The Design and Realization of Multimedia Textbook The Equipment of Ship’s Command and Control (C²) System

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Abstract. Based on the powerful multimedia interactive integration platform of Director, the paper designs to make a multimedia textbook The Equipment of Ship’s Command and Control (C²) System with reference to the characteristics of the equipment, while making use of various image and sound editing software like Photoshop and Video Studio who are rich in functions. It attempts to solve problems in the teaching of the course, such as unitary teaching mode, outmoded course content, unsatisfactory teaching result, the lack of fitted textbook, etc.

1. Introduction
Currently, the teaching of the equipment of ship’s C² system takes the traditional form of instructing and lecturing, which is outdated in teaching theory and unsatisfactory in teaching result. The low efficiency of talent training can barely meet the requirements for the cultivation of highly qualified talents in command in the new era. In order to solve these problems, reduce the span of talent training and enhance the efficiency of teaching, it attempts to design and realize a multimedia textbook The Equipment of Ship’s C² System by using multimedia software like Director, Photoshop, Cool Edit Pro, Video Studio, etc.

2. Basic Principles Of Design
In consideration of the characteristics, problems and requirements, the design of the multimedia textbook abides by the following principles:

2.1 Pedagogic Principle
As a new form of teaching, the development of the multimedia textbook aims to enhance the overall comprehension of the equipment of ship’s C² system by officers and soldiers, while at the same time, reducing the time of learning. Therefore, the content and structure of the multimedia textbook should conform to teaching rules and cognition rules, making it easily acceptable and convenient for self-study.

2.2 Scientific Principle
As a carrier of knowledge, the content of the multimedia textbook should be accurate, reliable and scientific. For example, the definitions for basic concepts and statement for combat theories should be absolutely correct. The explanation of important ideas should be in an easily understandable way, like through visualized images, simplified sentences, etc.

2.3 Systematic Principle
A set of complete and systematic structure is required. With relevant theories on the equipment of
ship’s C² system as the core, the multimedia textbook should be constructed in a hierarchical way to meet the demand of officers and soldiers’ different levels of learning. The logic in the structure is emphasized.

2.4 The Principle of Advancement
Making full use of multimedia technology, the textbook should follow the trend of equipment development and consist with the demand of information warfare, reflecting the application of scientific development in military.

2.5 The Principle of Combination of Theory and Practice
Theories should be always combined with practices in the statement of concepts, the explanation of operating methods, and the selection of exercises. Specifically, relevant data and typical cases in actual maneuvers can be brought into the textbook, as multimedia technology makes it easy and informative. In this way, the use of C² system can be mastered by officers and soldiers. Meanwhile, their analysis and problem-solving ability can be better trained.

3. Overall Design Ideas

3.1 Structure Design
The design of structure, as the core and basis of multimedia textbook design, is to set the framework for the whole program. The structure design of The Equipment of Ship’s C² System covers three parts: the content, the supplement, and the extension.

3.1.1 The Content. The content is fundamental to structure design. This textbook expounds the equipment of type 056 ships’ C² system in five chapters, namely, general introduction to the system, basic components, working mechanism, position setting and personnel responsibility, operating principles. The details of design are shown in figure 1.

![Figure 1 The Design of Content](image1)

3.1.2 The Supplement. The supplement is important to structure design. It assists the running of the content and shows other useful information to consummate the structure design. The supplement of The Equipment of Ship’s C² System consists of seven parts. The details are shown in figure 2.

![Figure 2 The Design of Supplement](image2)
3.1.3 The Extension. Question bank is the extension part of this textbook. The question bank focuses on the basic knowledge of the equipment of ship’s C² system, and sets questions on relevant concepts and theories, equipment composition, technique and tactic norms, working mechanism, application scope, etc. It takes the form of true or false questions, choice questions, and essay questions. The users can check the answer after finishing each question. It is possible for them to mark the difficult question and come back to it until they finish the whole test. The users can concentrate on the difficult questions, taking notes and practicing again and again. In this way, the study of the officers and men can be better measured and planned.

