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Research Article

Creative Design and Technical Analysis of Animation Public Service Advertisement Based on Ant Colony Optimization Algorithm

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In order to solve the bottleneck problem of public service advertising, an analysis method of creative design and design and production technology of animation public service advertising based on the ant colony optimization algorithm was proposed. In the current creative design process of animation public service advertising, along with the improvement of people's aesthetic requirements, it is necessary to carry out a comprehensive innovative design of its design methods and content. This paper mainly describes how to use the ant colony optimization algorithm in the actual design process to carry out the corresponding design and analysis and then improve the overall communication of advertising. The research results show that under the ant colony algorithm, the customer satisfaction rate of public service advertising design is 89%, the general rate is 10%, and the dissatisfaction rate is 1%, which is superior to the traditional algorithm. Using Flash, 3DS Max, Premiere, and other software as well as "3D simulation," Easy Mocap motion capture, and other technologies, the production quality of animation public service advertising films has been effectively improved.

1. Introduction

Public service advertising first appeared in the United States in the early 1940s. After more than 70 years of development, it has been built into a relatively perfect industrial system. Public service advertising, as a means of information dissemination for the world public (Figure 1), now has the widest audience and has become an indispensable part of the world public welfare.

An ant colony algorithm (Figure 2) is a newly developed bionic optimization algorithm. Aiming at the defects of the ant colony algorithm in solving practical combinatorial optimization problems, this article puts forward several possible improvement methods and strategies based on reading a lot of relevant literature. The ant colony optimization (ACO) is used to identify the route between the cluster head and the base station. It selects the optimal route according to the distance, residual energy, and node degree. The performance measurement of this method is analyzed from the aspects of live node, dead node, energy consumption, and data packets received by BS. The output of this method is compared with the traditional methods LEACH and DEEC, and with some existing methods FUCHAR, CRHS, BERA, CPSO, ALOC, and FLION. For example, compared with CRHS and BERA methods, the proposed method has 200 live nodes in 1500 iterations [1].

The main work of this paper is to improve the algorithm model based on the experimental analysis of the ant colony algorithm (Figure 3). In terms of pheromone updating mechanism, the concept of pheromone diffusion is introduced for the first time, so the algorithm considers the previous nodes better when updating pheromone, so as to avoid unnecessary useless search. Therefore, the ant colony algorithm based on pheromone diffusion has the ability to constantly obtain new optimal solutions, so that the improved ant colony algorithm can obtain the global optimal solution after continuous iteration, and is not easy to fall into the local optimal solution. In order to solve the TSP, the

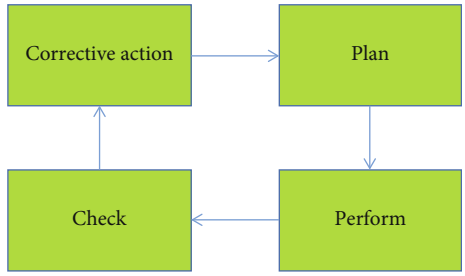

Figure 1: Information dissemination process.

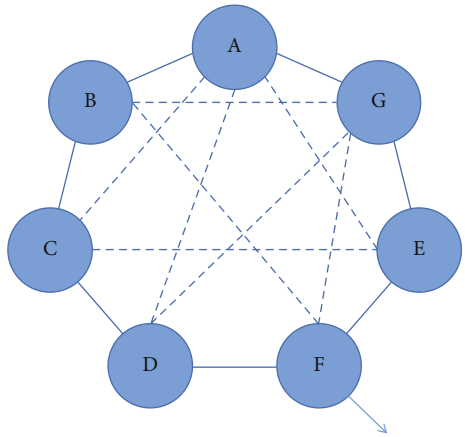

Figure 2: Ant colony algorithm.

coordinates of all nodes are preprocessed, and then, pheromone diffusion mechanism and ant flooding technology are adopted to improve the ant colony algorithm, so as to find shorter and less expensive paths within the same number of iterations.

On the basis of this research, this paper proposes an analysis method of creative design and design and production technology of animation public service advertising based on the ant colony optimization algorithm. Based on the experimental analysis of the ant colony algorithm, this paper improves the algorithm model. In terms of the pheromone update mechanism, the concept of pheromone diffusion is introduced for the first time. Therefore, this algorithm better considers the previous nodes when updating pheromone, in order to avoid unnecessary useless search. Therefore, the ant colony algorithm based on pheromone diffusion has the ability to continuously obtain new optimal solutions, making the improved ant colony algorithm can obtain the global optimal solution after continuous iterative process, and is not easy to fall into the local optimal solution. According to the production process of animation public service advertising films, the production quality of animation public service advertising films has been improved by using Flash.3DS Max. Premiere and other software as well as "3D simulation", EasyMocap motion capture, and other technologies, and ingeniously integrating creative design art.

