

Design of Intelligent Comic Make System for Educational Application Based on Comic Script Creation

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ABSTRACT

A comic book with rich picture and storyline, which needs to combine the storyboard creation and visual picture design. In the comic production process requires a lot of manpower and time cost to complete the work. This study presents an intelligent comic production system (ICPS) in which cartoons are subdivided into many design elements and integrated into the framework of Creative Design Resource Integration (CDRIM). By analyzing the creative requirements of cartoon scripts, ICPS reconstructs the new comic design elements and completes the new Comics. The comic design of the paper is to let the author use the text script directly to produce a sub-mirror screen and the role of dialogue in the system.

ICPS model to help cartoonists to achieve another comic creation, the use of writing scripts to produce comics, can reduce the traditional cartoon design process of human, capital and time costs. The system provides professional cartoonist design elements during the design of the comic context, as well as non-professional one creative cartoon design training courses.

Keywords: comic design elements, creative design resource integration, intelligent comic production system, comic script writing, comic creation reference

INTRODUCTION

In this study, the use of comic design-related teaching story situation, and then education or training learners, compared with the general description of the main text of the text reading teaching methods, but also allow learners to accept and leave a deep image, such as in medicine education (Babaian & Chalian, 2014) and patient care (Wilson, 2005; Green & Myers, 2010), or for contextual teaching research in science (Tatalovic, 2009), as well as children's art education (Wilson, 2005), have been very effective. At present, the research on cartoon creation teaching is mainly based on the use of multimedia environment (Marianthi et al., 2001), providing interactive digital narrative environment for creators to generate cartoon development, which leads to learners' interest (Azman, 2015), or use script creation Demonstrating related comics, improving students' ability to apply relevant knowledge (Chang et al., 2017), and designing an interactive cartoon creative teaching application platform integrated into the Internet environment to stimulate learners to be full of freshness under the network multiplayer (Kingsley & Brinkerhoff, 2011) guided by the creativity.

Comic is a kind of cultural innovation that can promote human thought and flexibility. To become a popular cartoonist, who need to accept a long painting training? The cartoonist uses the delicate drawing skills and the rich ability to create the subject matter, to draw the conceptual storyline on paper. Complete the steps of a comic book, as shown in **Figure 1**. First, the author conceived the story structure and the scene, to meet all the role style, and then the story in order to develop, the use of split screen way to design all the characters of action and dialogue (Ichino et al., 2010; Wang et al., 2012; Jamaludin, 2011; Tsai et al., 2016; Tsai, 2016; Tobita, 2010). Readers from the comic works to understand the author to express the idea, but the lengthy training process so that many creative learners quit, resulting in the loss of many potential talents.

Contribution of this paper to the literature

- This study proposes an educational method that can be used in relation to the application of comic script writing and produces a Intelligent comic make system according to the comic script and subdivides the resulting process into many design resources and design elements.
- The results show that the experimental system can be in accordance with the comic script created by students to produce the corresponding sub-comic style, and the subjects of the experimental system for the use of experience analysis and satisfaction analysis, there is a tendency to improve the learning interest and other positive distribution.
- This study provides another way for creators of comic to creation comic, can reduce the manpower, capital and time required for traditional comic design, as well as provide non-professional creative ideas Comic design training course.

