path adaptation (0.969), but with a slower convergence (52.834 iterations) and a long running time (8.634s). The bi-directional ACO algorithm has a significant reduction in running time (1.381s) but little other performance improvement. The GA algorithm has a slightly weaker performance in both the number of buildings (5.374) and the average angle of turn (23.872°). The PSO algorithm has poor convergence and long running time (3.319s).

The A-star algorithm in this paper maintains better and balanced results in all values of path quality, with a path length of 27.321m and a shorter walking path, which is not likely to cause students to

appear to lose their interest in learning about the red classic buildings due to fatigue. The number of red classic buildings passed by 8.794, which is more than the comparison algorithm. The average turning angle is 20.172°, and the average obstacle distance is 1.749 m. There are fewer turns and object obstacles, and the sense of space in path planning is more open. Meanwhile, it converges quickly (13.515 times), and the operation time is kept at 0.525 s. Using the A-star algorithm in this paper can improve the quality of campus roaming path planning for 3D red classic buildings, mobilize students to feel the charm of red classic buildings in immersive way, and receive patriotism inculcation in the Civic and Political Science practice course.

Table 1. Path planning simulation results

Algorithm type	Algorithm	Long Road (m)	Number of buildings	Average rotation Angle (°)	Average obstacle distance (m)	Fitness	Convergence algebra	Running time (s)
Traditional algorithm	A*	46.536	7.612	29.572	1.152	0.289	-	-
	ACO	49.884	7.284	52.117	0.452	0.484	125.000	7.718
	BFO	30.262	7.167	25.805	0.564	0.969	52.834	8.634
Intelligent algorithm	Bidirectional	27.691	7.184	25.674	0.605	1.913	33.274	1.381
	ACO	26.857	5.374	23.872	0.635	1.588	125.000	0.696
	GA	42.371	5.306	22.489	0.841	1.098	125.000	3.319
	PSO	27.321	8.794	20.172	1.749	2.089	13.515	0.525

3.2. Comparison of patriotic feelings before and after the experiment

Using the constructed red classic building model and A-star algorithm system, etc., we innovate the practical teaching mode of the Civics and Political Science course in colleges and universities, and guide the students to cultivate patriotism emotion in the campus roaming of 3D red classic buildings. In Civics education, patriotic emotion contains three main aspects: love for the country, loyalty and defense of the country, and dedication to national construction.

The sophomore class A and class B of Marxism College of a university were chosen as experimental subjects and a control experiment was set up. Among them, the number of students in both classes is 35. Class A, as an experimental class, uses the practical teaching method of campus roaming with 3D red classic buildings; class B, as a control class, uses the conventional teaching method. The experiment lasted for one academic year, and there were no other influence variables except the teaching method.

At the end of the experiment, questionnaires were set up for each of the three aspects of patriotism sentiment, and the changes in patriotism sentiment of students in the experimental group and the control group were counted.

3.2.1. Comparative analysis of love for the country

Table 2 shows the results of a comparative analysis of the love for the country between the experimental group and the control group after the experiment. From the perspective of the three dimensions of love for the country, the scores of the control group in loving the mountains and rivers of the motherland, the history and culture of the motherland, and the people of the motherland were 22.142± 1.216, 21.116± 2.167, 20.563± 2.267, while the scores of the experimental group were 26.364± 1.157, 28.248± 2.524, 29.798± 2.684. The experimental group scored higher than the control group in all 3 dimensions. And in all 3 dimensions, p=0.001, which indicates that the experimental group of students showed more positive emotions of recognition in the love for the country after the experiment.

Table 2. Comparative analysis of love for the country

Item	Group	N	X±S	T	P
Love the mountains and rivers of the motherland	Control group	35	22.142±1.216	-5.372	0.001
	Experimental group	35	26.364±1.157		
Love the history and culture of the motherland	Control group	35	21.116±2.167	-5.694	0.001
	Experimental group	35	28.248±2.524		
Love the Chinese people	Control group	35	20.563±2.267	-5.268	0.001

3.2.2. Comparative analysis of loyalty to and defense of the State

Table 3 shows the results of the comparative analysis of the experimental and control groups in terms of loyalty to and defense of the country. In the 2 dimensions related to loyalty to the country and the feeling of maintenance, the scores of the experimental group were 25.679±2.263 and 27.419±3.635 respectively, which were higher than those of the control group, which were 20.215±0.172 and 22.108±1.230, and the p-values were 0.001, which proved that in the aspect of loyalty to the country and the feeling of maintenance, the use of the campus of the 3D red classic building roaming to cultivate students' patriotic feelings related to the maintenance of national sovereignty and territorial integrity and the maintenance of national security and interests, the effect is excellent.

