



## Design and Construction Method of Interactive Animation Teaching Scene based on CAD

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**Abstract.** Based on the need of interactive animation teaching and the platform of computer aided software, this paper studies the production process and method of animation for teaching. The successful realization of the sound and appearance of the computer network working principle animation, and has interactive functions, so that the complexity and highly abstract computer network protocol working principle of knowledge can be vividly illustrated in the form of animation demonstration, thus improving the level of teaching. The computer-aided teaching based on interactive animation is different from the traditional teaching, and has successfully realized the animation demonstration of the law of animation movement, and has good man-machine interaction function. The teaching is carried out in the form of interactive animation demonstration, with both pictures and pictures and sound and painting, which fully embodies the teaching characteristics of visualization and practicality of the course. It makes the complicated course of animation motion law simple, intuitive and easy to understand, thus improving the teaching effect.

**Keywords:** computer-aided design; interactive animation; teaching scene design.

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### 1 INTRODUCTION

The application of interactive animation in digital media has greatly improved the interactive performance of animation. New media will show interactive animation in a more vivid and

attractive way in front of people. The emergence of various new digital media platforms has also brought a lot of fun to people's study, leisure and work. The application of interactive animation in digital media has changed the simple and shallow interaction mode of traditional interactive animation, which makes people interact more deeply and entertain more intensely, and greatly improves people's interest in using it [1]. Interactive animation is a new form of animation. Compared with traditional animation, the characteristics of interactive animation are mainly reflected in the support of event response in the animation playback process, and at the same time have certain interactive ability. Interactive animation changes the traditional mode of animation watching and makes the audience change from passively receiving animation information to actively choosing animation information. Interactive animation is a new digital expression, which is developed on the basis of traditional animation and information technology. Interactive animation avoids many disadvantages in traditional animation. In the process of animation playback, users can control the interface, content, progress and other aspects of the work through mouse, keyboard and other devices, and implant their own emotions into the animation situation, changing from a passive recipient to an active participant in the animation. Interactive animation was born in the 1990s. After years of development, interactive animation not only becomes more perfect in its own technical form, but also has been widely used. With the help of interactive animation, users can get audio-visual experience and other aspects, and can better meet the entertainment needs of users, enhance the user experience. With the development and improvement of interactive animation, interactive animation has gradually become the darling of digital media market, and has been widely recognized by virtue of the further upgrade of user experience. According to the user survey of digital media using interactive animation, most users think that the current interactive animation has a serious homogeneity tendency in mode design, the interactive function needs to be further developed, and the function of cultural transmission is also slightly inadequate. Therefore, in the process of interactive animation design, designers need to break through the shackles of thinking, realize the innovative application of technology, and enhance the sense of experience, novelty and entertainment of interactive animation. In addition, the operation process of interactive animation is complicated, which also affects the application effect and application scope of interactive animation to a great extent. In addition, the appreciation of interactive animation also needs to be improved. In order to highlight the characteristics of interactive animation, in the design process, designers often pay more attention to the interaction of animation, but pay enough attention to the appreciation of interactive animation, resulting in a single form of expression of interactive animation, it is difficult to catch the eye of the audience. The existence of this situation will make the application effect of interactive animation in digital media greatly reduced. There are many examples of combining computer-aided computing with interactive animation. Schulz et al. [2] used CAD technology to apply interactive animation to the optimization of space. Menn and Seliger [3] combined 3D technology with interactive technology to be used in prefabricated spaces. Xue et al. [4] combined CAD models with interactive techniques for space frame design. Zhao and Zhao [5] explored the relevance of interactive animation scenes to computer-aided technology. Gan et al. [6] modeled research using interactive animation and virtual reality technology.