Dijkstra is a greedy algorithm. Dijkstra algorithm is the basic method to determine the shortest path in graph theory and is also the basis of other algorithms. The Dijkstra algorithm is as follows: (1) suppose that the weighted adjacency matrix Edges represent the directed graph, and the edges represent the weights of arc $<vj, vj>$. If $<vj, vj>$ does not exist, then $\text{Edges}[i][j] \longrightarrow \infty$ (on the computer can be replaced by the maximum allowed), S is the set that has found the end of the shortest path starting from v. Its initial state is an empty set. Then, from v to its point on the graph, v may reach the initial value of the shortest path length as

$$D[i] = \text{Edges}[\text{locVex}(G, v)][j]. \quad (1)$$

In the formula, $\text{locVex}(G, v)$ represents the position of node V in graph G. Select Vj so that

$$D[j] = \text{Min}\{D[j] | v_i \in v - s\}, \quad (2)$$

where Vj is the end of the shortest path from v. Modifies the shortest path length reachable from V to any vertex V of the set $v - s$, as shown in

$$D[j] + \text{Edges}[j][k] < D[k]. \quad (3)$$

At this time, to modify $D[k]$,

$$D[k] = D[j] + \text{Edges}[j][k]. \quad (4)$$

The specific path is shown in Figure 4.

The optimal path solution is shown in Tables 1–3.

2. Research Methods

2.1. Ant Colony Algorithm. Today's society has entered the era of rapid development, with the continuous expansion of human existence and space and the scope of understanding the world, the transformation of the world continues to broaden, and human science and technology put forward higher and new requirements. Complex problems of super-large scale, nonlinear, and randomness are constantly emerging in various fields, and it is difficult for traditional computing methods to solve these complex problems. Among them, efficient intelligent computing and optimization techniques are increasingly required [2, 3]. The ant colony algorithm is a newly developed intelligent bionic optimization algorithm. Its design principle is generated by simulating the colony foraging behavior of ants in the insect kingdom. It is a novel system optimization idea proposed and improved by European scholars. The bionic optimization algorithm (Figure 5) is completely different from the traditional mathematical programming principle and is inspired and developed by the evolution behavior of individual organisms and ecosystems in nature [4].

The ant colony algorithm (ACO) has become a research hotspot in the field of artificial intelligence due to its strong robustness, excellent distribution calculation mechanism, and easy to be combined with other methods. And it is attracting more and more scholars' attention and research. Application scope also began to spread to many science and technology and engineering fields. Through years of careful research and application development of the ant

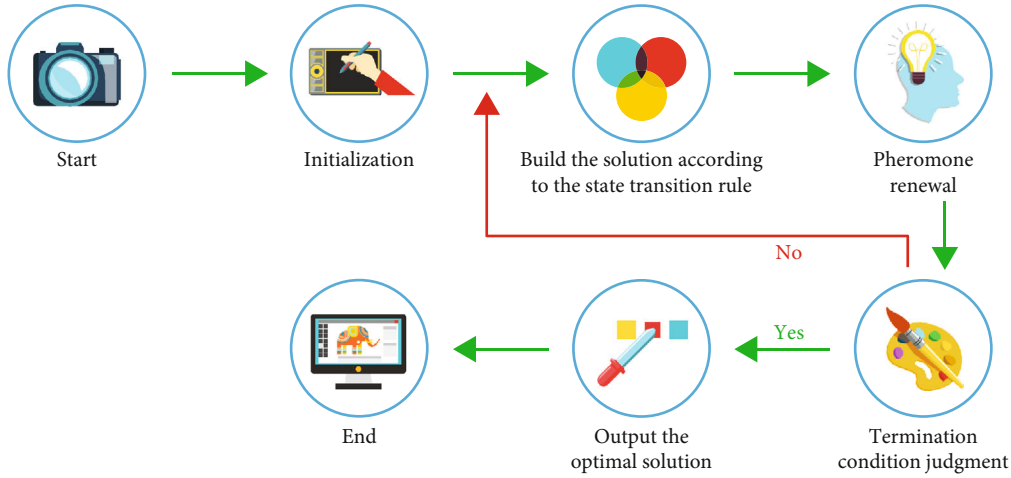

Figure 3: Ant colony algorithm flow.