Table 3. Comparative analysis of loyalty and maintenance of the country

Item	Group	N	X±S	T	P
Safeguard national sovereignty and territorial integrity	Control group	35	20.215±0.172	-7.263	0.001
	Experimental group	35	25.679±2.263		
Safeguard national security and interests	Control group	35	22.108±1.230	-6.179	0.001
	Experimental group	35	27.419±3.635		

3.2.3. Comparative analysis of dedication to nation-building

Dedication to nation-building covers the dimensions of “contributing to national development” and “actively fulfilling civic duties”. Table 4 shows the comparison results of the two classes' dedication to nation building after the experiment. In the dimension of contributing to national development, the score of the control class is 19.875±1.453, which is lower than that of the experimental class which is 27.356±3.637, and at the same time, T=-6.351, P=0.001. In this dimension, the two classes show a significant difference, and the experimental class is better than the control class. In the dimension of active fulfillment of civic duties, the control class scored 20.773±2.480, which was much lower than that of the experimental class, which was 29.557±2.431, and T=-5.623, P=0.001. In this dimension, the two classes showed the same significant difference after the experiment, and the experimental class was better than the control class. Based on the red classic building model and A-star algorithm path planning, the students were able to improve their self-consciousness to dedicate themselves to the construction of the country in practice.

Table 4. Comparison results of the dedication to national construction

Item	Group	N	X±S	T	P
Contribute to the development of the country	Control group	35	19.875±1.453	-6.351	0.001
	Experimental group	35	27.356±3.637		
Actively fulfill civic duties	Control group	35	20.773±2.480	-5.623	0.001
	Experimental group	35	29.557±2.431		

3.2.4. Comparative Analysis of Patriotic Sentiments

The overall analysis of the patriotic sentiment of the students in both classes after the experiment. Patriotism emotion contains two dimensions of patriotic spirit and patriotic cognition. Figure 2 shows the comparison of patriotism emotion between the experimental group and the control group. For the dimension of patriotic spirit, the control group scored in the range of 15.26-20.34, while the experimental group scored in the range of 23.76-28.45, and at the same time, T=-3.57, P=0.001. For the dimension of patriotic cognition, the control group scored in the range of 14.31-19.23, while the experimental group scored in the range of 23.43-28.78, and T=-2.69, P=0.001. In the 2 dimensions of patriotism, the experimental group obtained better scores than the control group, and there was a significant difference at the level of 0.001. It is once again verified that the practical teaching of college civics courses under the perspective of red classic architecture can significantly enhance the patriotism emotion of college students.

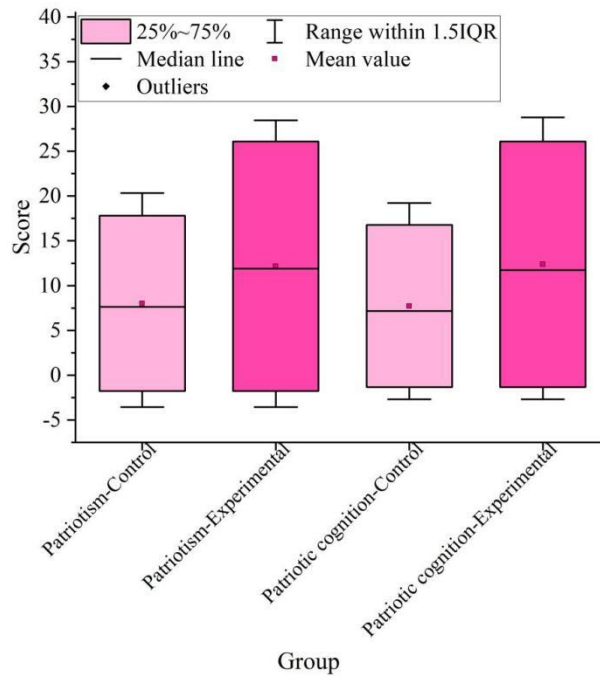


Figure 2. Comparison of patriotic feelings

4. Conclusion

In this paper, the optimal path planning for the practice of the Civics course is realized by establishing the red node building model and integrating A-star algorithm to cultivate the students' patriotism emotion. The A-star algorithm iterates about 13 times to quickly generate the path with 2.09 fitness, and the walking path is only 27.321m, which passes through the red classic buildings of 8.794, and the computing time is kept at 0.525s. The path planning performance of the A-star algorithm is better than several comparison algorithms. Through the comparison experiment, it was found that the experimental classes were all significantly higher than the control class at the level of 0.001 in the dimensions related to patriotism emotion, which proved that the integration of Civic and Political Patriotism in colleges and universities under the perspective of the red classic architecture has a good effect. In the future, we can try to expand the practice space to areas beyond the campus, improve the generalization ability of algorithmic path planning, and promote the diversified development of Civic and Political Patriotism teaching practice.

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