3.2 Interface Design

Interface design is to determine the components and style of the interface. The interface design of this textbook includes: the design of dominative interface, the design of subsidiary interface and the design of the question bank.

3.2.1 The Design of Dominative Interface. As the catalogue of the main page, the dominative interface contains all information about the multimedia textbook, which makes it the first level of design in interface design. The dominative interface of The Equipment of Ship’s C² System is made up of the background, 7 interactive buttons, and navigational icons of 5 chapters, which is shown in figure 3.

![The Dominative Interface](image)

Figure 3 The Structure for Dominative Interface

3.2.2 The Design of Subsidiary Interface. The subsidiary interface contains information about the chapters, whose design is similar to the dominative interface, containing the background and 8 controlling buttons. The detailed composition is shown in figure 4.
3.2.3 The Design of Question Bank Interface. The question bank interface includes the first page interface and the questions interface, whose design is for user friendly. Its structure is shown in figure 5.

3.3 Function Design
The function design is to clarify the functional components and its applications, which determines the running effects and evaluation level of the multimedia textbook in practice. It is a key part in design. Following the concept of “diversification and enrichment”, the function design mainly makes use of Lingo language to fulfill the navigational function design and controlling function design.

Noticeably, the design of the textbook should be more convenient and efficient for the benefits of users’ self-study at different levels.

4. The Realization Of The System
4.1. The Overall Procedure
The realization of the multimedia textbook *The Equipment of Ship’s C² System* depends on the audios,
images and texts produced by the main platform Director and other software like Video Studio, Photoshop, Cool Edit Pro, etc. Among them, the initialization is the premise; the core module is the main part; and the publish is a key step.

4.2. The Initialization
As the preparation work, the initialization of the multimedia textbook includes interface settings and actor import.

4.2.1 Interface Settings. In Director, the interface settings are to set the size, color, and background environment of videos and images. The detailed steps for setting are:

- Entering into the operating interface of Director.
- Set the layout of the operating interface.
- Among them, the stage toolbar, attributes inspector, procedures working group, design working group can be concealed so that the size of three windows can be larger and more convenient to operate.
- Click the “Attributes Inspector” in icon toolbar and a pop-up dialog will show on the right side of the operating interface.
- Click the column of “Film” in the pop-up dialog and set the size of the stage 1024×768, number of channels 150, the color of background environment #000000(black), format of color RGB, the palette System-Win.
- Click “Save All” in icon toolbar to save the settings of the interface.

4.2.2 Actor Import. Actors are basic elements for film-making. In Director, all images, videos and texts are called actors. Various types of actors are imported in the following ways:

a) Images and Videos
- Choose a blank cell in “Actors List Window”. Click the right key and the shortcut menu pops up.
- Click “Import” in the shortcut menu and it comes the pop-up dialog “Import Files into internal”.
- Choose the targeted images and videos, i.e. “main interface.png”, and click “Import” to complete the action.
b) Texts
- Choose a blank cell in “Actors List Window”. Click the “Text Window” in icon toolbar and the text window will pop up.
- Input text in the text window. Set the font and close the window.

4.3. The Realization of the Core Module
As the most important part in the realization of the multimedia textbook, the core module determines the running of textbook in each step. It includes the module of buttons, the module of interface switchover, the module of sound, the module of transitional effect, the module of script.

4.3.1 The Module of Buttons. Buttons directly operate and control the textbook, whose function determines how convenient the textbook can be. In Director, the looks of the buttons are imported images edited by Photoshop, while the functions of the buttons are realized by Lingo language within Director. Take the button of “Play” in subsidiary interface for example, the steps for realizing its function are as follows:

- Click “Play” in the stage window with the right button, and the shortcut menu pops up.
- Click “Scrip…”, and the Scrip window pops up.
- Write code in Lingo language in the Script window:

```lingo
on mouseup me
  go to the frame+0
end
```
The function of this sentence is: when clicking it with the left button of the mouse, the film will start to play from the current frame.