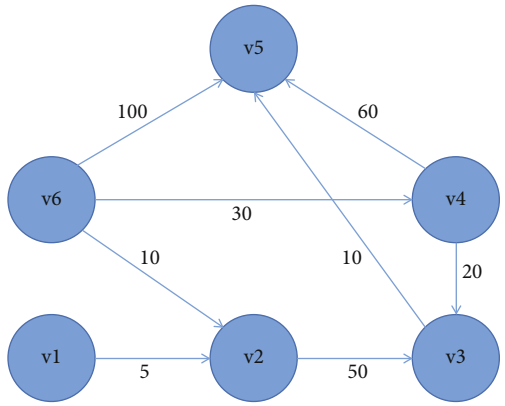

Figure 4: Path diagram.

colony algorithm by researchers around the world, the algorithm has been widely applied in various fields such as electricity, communication (Figure 6), water conservancy, mining, chemical industry, and transportation [5].

Although the ant colony algorithm has made some achievements so far, many of them are still theoretical research, and the application of the algorithm is not mature. For example, there are still many problems to be improved in the efficiency of the algorithm. Based on the theme of the basic ant colony algorithm, this paper tries to find a more effective way to improve some combinatorial optimization problems that the ant colony algorithm often meets in engineering practice. For example, vehicle routing problem (Figure 7), network routing problem, and optimization problem in chemical industry, etc., among which the most typical is traveling salesman problem, the mathematical model abstracted from these problems has been proved to be NP problem. It is the emergence of the bionic algorithm that makes these seemingly complex problems simple and provides new competitive solving algorithms for complex and difficult system optimization problems [6, 7].

Inspired by ant colony, a new intelligent optimization algorithm, ant system, was first proposed in Italy in the early 1990s and successfully used to solve the traveling salesman problem (TSP). Experimental results show that the AS algorithm has strong robustness and the ability to find good solutions, but it also has some defects, such as slow convergence rate and easy stagnation, as shown in Figure 8.

The emergence of this algorithm has attracted extensive attention of scholars, and some improved ant colony algorithms have been proposed [8]. When one finds food, it does this by releasing pheromones (called pheromones) into the environment, which evaporate over time, and the pheromone's concentration indicates how far the path is, attracting other ants, so that more and more ants find food. Instead of repeating the same route as others, some ants take a different path. If the alternative path is shorter than the original one, gradually more ants are attracted to the shorter path. Finally, after some time of running, there may be a shortest path repeated by most ants. The range that an ant can observe is a square world. If an ant has a speed radius (usually 3), the range it can observe is $3 * 3$ square worlds, and the distance it can move is also within this range. The environment of ants is a virtual world, in which there are obstacles, other ants, and pheromones. There are two kinds of pheromones, one is the food pheromone sprinkled by ants who find food, and the other is the pheromone sprinkled by ants who find nests (Figure 9). Each ant can only perceive information about its environment within its range. The environment makes pheromones disappear at a certain rate [9].

Look for food within the range of each ant's perception, and if there is, go straight to it. Otherwise, look to see if there are pheromones, and compare which point has the most pheromones in the range of perception, so it goes where there are more pheromones, and each ant makes a small mistake, so it does not go where there are the most pheromones. The ant follows the same rules for finding a nest, except it responds to the nest pheromone, not to the food pheromone. The ant colony algorithm is a self-organizing algorithm. In system theory, self-organization and other organization are two basic classifications of organization. In an abstract sense, self-organization refers to the process of reducing the entropy of the system without external

Table 1: Optimal path table A.

Level 1 project	Set T	Selected nodes	Dist[1][2][3][4][5]
No.1	v1	v2	∞
	v2		10
	v3		∞
	v4		130
	v5		100

Set S.

Table 2: Optimal path table B.

Level 1 project	Set S	Set T	Selected nodes	Dist[1][2][3][4][5]
No.2	v0, v2	v1	v4	∞
		v3		0
		v4		60
		v5		130
				100

Table 3: Optimal path table C.

Level 1 project	Set S	Set T	Selected nodes	Dist[1][2][3][4][5]
No.3	v0, v2, v4	v1	v3	∞
		v3		0
		v5		50
				0
				90

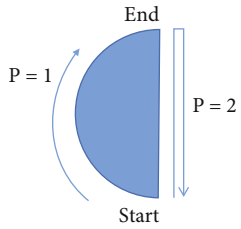

Figure 5: Schematic diagram of bionic algorithm.