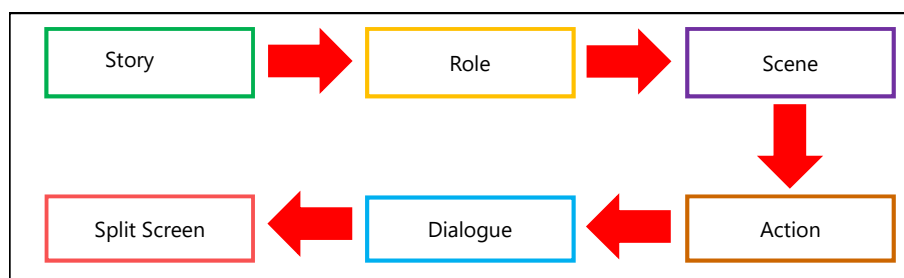


Figure 1. Comic Design and Creation Process

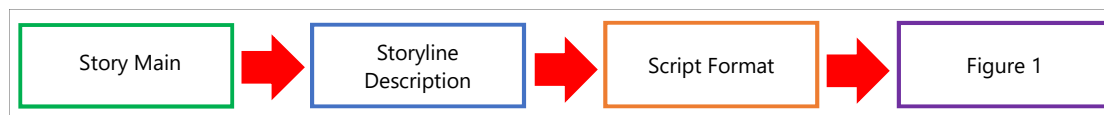


Figure 2. Comic Script Creation Process

The script is created by writing the development of the whole story, and the main elements of the comic is the picture, and a small amount of text coherent. Cartoonist want to convert text scripts into comics (Tobita, 2015), which requires long hours of painting. The comic script is the basis of a comic creation idea. The main purpose of the comic script creation is to record the main plot in the comic story plot conceived by the cartoonist, and to translate the description into comic drawing content (Tobita, 2015). Comic design is the story of the coherent picture to the illustrative way to make the reader easy to read, while the design team is conducive to reading and communication, and thus effectively complete the Split Screen design and division of labor, as shown in Figure 2.

In this paper, the “creative design resource integration model”(CDRIM) is applied to comic design. Figure 3 shown a CDRIM architecture (Tsai, 2016) provides designers to share their own creative and design resources, or uses other design resources shared by other designers to join their designs to form new design works (Sanders & Stappers, 2008). And the new design works are also shared to the design resources (Goldner & Birch, 2012), to stimulate the creative ideas of many designers groups (Wang et al., 2012). CDRIM helps designers create design work and share design resources (Kangas, 2010), with the goal of reducing design costs and increasing creative design speed.