New media and the Internet provide a medium of communication between people and animation, but in essence, the Internet is also designed by an individual subject. Therefore, interactive design can also be seen as communication between people. Communicate to express emotions, create value, or achieve goals. This is also the convenience brought to life by the digital age. Users have changed from the external senses to the internal experience of interactive design, which is not only a progress in the design form, but also a deep communication between people and intelligence or people and life [7]. Interaction design is not only a design method, but also a more humane design attitude. Interaction in the traditional sense refers to a process of mutual communication, interaction and influence between two people or people and other things. After the rise of Internet technology, man-machine interaction is gradually known to people. Human-computer interaction refers to the behavioral interaction between people and computers or networks, but the core of which is human-centered. Human-computer interaction refers to the

behavior by which people transmit information to the outside world through their own behaviors, in order to achieve established goals or achieve certain goals. With the advent of the era of artificial intelligence, the Internet or media can transmit two-way information with people. Before the arrival of the era of artificial intelligence, people can only identify the content they watch or hear through their senses, including words and pictures, etc., while in the era of new media interaction, users can communicate with what they see to convey their will [8].

## 2 POWERFUL FEATURES ON INTERACTIVE ANIMATION

Compared with other electronic media equipment teaching, interactive animation teaching is more vivid and better than traditional blackboard teaching. It can not only produce visual and auditory stimulation for students in the media, but also enable students to explore by themselves and enhance their hands-on ability through interactive operation. Through the multi-angle, all-round demonstration, the abstract, boring theoretical knowledge vividly displayed [9].

Interactive animation allows the user to control the animation through mouse clicks or keyboard operations, so that the animation screen to produce jumping changes or the implementation of some other actions (i.e., procedures, also called scripts), Flash software in this area has a powerful function. Flash provides the ability to load synchronized sound while creating dynamic animations, meaning that we can hear the narration while seeing the screen and the text, and that the timing of these sounds can be precisely controlled. This is an outstanding feature for some other courseware. In addition, with the acquisition of Macromedia by Adobe, the Flash software has become more powerful in terms of graphics and image modification, allowing us to make more vivid adjustments to our courseware. Building on the above, Flash's ability to create powerful interactive animations is based on its object-oriented programming capabilities. Object-oriented programming was introduced in the 1980s and is derived from the Smalltalk language. It uses an object-oriented approach to problem solving, where problems are not broken down into processes, but into objects. An object is a real-world entity that can exist independently and can be distinguished, or it can be some conceptual entity, and the world is made up of many objects. An object is an entity that has its own properties, operations that act on the object (i.e., methods that act on the object and actions that correspond to the object (i.e., events). By using the object-oriented programming of the ActionScript language and the functionality of the components, we can create powerful interactive animations, making this type of courseware more practical and interesting, and making the teaching content more easily accepted and understood by the students in the process [10].

Interactive animation differs from traditional animation in that it not only expresses the meaning the author wants to express, but also makes the animation artistic, allowing people to enjoy the beauty of the technology and feel the convenience. With the introduction of digital media, interactive animation has entered a higher realm. Interactive animation not only meets the traditional production requirements, but also satisfies the automation system, realizing interactive autonomy and making the user's experience more realistic, perfectly reflecting the technological nature of interactive animation. Interactive animation has a certain degree of convenience, in the design, designers focus on the role of people in interactive animation, follow the principle of human-centered, from the auditory, visual to enhance the user's sensory experience, interactive animation has the option is also to make interactive animation become more convenient animation way. People can learn, work or play through interactive animation, deepening the user's understanding of the content through a more realistic sensory experience and providing a convenient way to communicate the author's ideas. Interactive animation respects the human senses, satisfying the senses of hearing, sight and taste, enhancing the user's sensory experience and enhancing the pleasure of using it. The user's experience of using interactive animation is enhanced, and the interaction enhances participation and meets people's viewing requirements. Art is accustomed to jumping type of thinking, while background programming requires strict logical thinking, interactive animation design is the art of combining art and science, whether the appropriate integration of programming technology in art and design teaching, training a new type

of art and design talents, is an important issue, through teaching practice has proved that the integration of art and technology is the trend of the development of new media art today, in the process of this integration, technology can be This is the inevitable development of science and art, and is a fact that we cannot avoid when we are engaged in art and design education. Through practice, we have indeed discovered ways and paths to integrate the two, acquiring new theories and techniques for the discipline, and this will be the direction of education for which we will strive to explore. By setting up scenarios from applications, through task-led and interactive teaching, students can actively participate in the classroom, stimulate their interest, mobilize their initiative and enthusiasm for learning and investigation, enhance their understanding of what they have learnt, and achieve good teaching results.