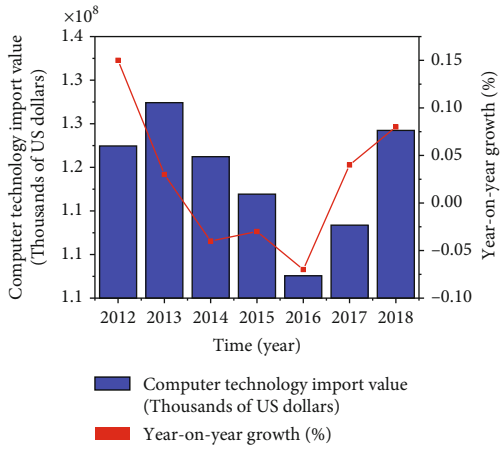

Figure 6: Development data of communication industry.

influence (i.e., the change process from disorder to order of the system) [10]. The ant colony algorithm fully embodies this process, taking ant colony optimization as an example. At the beginning of the algorithm, individual artificial ants search for solutions in disorder. After a period of evolution of the algorithm, artificial ants tend to find more and more solutions that are close to the optimal solution spontaneously through the action of information hormones, which is a process from disorder to order. The ant colony algorithm is a positive feedback algorithm. From the foraging process of real ants, it is not difficult to see that ants can finally find the shortest path directly depends on the accumulation of pheromones on the shortest path, and the accumulation of pheromones is a positive feedback process. For the ant colony algorithm, the same information hormone exists in the environment at the initial moment, giving the system a small disturbance, which makes the trajectory concentration of each edge different, and the advantages and disadvantages of the solution constructed by the ant will exist. The feedback method adopted by the algorithm is to leave more pheromones in the path of the better solution, and more pheromones attract more ants. This process of positive feedback enlarges the initial difference and leads the whole system to evolve towards the optimal solution. Therefore, positive feedback is an important feature of ant algorithm, which enables the evolution of algorithm [11].

2.2. Theoretical Basis of Animation Public Service Advertising

(1) The definition and characteristics of animation public service advertising. The current definition of animation public service advertisement in the industry is as follows: Animation public service advertisement refers to an advertising activity that uses artistic expression and the form of animation as a means of publicity to spread beneficial social concepts to the public without making profits, so as to change their attitude and behavior. The animation public service advertisement studied in this paper refers to the public service advertisement combining animation and cartoon elements, that is, the animation public service advertisement on TV, Internet, mobile phone and other digital media [12]

(2) Classification and development of animation public service advertising: animation public service advertisements are divided into social civilization categories according to their content (2012 CCTV public service advertisement "Home"), such as environmental protection, care for public property, and care for vulnerable groups; political policy, such as world peace, rejuvenating the country through science and education, and legal education; life and health, such as national fitness, drug and AIDS prevention, and medical care; social focus categories, such as Project Hope, drink-driving education, antipornography, and illegal publications; festivals; and so on. Animation public service advertisements are divided into 2D animation public service advertisements, 3D