- Close the Script window and finish the setting of its function.

Likewise, change the second line of the code “go to the frame+0” to “pause, go to the frame+1, go to the frame−30”, the functions of pause, forward and backward can be realized.

4.3.2 The Module of Interface Switchover. The switchover and skip between interfaces are the embodiment of multimedia textbook’s powerful interaction and flexibility. In Director, the control of interfaces and the switchover between them can be realized by making use of the mark channel in mirror window to mark the first frame of each interface and establishing connection between the controller and the marker through Lingo code. Take “Chapter One General Introduction to the System” for example, the steps for switching to an interface include:

- Click the first frame of “The Interface of Chapter One” in marker channel. The word “New Marker” will pop up.
- Change the word “New Marker” into “Chapter One General Introduction to the System” to finish marking.
- Click the pull-down button on the left side of the marker channel to check all the markers being set.
- Enter into the first chapter’s navigation icon in the main interface and the Script window under the navigational words “General Introduction to the System”. Write the sentence in Lingo code:

```lingo
on mouseup me
    go to Chapter One General Introduction to the System
end
```

The function of this sentence is: when clicking it, the film will skip to the marked frame in chapter one and start to play from that frame on.

Likewise, “Chapter One General Introduction to the System” can be changed into “Chapter Two Basic Components” “First Working Patterns” etc. Meanwhile, the marker should be set at the beginning of the chapter. In this way, the switchover between interfaces of other chapters can be realized. Therefore, the function of switchover between interfaces and the control of navigation of the multimedia textbook are achieved through the marker channel.

4.3.3 The Module of Sound. Sound is the most direct and effective way to convey information. The demonstration effect of the multimedia textbook depends largely on the setting of the sound. In Director, the sound is played through the sound channel in mirror window. Noticeably, there are 8 sound channels in Director, with two revealed ones (sound 1 and sound 2) and 6 concealed ones. What’s more, in Director, two or more sound records cannot be played simultaneously in one sound channel. There are three types of sound in this textbook: audio of the content, background music, and click sound. In this way, the audio of the content will be played in Sound 1, background music in Sound 2, click sound in Sound 3 and Sound 4. The setting of different types of sound is as follows:

a) Audio of the Content

Audio of the content is the sound document recorded by the text of each chapter. Take Chapter One Section One’s sound record “1.2” for example, the steps for its setting are:

- Drag the audio 1.2 in Actors List Windows to Sound 1.
- Adjust the length of the audio to approximately 30 seconds to cover the corresponding text part.

b) Background Music

The setting of the background music of dominative interface and subsidiary interface is similar to that of the audio of the content. Drag the two sound records to Sound 2 and adjust the length to cover all frames of the dominative interface and subsidiary interface.

c) Click Sound

Click sound is usually short. They are set on navigational icon and buttons in interfaces. Take the navigational icon of chapter one as an example. Enter into the Script window of chapter one’s navigational icon and write the sentence in Lingo code:
on mouseenter me
    sound (4). play (member ("icon sound 1"))
end
on mouseleave me
    stop sound (4)
end

The function of this sentence is: when the cursor touches “navigational icon of chapter one, play icon sound 1 in sound channel 4; when the cursor removes from the icon, the sound will stop in channel 4.

Take the navigational key of the dominative interface as an example. Enter the Scrip window of navigational key and write the sentence in Lingo code:

on mouseenter me
    sound (3). play (member ("touch sound"))
end

The function of this sentence is: when the cursor touches navigational key, the click sound will be played in sound channel 3.

The settings of various types of sound are basically handled through these operations. The sound is multifunctionalized in this way.