Interactive animation emphasizes communication, and the course forms an interactive platform for interaction with students, as well as communication between students, constituting effective interaction. In the interactive animation teaching system of animation movement law, I fully consider the display characteristics of graphics and symbols in human-computer interaction, optimize the interface elements, after a high degree of generalization and abstraction of display content such as people or animals and formed, so that graphics and symbols and actual people and animals have similar characteristics, easy to identify and recognize, so as to improve the cognitive speed and accuracy of student learning, so that students and interactive animation This makes the communication between students and the interactive animation more smooth and makes the interactive animation more considerate and humane, thus improving learning efficiency.

### **3 STAGES OF INTERACTIVE ANIMATION IN TEACHING**

#### **3.1 Preparation Phase**

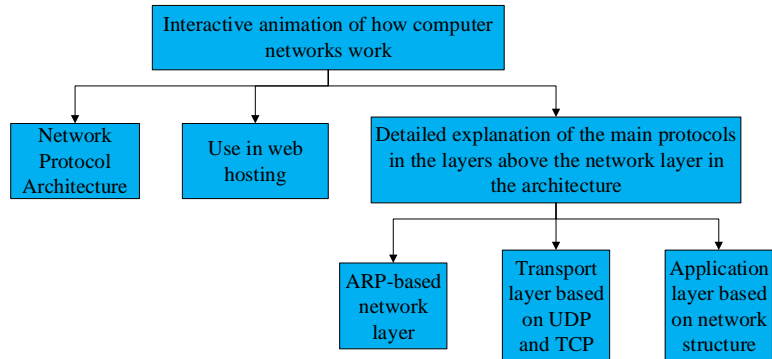
##### *3.1.1 Animation Architecture Design*

Animation architecture design is the basis for the development of teaching animations. To create an interactive animation of how a computer network works, it is important to first understand the architecture of a computer network, then to get a sense of how the data is sent from the upper layers of the architecture to the bottom layer and then sent on the physical line, and how the data is extracted from the bottom layer to the upper layer when it is received by the receiver. The next step is to understand how the entire computer network works by examining the working principles of the specific protocols of each layer of the architecture. However, it is not possible to jump directly to a higher or lower-level node without skipping the parent or child nodes. In order to improve the interactivity of the whole animation, the movie clips for each node are published independently, so that any node can be used as an access point for the animation. This is in line with the 'hypertext theory' conceived and invented by Ted Nelson in 1960, which links files to a simple user interface. This is an animation architecture that is often used in multimedia courseware produced by F lash. The animation structure shown in Figure 1 is based on the knowledge of how computer networks work, from shallow to deep, and the continuity and relevance of knowledge. The nodes in the top-to-bottom tree structure are connected and can jump around each other. Figure 1 is a schematic diagram of the interactive animation structure.

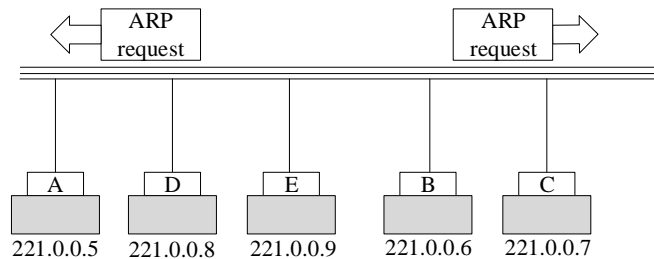
##### *3.1.2 Making a subplot*

Once the interactive animation has been produced, the sub-camera script is recreated according to the development process of the animation, and then modified and improved during the animation process. It is not an illustration or translation of the script, but a translation of the abstract text into a visual image, which has a certain degree of visibility. If necessary, the sketch can be completed by adding text to the corresponding timeline. This makes the animation more intuitive and easier for the draughtsman to draw and the animator to work on in the later stages. Figure 2 shows a split-screen of the animation sending request group. The text symbols should be used to

correspond to the corresponding frames in the animation, in an attempt to create a concrete and visible picture with text. Figure 2 is a shot of the ARP sending request packet.