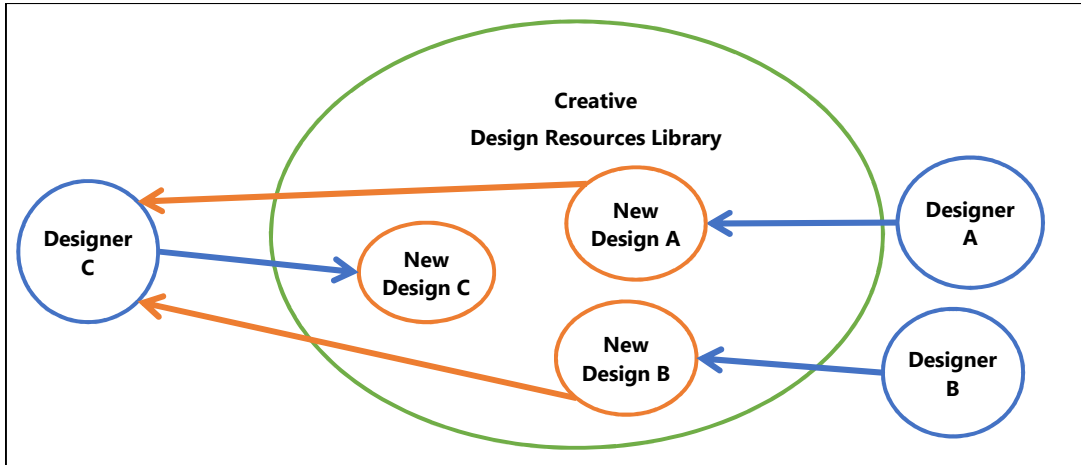


Figure 3. Creative Design Resource Integration Model

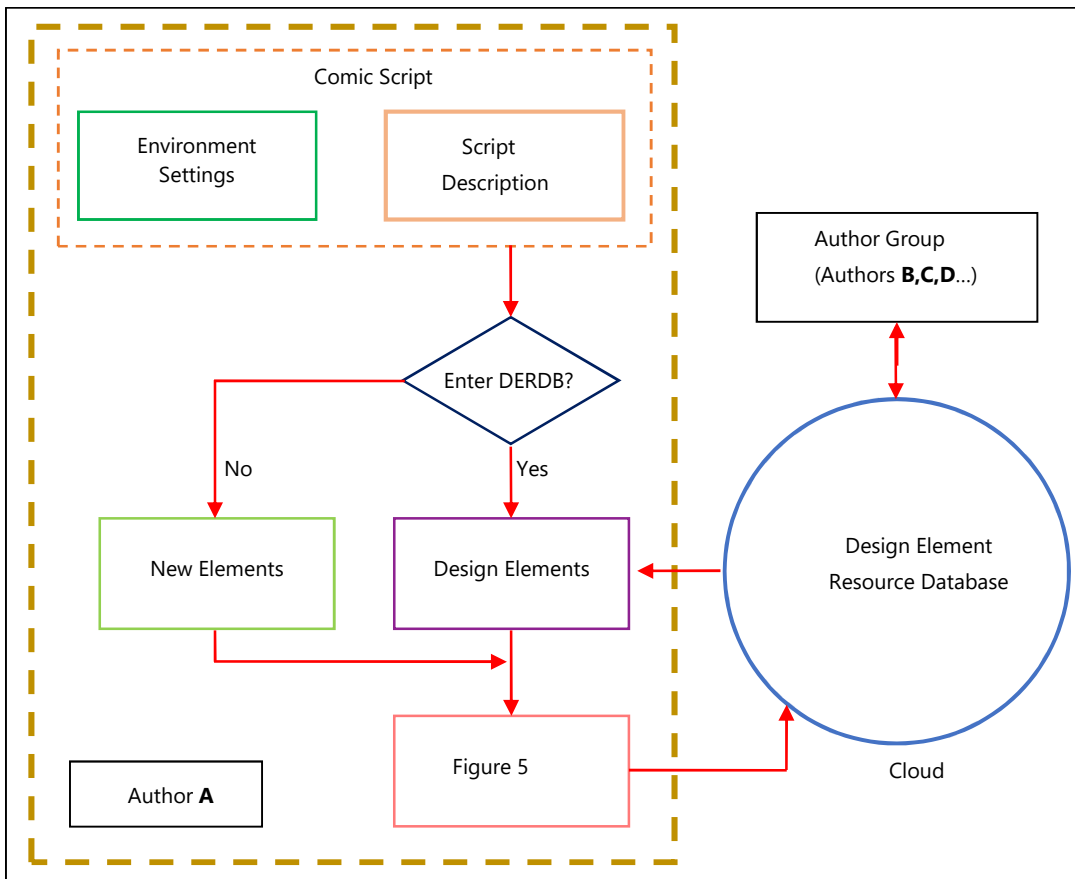















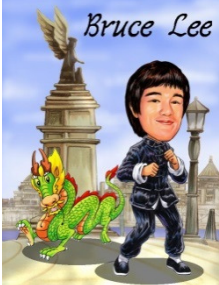



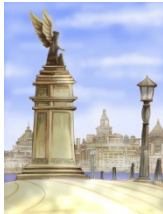







Figure 4. Flow of Intelligent Comic Make System

INTEGRATION COMIC MAKE SYSTEM

Based on CDRIM architecture, the paper provides a design element database (DED) platform that provides designers with the main comic design elements (Deterding et al., 2011) such as head, body, object, font, background, etc., uploaded to the DED platform, and the formation of integrated modeling database. Designers can enter this database platform to play the creative choice of the comic design elements needed to produce new styling designs (Barab & Squire, 2004). Figure 4 is the flow of the intelligent comic make system (ICMS) presented in this paper. First, Many designers provide works and classify works into the design elements (Tsai, 2017) of Table 1, and store them into the database platform.