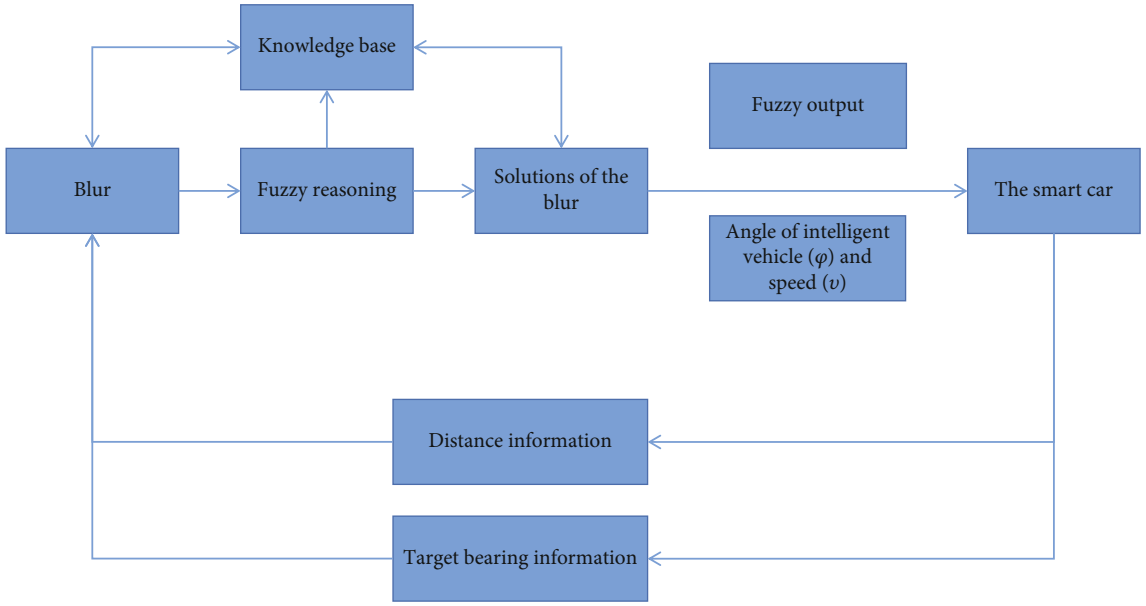

Figure 7: Vehicle path planning.

animation public service advertisements, and 2D and 3D combined animation public service advertisements according to their production technology. With the rapid development of animation industry and the continuous progress of computer animation production technology, as well as the upgrading of commonly used animation production software or the advent of new animation production software with more powerful functions, these have laid a solid technical foundation for the production of animation public service advertisements. It is expected that in the next ten years, animation public service ads will develop towards "fine beautification" and "creativity" [13]

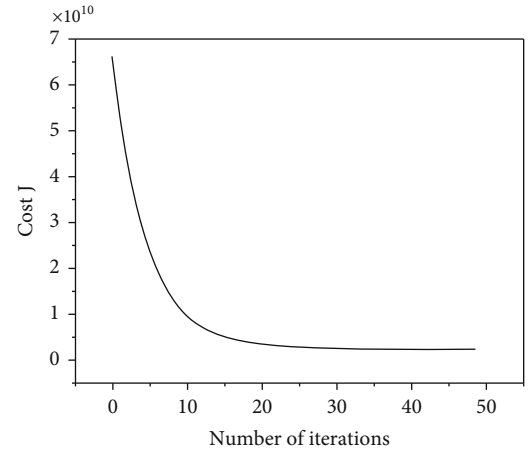

Figure 8: Stagnation of convergence.

3. Experiment and Research

3.1. Ideas of Creative Design. Animation public service advertising needs to use unique creative, profound, and animation form of advertising means, so that the concept of public service in digital media effectively spread, forming a wide range of social influence. Creativity is the soul of animation public service advertising, creative new, unique animation public service advertising is easier to expand the audience [14].

3.2. Requirements for Creative Design. A successful cartoon public service advertisement should have both emotional and rational elements and should meet the following three requirements in its design art [15].

3.3. Animation Public Service Advertising Production Software. There are many kinds of software for animation public service advertisements, but the following software is commonly used for synthesis and production: (1) image processing software; (2) audio editing software; (3) two-dimensional animation public service advertising software, such as Flash and Animo software; (4) 3D animation public service advertising production software, such as Maya, 3Ds Max, and Easy MoCap; (5) animation special effects production software, such as After Efects and Premiere; (6) video format conversion software, such as "Format Factory" and "Jiwo All-purpose Video Converter" software [16].

3.4. Animation Public Service Advertisement Production Process. The production process of two-dimensional animation public service advertisement mainly includes three stages: first, the preproduction stage including material collection, animation plan, public service advertisement script, art design, screen shooting, prerecording, and image processing. The second is the middle production stage including original painting, intermediate painting, scene design, color, and synthetic animation. The third stage is the postproduction stage: including sound mixing and sound synthesis,