**Figure 1:** Schematic diagram of animation structure.



**Figure 2:** Split shot of ARP sending request packet.

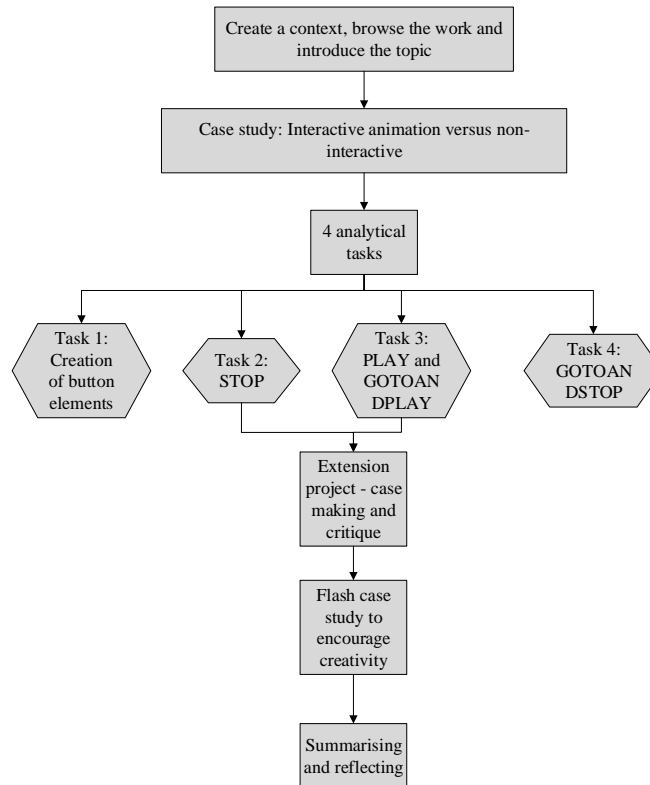
### 3.1.3 Making a subplot

When the animator has the scene files created by the cartographer, a new layer is created in each scene file, named SOUND, and the previously recorded and edited sound is imported into the library, then the SOUND layer is dragged and dropped and the properties of the sound are set to stream. Each film clip is then completed using motion animation and frame-by-frame animation techniques based on the sound playback and the split-screen script.

The scripting of the animation plays an important role in the production of the animated scenes. Interactive motion animation is a scientific and educational animation, so it is important to have a good knowledge of the principles of computer networks before writing its motion design. It is also possible to summarize the role of specific abstract protocols and their working methods on this basis in a corresponding example, in order to make these examples simple and easy to understand, so that the viewer can easily understand them. Figure 3 is a flow chart of interactive animation case analysis.

## 3.2 Animation Stage

As the animation has been split into individual film clips, the only elements that need to be drawn here are the button elements and the graphic elements. The button elements and graphic elements are drawn according to the sketches in the split-screen tableau, and the buttons can be given the appropriate effects.



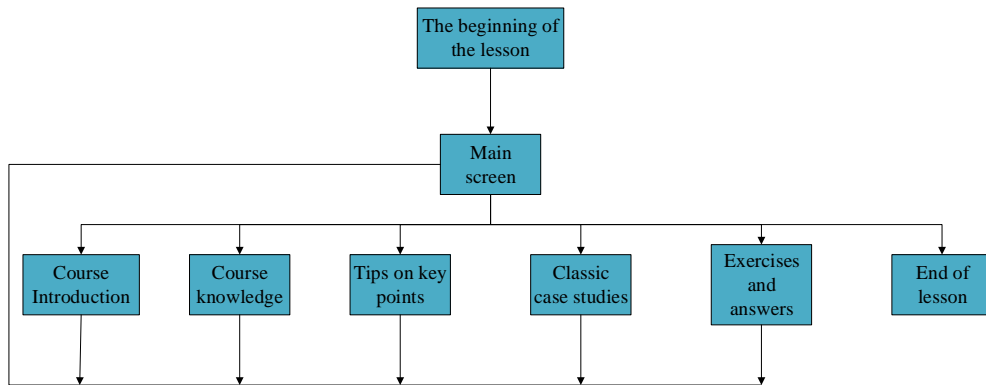
**Figure 3:** Interactive animated case study process.