Table 1. Design Elements Content Classification

Designer works	Design Elements				
	Head	Body	Item	Font	Backgroup
				Yes ! We Can	
				Iron Man	
				海内七曜	
				Bruce Lee	
				蘭陵王	

When the creator creates the script, the script will be divided into two main parts to control the performance of the drama (Tsai et al., 2016), mainly for the top of **Figure 5** drama theme, scene, role, date, time and other story settings, and **Figure 5** shows the role of dialogue, action, narration, emotions, expressions and other performance sequence.

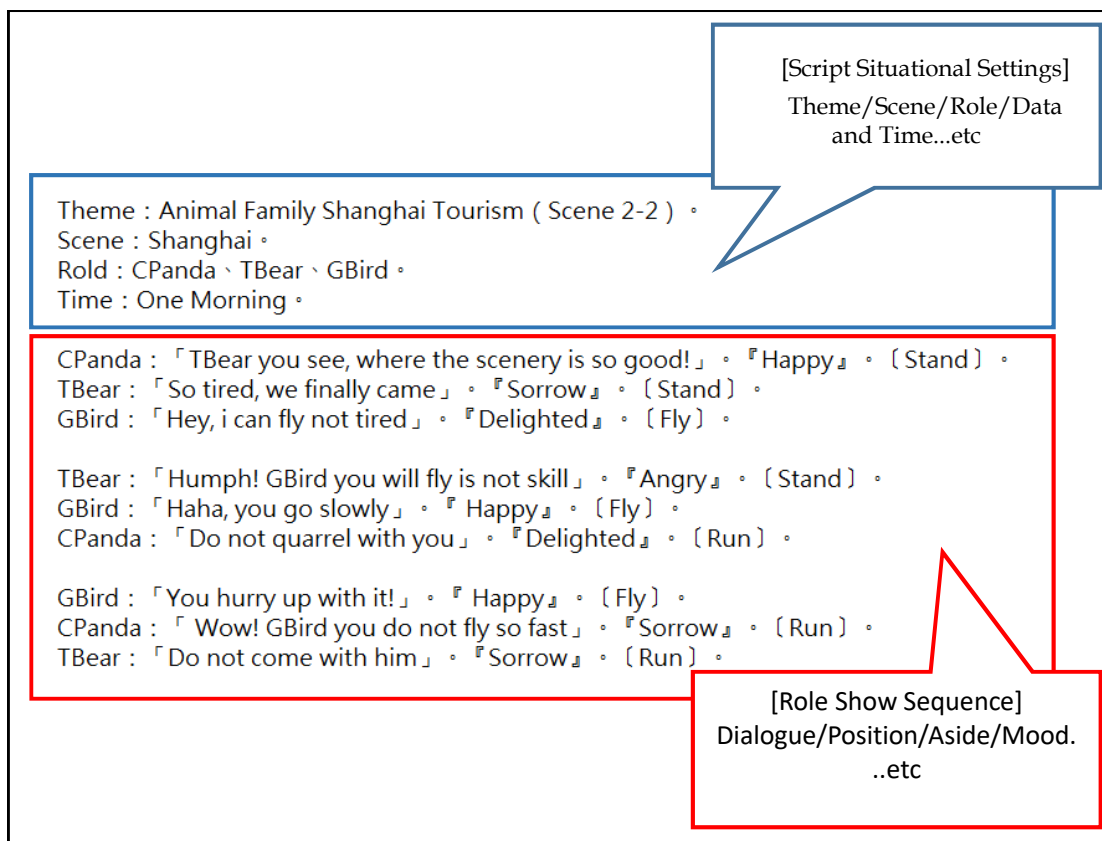


Figure 5. Script Format Structure Analysis

Table 2. Script Control Symbol Table

Symbol	Explanation
◆	Aside
「」	Dialogue
:	Role Select
『』	Facial expression
{ }	Action
()	Position
◦	Paragraph

In this study, we add various control symbols (Tsai et al., 2016), as shown in Table 2, which can directly control the expression, position and action of each role in the script. The paper uses the control symbols to increase the readability of script content, let a un-imagination cartoonist can quickly understand the idea of the script, this way can shorten the time to read the script and quickly understand the director to express the situation (Tobita, 2010).