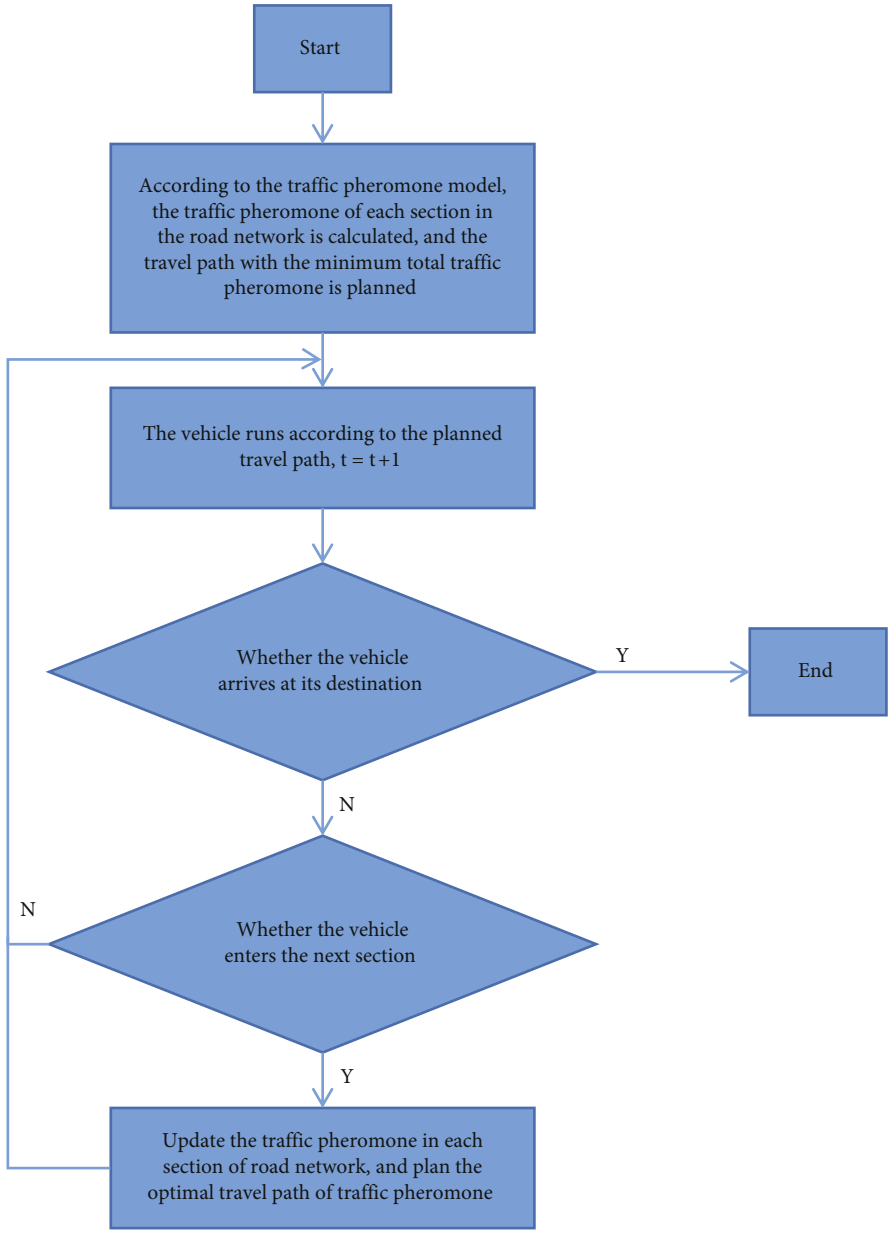

Figure 9: Pheromone of transportation industry.

postproduction animation special effects, rendering output into films, and format conversion [17].

3.5. Key Technologies of Animation Public Service Advertisement Production. First, flash software production technology (Figure 10). Flash is a two-dimensional animation production software developed by Adobe. It has powerful functions, is easy to learn and use, and has been widely used in digital media fields such as Internet, TV, and mobile phones [18].

Flash is a standard for interactive vector graphics and Web animation developed by Macromedia and acquired by Adobe. People who make Flash animations are called flashers. Web designers use Flash to create beautiful, resizable navigation interfaces, and other fancy effects [19]. When designing public service advertising campaigns, tracks should be allocated reasonably. On the basis of the middle cut, the animation sheet is added or subtracted to make the action look more vivid. Interactive animation production technology: since the animation public service advertisement of "Green Environmental Protection" is mainly put on the Internet, preloaded animation needs to be made, and the core code is added as follows:

Second, 3D Max software production technology. 3DS Max is a 3D animation production software developed by Autodesk. It provides powerful real-time 3D modeling, rendering, and animation design functions based on Windows platform and is widely used in advertising, film and television, architectural design, game design, engineering visualization, and other fields. When the data is read by the