For those recurring button elements or graphic elements that only need to be drawn once, the animator only needs to import the library of drawn elements into the Flash software when they recur. After drawing the components, the artist draws out the scene of each film clip according to the animation structure, saves it separately, names the corresponding film clip with the node name in the structure, sets the size of the scene of all film clips and the frame rate of the animation to the same value, so that the film clips are more fluid when jumping.

(1) Master the basic language of ACTION and the creation of button elements. (2) Tasks that can be completed: the creation of button elements; the creation of film effects; the implementation of interactive animation. (3) Create short animations creatively and be able to help other students in the same group to help each other learn. The focus at this stage is on the creation of button elements and the design and production of animated interfaces. Difficulties are identified in the setting of scripting language in the action panel and in the creation of interactive animations. The project "Beautiful Campus" is designed around the general teaching objectives, covering the knowledge of button elements, animation interface, action panel and interactive animation, and is divided into four tasks, aiming to highlight the key points and solve the difficulties.

Firstly, the operation process of interactive animation is complex, and designers must take into account both the artistic and technical aspects of the animation, focusing on the form of expression, but also making the animation have the quality of attracting the audience's attention, and the operation must not be too complicated. Designers should focus on the user's viewing experience when designing, not just on the artistry of the animation but also on the fact that the most important role of animation is to enhance the sensory experience of the viewer. This is why a

number of factors need to be taken into account during the animation production stage. With the reform of the modern teaching system, teaching methods are also changing, and the application of digital media makes interactive teaching more vivid and interesting at this stage, which greatly enhances students' learning enthusiasm. The application of interactive animation stage in digital media teaching is to maximize teaching efficiency, most modern teaching is conducted with the help of multimedia or video, the use of interactive animation in teaching, the use of its interactivity, some abstract concepts in a more visual way, complex concepts become more simple, the students information absorption efficiency increased, is conducive to enhance the students and the use of interactive animations in teaching makes some abstract concepts more visual, complex concepts become simpler, and students absorb information more efficiently, which helps to improve students' understanding and practical application. Figure 4 is a schematic diagram of the overall planning of the multimedia courseware.



**Figure 4:** Overall Planning of Multimedia Courseware.

### 3.3 Use of Flash Files for Publishing

Flash files are created in ".fla" file format and can be saved in a variety of file formats after the animation has been created, from ".swf" for FlashPlayer to ".exe" executable files for any windows operating system, making it easy to use. In addition, as a result of exploring research-based teaching methods, web-based courseware is increasingly used, and Flash can be used to publish courseware directly to web pages. The use of Flash courseware in web pages allows for the exchange and sharing of courseware resources using the Internet, enriching teaching resources. The methods are as follows:

(1) Open the ".fla" file in Flash, select "File", then select the "Publish Settings" menu command, and in the "Publish Settings" dialog box that pops up, Click on the "HTML" tab.

(2) Select the "Loop" option in the "Playback" column to make the courseware loop. Cancel the "Show menu" option selected posture, so that when the Flash animation is played, do not show the shortcut menu.

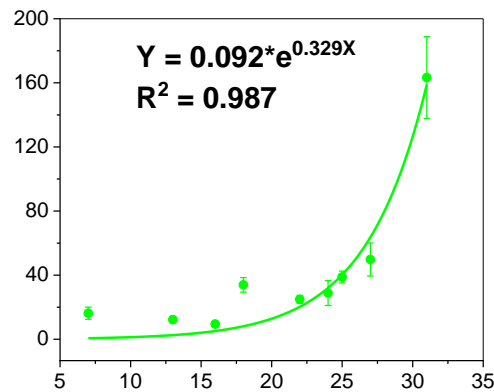
(3) Click the "Publish" button, in the folder where the ".fla" file is located, generate a ".html" web page file, click the "OK" button, close the "Publish Settings" dialog box.