This study analyzes the structure of the script text, to find out the interaction between the roles, such as expression, dialogue, action, etc., and split screen planning. System analysis the interaction between the main role and the secondary one, and then specify the comic image produced by the first person, second person or third person, as shown in Figure 6. Among them, the first person’s image expression or action is the most distinctive. The system will be divided into a number of split screen, the dialogue of the role of each split screen is divided into: I to You, You to Him, He to Him. The system provides the director to select the control symbols for each role, and the cartoonist enters the DED platform to select the appropriate comic design elements group to match the control symbols. The cartoonist can combine the design elements into a new comic style, and arrange for the distance, size, location between the roles. If there is no suitable design element in the DED platform, the cartoonist designs the new elements to match the director’s needs.

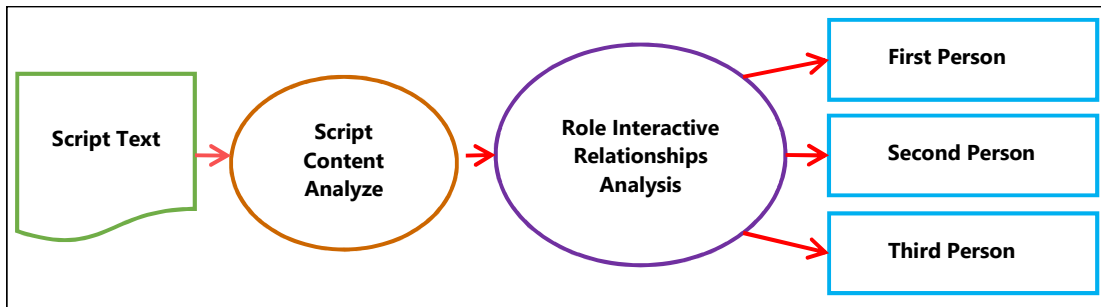


Figure 6. Script Role Interactive Relationships Analysis

COMIC MAKE SYSTEM ANALYZE

Comic Make System Process

This study will be stored in the “Comic Script Library”, within the text format script comic script (Williams et al., 2005), defined as “KDS”, and analysis of comic books in the various groups and related attributes (Object and Attributes), then these Analyze the Information System Table, find out the similar values of RX, and then use the Decision Tree method to predict the dialogue action of the comic script characters. The analysis dialog is first person, second person and third And then determine whether each of the analysis accuracy training can be accepted, if it is acceptable to the system automatically match the “Design Element Resource Database”, the relevant comic modeling elements, and modeling integration Corresponding to the comic style, if not accepted, the system continues to find the relevant comic script information, and analyze the relevant attributes and analysis of the information list (Figure 7).