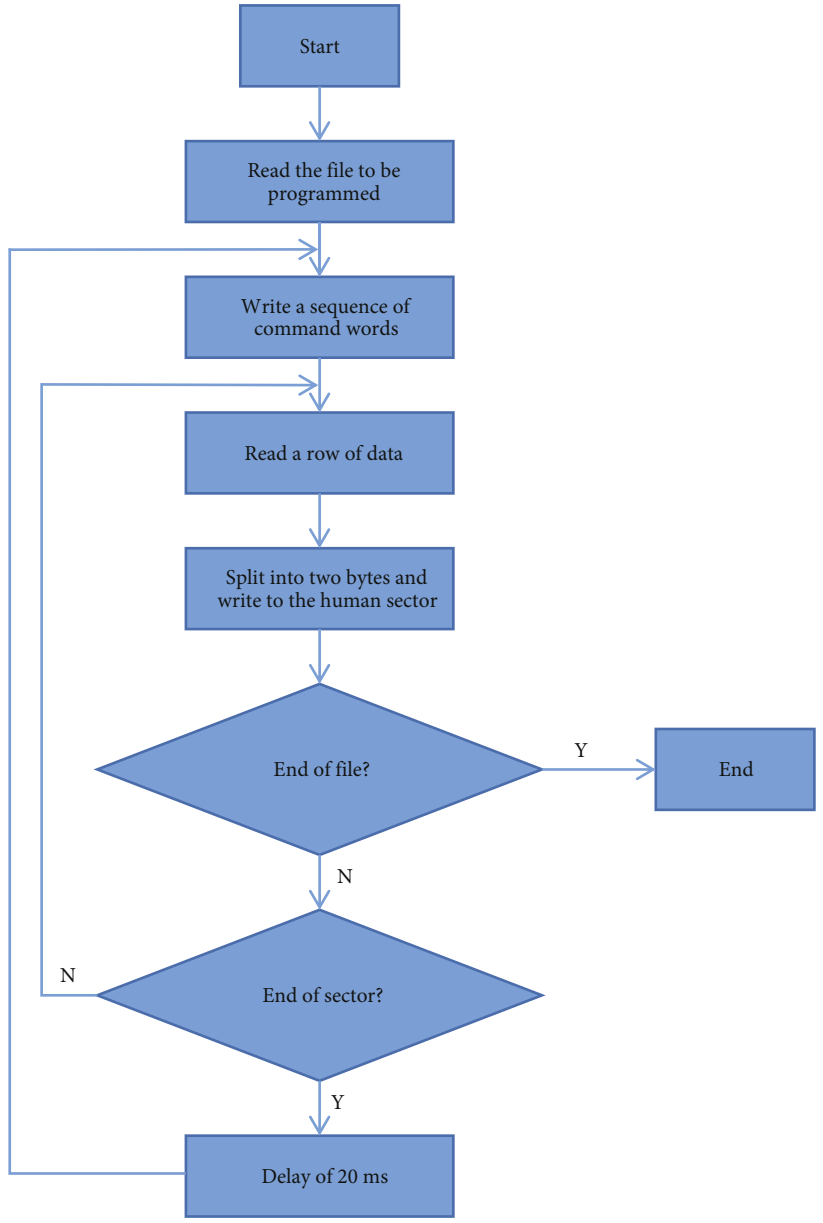

Figure 10: Flash software production technology.

```
stop();
var info:Loaderlnfo = this.root. loaderInfo; info.addEventListener(Event.COMPLETE. completeHandler);
info. addEventListener(ProgressEvent. PRO-GRESS,progressHandler);
function completeHandler(event:Event){play();
function pregressHandler(event: ProgressEv-ent):void{
var loadb:Number = event.bytesLoaded; var totalb:Number = event.bytesTotal; var percent:Number = Math.floor((loadb/tot-alb)*
100);
percent_txt.text = percent. toString(); }
```

Code 1: The core code.

computer, animators can adjust and control the moving objects in the computer-generated footage. For example, an Easy Mocap motion capture technology flow is as follows: (1) connect the Kinect camera "Microsoft 3D Camera" and power supply; (2) start the Easy Mocap software and open the 3DS Max animation public service advertisement character animation instance file; (3) click the "Max Tool "/" Motion capture" button/" Test "button; (4) click the" Test

"button; (5) people do body movements in front of Kinect camera, Easy Mo-Cap software can reconstruct the three-dimensional scene and characters, restore the three-dimensional picture to three-dimensional data, and then analyze the human joints for 3D coordinate accurate positioning and identification of the initial movement is captured; and (5) after all the role actions are captured, the action data capture files such as BVH, BIP, DAE, and FBX are recorded and output to various 3D animation production software.