4.3.4 The Module of Transitional Effect. Transitional effect is the visual effect of the smooth and natural cohesion among interfaces of each chapter. There are several transitional effects in Director, which are placed in the transitional effect channel in mirror window. Besides, the transitional effect can also be realized by inserting key frame. In this textbook, the transitional effect of each chapter is set by transitional effect channel, while the transitional effect of different sections in each chapter is set by inserting key frame. The details are as follows:

a) Transitional Effect Channel

As transition takes place at the end of the previous interface and the beginning of the next interface, the transitional effect is put in the first frame of the next interface in Director. Take the transition of chapter one and chapter two as an example, the steps for setting are:

- In the transitional effect channel, double click the first frame of chapter two’s interface, it comes the pop-up dialog “Frame Attribute: Transitional Effect”.
- Choose “Strips” in the column of “Catalog” in the pop-up dialog and “Strips on Top, Build Right” in the column of “Effect”. Adjust the duration to 1.20 seconds and the smoothness to the minimum.
- Click “Yes” to finish the action.

b) Insert Key Frame

In mirror window, all “actors” are called “elf”. The key frame is to define the character of any frame in elf. If two frames are inserted simultaneously at the frames shortly prior to and after an elf, then, when the film is running, the character of the previous frame will be transited to the next frame, achieving the transitional effect. Take the transition of the first and second sections of chapter one for example. The steps for setting are:

- Click Frame 361 of elf “Text 111” with right-hand button, the shortcut menu will pop up.
- Click “Insert Key Frame”.
- Set the transparency to 100% in Attributes Inspector.
- Repeat the previous steps on Frame 370 and set the transparency to 0%. The set of the key frame is completed and the transitional effect of gradual disappearance is achieved.

Through these two methods, the function of the module of transitional effect is achieved, which will ensure the smooth running of the textbook.

4.3.5 The Module of Script. The module of script is used for the automatic control of the multimedia textbook, which mainly assists the buttons in the textbook. In Director, the running process is usually controlled by the settings of the script channel. For this textbook, it is required that at the completion
of one audio, it will stop at its last frame and then automatically skip to the next audio. The action will repeat. Take the audio of content “1.3” for example, the steps for fulfilling this function through script channel are:

- Double click the last frame of “1.3” at the script channel, and the Script window will pop up.
- Write Lingo code in Script window:
  ```lingo
  on exitframe me
    if soundbusy (1) then
      go to the frame
    else
      go to the frame+1
    end if
  end
  ```
  The function of this sentence is: at the time of leaving the frame, if the sound is still playing in Sound 1, the film will stay at this frame; if the play is finished in Sound 1, the film will automatically skip to the next frame. The sound control is fulfilled in this way.

  Besides, if the process should be controlled so that at the completion of one audio, it will pause and not skip to the next audio, the sentence should only be changed into “go to the frame”. Through the script channel, the functions of the multimedia textbook will be more abundant.

4.4. The Publish of the System

The last step is the publish of the system, which means the production and export of a document “the multimedia textbook The Equipment of Ship’s C2 System. exe”. The detailed steps are:

- Click “File/Publish settings” in the menu bar, and the “Publish Settings” dialog will pop up.
- Check the needed options in the columns of “Formats” and “Projector” in “Publish Settings” dialog. Other columns will stay at the default settings.
- Click “… ” at the right lower side of “Program File’s Customized Icon” in “Projector”, and choose “download the icon for national flag in the world 0.ico” in the pop-up dialog. Click “open”, and the setting of the icon for exe file will be completed.
- Click “OK” to finish the setting.
- Click “Publish” in the icon toolbar, and export the document “the multimedia textbook The Equipment of Ship’s C2 System. exe”. The multimedia textbook is published at last.

5. Conclusion

Based on relevant theories and knowledge on the equipment of ship’s C2 system, the paper adopts hierarchical design model and uses diversified multimedia technology in the fine design and reasonable arrangement of the textbook. It meets the demand of the forces for study with content of different levels of difficulty, clear cohesion among different parts, and detailed explanation for key points. What’s more, the platform of Director is multi-functional, interface friendly, interactive, practical and operable, which is beneficial for the study of officers and men. In a word, the multimedia textbook is meaningful and helpful for the cultivation of personnel who will use the ships’ C2 system in military forces.

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