(4) Double click on the ".html" file to display the content of the courseware in your web browser.

It should also be noted that in the "HTML" tab of the "Publish Settings" dialog box, if you select the "Pause at Start" option in the "Playback" column, it will cause the courseware to pause at the



playback will be paused at the beginning and will not start until the user clicks a button in the courseware or selects the "Play" command from the shortcut menu. In addition to using the original size of the courseware for playback on a web page, you can also reset the size of the courseware for playback. This is done by setting the "Size" to "pixels" or "percentage" in the "HTML" tab of the "Publish Settings" dialog box. "or "Percentage" option, and enter new values for "Width" and "Height" below it. The default value for the "Size" option is "Match movie", which means that the original size is used when the courseware is played. Figure 5 is the fitting curve diagram produced by the interactive animation.



**Figure 5:** Interactive animated fitting curve graph.

#### 4 WAYS TO USE INTERACTIVE ANIMATION IN CAD

With the advancement of modern information society, people's requirements for interactive animation are getting higher and higher. The application of digital media technology will integrate interactive animation into people's lives in a more rapid way, making full use of interactive animation's interactive function and vivid expression form, forcefully fast interactive animation's information transmission speed, people can absorb information from the process of cloud painting viewing, bringing convenience for information acquisition.

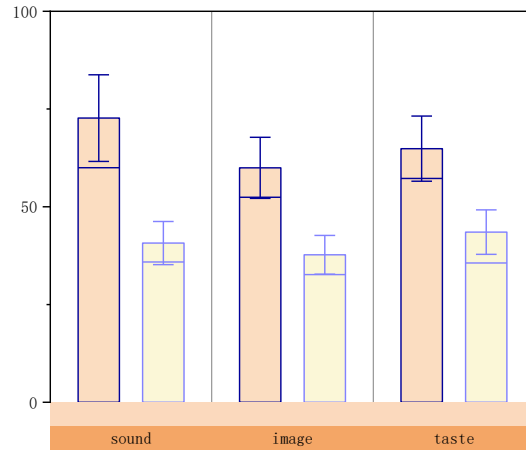
The application of interactive animation in games fully reflects the artistry and technicality of interactive animation. By adding interactive animation to the game, the player achieves independent information acquisition in the process of use, increasing the fun of the game. The application of interactive animation in games adds new power to the game, not only satisfying the player's requirements for virtual scenes, but also expressing the player's role in the game in a more vivid and human way. The application of interactive animation in games can also perfectly combine games and sports, the emergence of physical games brings people a more realistic sensory experience, people in a relaxed state in the game to achieve the requirements of physical exercise, two birds with one stone.

With the reform of the modern teaching system, teaching methods are also changing, and the application of digital media makes teaching more vivid and interesting, which greatly enhances students' learning enthusiasm. The application of interactive animation in digital media teaching is to maximize the efficiency of teaching, most modern teaching is conducted with the help of multimedia or video, the use of interactive animation in teaching, the use of its interactivity, some abstract concepts in a more visual way to show, complex concepts become more simple, students information absorption efficiency increased, is conducive to enhance students and the ability to



understand and The use of interactive animations in teaching makes abstract concepts more visual, complex concepts become simpler and information is absorbed by students more efficiently.

Product design is not only to focus on the basic functions of the product itself, but also to reflect the cultural implications contained in the product. With the promotion of information technology, the application of digital media technology in product design has become more widespread. The application of interactive animation brings out the sounds, images and flavours that affect people's overall feelings, enhancing the user's sensory experience and sense of immersion, mobilizing the audience and providing a better representation of product design. Figure 6 is a graph of image efficiency for different features.