Third, Premiere software film editing technology. Premiere is a powerful nonlinear video editing software, which is widely used in the field of video content editing and special effects production. The main process of using Premiere software to edit animation public service advertisements is as follows: (1) develop scripts, collect materials, and import them into Premiere software; (2) edit the materials including cartoons, public service advertisements, cartoons, and other materials, combine them in the "timeline" panel, and arrange the time and position of their appearance in the film; (3) add a video switching effect for two adjacent materials in the "Timeline" panel, expand the folder of this type in the "Effects" panel, and drag the corresponding video switching effect between adjacent materials in the "Timeline" panel; (4) drag the required video effects to the material specified in the "Timeline" panel to create the video effects; (5) add subtitles and audio effects, preview and modify the edited animation public service advertisement films; and (6) in order to prevent the jitter phenomenon of the output video, the command of "material/video options/field options" should be executed before the output video, and the check box of "exchange field order" should be selected in the popup panel of "field options", and the radio button of "eliminate flicker" should be selected in the "processing options." Finally, the edited cartoon public service advertisement file will be output in the format of video 10.

Fourth, Gold Wave software sound editing technology: using the Gold Wave software, you can input your voice into a computer and alter it to voice multiple characters in an animated public service announcement. The recording process is as follows: install the microphone on the computer, create a new audio file in Gold Wave software, click the red "start recording" button in the "controller" to start recording, click the "stop recording" button to complete the recording of the sound. It is necessary to "de-noise" the collected audio files due to the limitation of recording conditions. The operation process of de-noising is as follows: open the sound files to be processed; click the "denoising" tool button; open the "denoising" dialog box; when the red line and the green line cannot overlap, it means that the noise difference needs to be adjusted, and click the "OK" button directly. The noise reduction process will be completed. Sound conversion and editing re as follows: import sound files in Flash, sometimes encounter the situation that cannot be imported, this is because of the music sampling rate and bit depth settings, as long as the sound is reset, and then output again, you can solve the problem. That is, open the music file that cannot be imported into Flash in Gold Wave software, execute the "File"/"Save as "command, open the "Save Sound as" dialog box, save as MP3, in the "Properties "select save as 441000 Hz, 128 kbps, stereo. Then, return to Flash and import the converted sound file.

Table 4: Customer satisfaction of pSAS design under different algorithms.

Algorithms	Traditional algorithm	Ant colony algorithm
Satisfied	54%	89%
General	20%	10%
Dissatisfied	26%	1%

3.6. Method of Adding Artistic Fonts. Artistic font is a traditional font for creative, special beautification and modification, it is widely used in all kinds of advertising design. Adding beautiful or individual artistic fonts for animation public service advertisements will be more able to attract the eye of the audience. The method of adding art Fonts is: firstly, download the required art fonts from the art font database website (such as download the font file of "mini Jinf.ttF"), then copy the file to the directory of "C: \WINDOWS\Fonts," and finally add these imported art Fonts in the animation public service advertisement making software [20].

3.7. Results. Under the ant colony algorithm, 89% of pSAS design customers are satisfied, 10% are generally satisfied, and 1% are not satisfied, which is better than traditional algorithm. Specific results are shown in Table 4.

4. Conclusion

The creative design of animation public service advertising has significant innovative and diverse characteristics. Through the application of software production, animation public service advertising can present a better publicity effect. It can be seen that the organic combination of animation production and public service advertising is conducive to improving the publicity effect of public service advertising. Under the ant colony algorithm, 89% of public service advertising design customers are satisfied, 10% are generally satisfied, and 1% are dissatisfied, which is better than the traditional algorithm. To sum up, a successful cartoon public service advertisement should have a distinct theme and be creative. At the same time, it has both technology, timeliness, artistry, and appropriateness. Rational connotation is reflected in the form of sensibility, making the content of communication easier to be understood and accepted by the audience, and truly gaining lessons from the cartoon public service advertisement. It is of far-reaching significance to study the creative design and production technology of animation public service advertisements, and to create more innovative, more fashionable, and more attractive methods and ways of animation public service advertisements. The arrival of the new media era has brought new opportunities to the development of animation public service advertising. Although there are still some problems in the development of animation public service advertising in

China under the new media environment, we can only make scientific analysis of these problems, make full use of the favorable conditions of the new media, and formulate effective countermeasures for travel, and we will be able to produce more and better animation public service advertising, to escort the overall progress of our society.

Data Availability

The labeled data set used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The author declares that he/she has no conflicts of interest.

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