**Figure 6:** Image Efficiency Diagram for Different Characteristics.

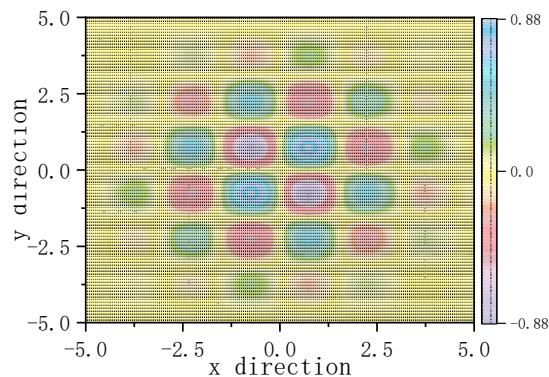
## 5 TEACHING INTERACTION METHODS

Self-testing is an important way to test the effectiveness of student learning. The self-test function of the computer-aided design-based online course includes randomly selected questions, answer time control, answer submission, question evaluation, answer point analysis and other functions - students set their own self-test content, difficulty, question quantity and other indicators, and the computer automatically assembles the paper. After the student has finished answering the questions and submitted the test, the computer will give the results of the self-test. Once in the self-test screen, the student selects the scope of the test, either for the whole course or for certain chapters. The self-test completion time is automatically set at the same time as the question paper is generated and controlled when the student answers the questions - at the end of the test time or after the student submits the paper, the computer gives the score for each question, the answers submitted, the correct answers, the key points and the total score. With this self-help approach, students can easily test their learning.

For standardized exercises (multiple choice and judgement questions) with clear answers, a progressive and heuristic design is adopted. After each question, there is a 'Submit' and 'Redo' button, where students submit their answers and are given a brief explanation for the correct answer. If the answer is wrong again, a further hint is given and the student is asked to redo it. On the third submission, the answer and solution are given. A record is kept of the questions that are not correct on all three occasions, and when the student solves the question again in the future, a marker is displayed to remind them of the correctness of the question. For non-standardized exercises, such as fill-in-the-blank and text-based questions, the answers are

designed as 'key words and phrases in summary form' so that students are not stuck with the same answer and can judge for themselves. For example, for multiple choice questions, after students have submitted their answers, the window lists all possible correct answers for each blank and lists some plausible answers, with an explanation of what could go wrong at the end of the question. This makes it easier for students to make their own judgements about their own answers and to remind themselves not to make the same mistakes by using the wrong answers and explanations. Another example is text-based exercises, where the answer is text-based and the answer is designed as a 'summary' answer, where the main points are listed and the computer prompts the points of error for students to refer to. Such interactive exercises are designed to mimic the process of teacher explanation, giving direction and autonomy to students' independent learning.

Real-time interaction means that communication between two parties on the network is immediate, with one party transmitting information that is immediately available to the other and vice versa. This type of interaction requires both parties to be online at the same time, otherwise the information sent by the other party is not available - online discussions, online classrooms, etc. are the most commonly used forms of real-time interaction in online courseware. This type of real-time interaction is a major trend in the development of current web-based courseware. Figure 7 shows the color settings in the x and y directions.



**Figure 7:** Color setting chart in different directions.

## 6 CONCLUSION

The application of interactive animation further expands the functions of digital media, and at the same time promotes the development of digital media, so that the scope of application and influence of digital media has been greatly enhanced. Therefore, it is important to recognize the characteristics and advantages of interactive animation and to strengthen the application of interactive animation in digital media. Interactive animated courseware based on computer-aided design combined with Flash is very much loved by teachers and students, and in the process of teaching, this kind of interactive courseware is more able to achieve our teaching objectives and make students grasp various related knowledge faster. However, this kind of courseware requires a high level of computer skills, especially programming skills, and is subject to some resistance in terms of popularity, but I believe that this kind of courseware is bound to be an important direction in the development of courseware as multimedia teaching becomes more popular. The use of interactive animation in teaching and learning has changed the way people learn, not only improving the quality of learning, but also providing a driving force for social development. Although the use of interactive animation in the classroom has developed to a certain extent, we still need to make continuous efforts to develop the integration of interactive animation with the

curriculum, to give full play to the role of this technology and to provide a boost to the development of students, as both are not mature enough.

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