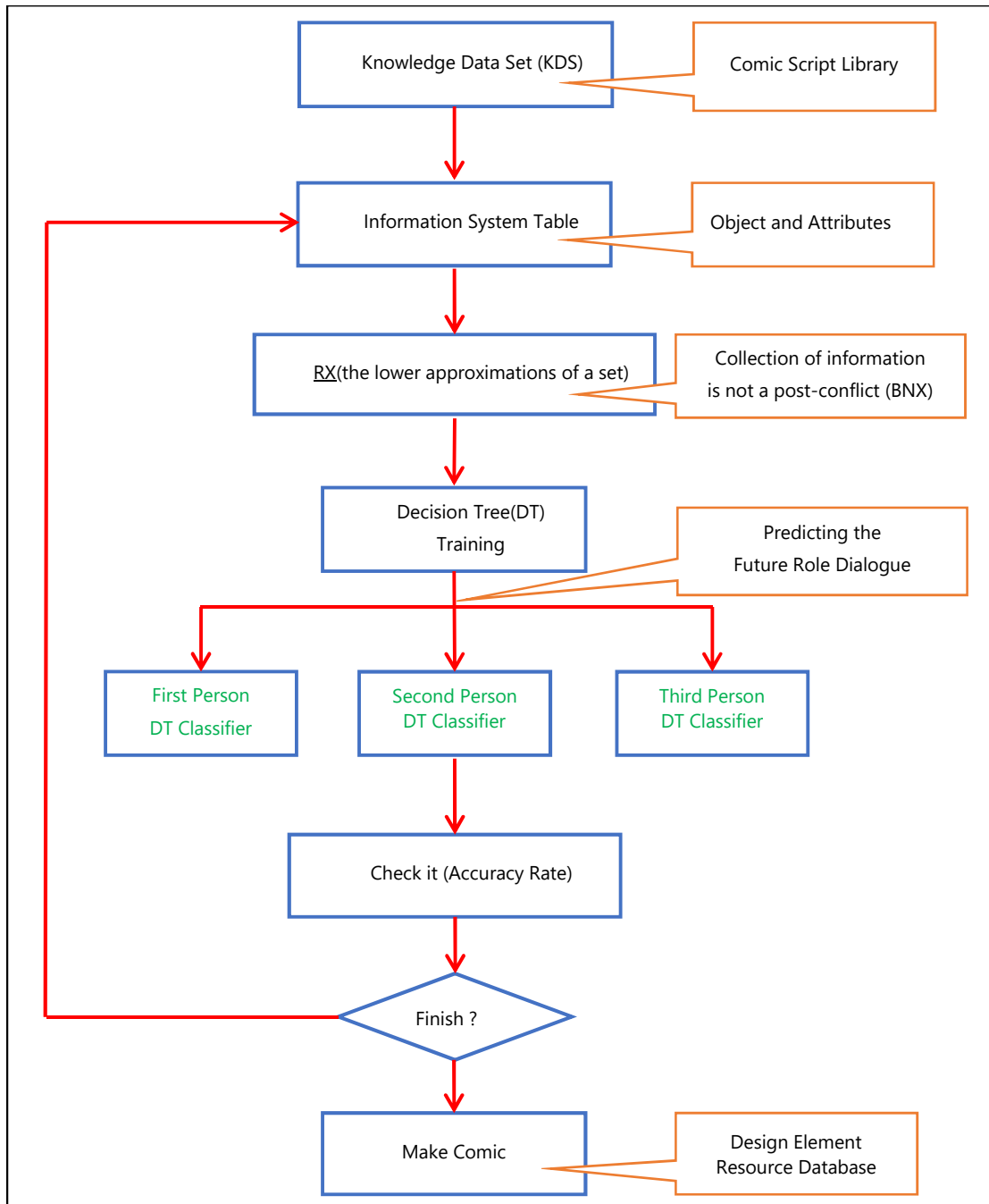


Figure 7. Comic Make System Process

The author designs the comic script creation system based on comic script creation, and provides the comic writer input script text, let the system compare the script information in the comic system database and find out the similarity drama, scene, Dialogue (Wang et al., 2012), and so on, and then one by one than the script of the role of dialogue is the first person or second person or third person, and finally the results of the information will be passed to the design elements of the integration of the library comic picture.

Comic Make System Examples

In accordance with Figure 4, this study presents an “animal family Shanghai tourism” comic script. This script is presented in accordance with Figure 5, as shown in Figure 8. cartoonists in the DED platform to find the “Shanghai” background, “Black Car” Item, and CPanda, TBear, GBird roles, and these design elements are organized as shown in Table 3.

Theme : Animal Family Shanghai Tourism (Scene 2-1) 。
 Scene : Shanghai。
 Role : CPanda、TBear、GBird。
 Time : One Morning。
 CPanda : 「TBear you see, where the scenery is so good!」 。 『Happy』 。 [Stand] 。

TBear : 「So tired, we finally came」 。 『Sorrow』 。 [Stand] 。

GBird : 「Hey, i can fly not tired」 。 『Delighted』 。 [Fly] 。

Theme : Animal Family Shanghai Tourism (Scene 2-2) 。
 Scene : Shanghai。
 Role : CPanda、TBear、GBird。
 Time : One Morning。
 CPanda : 「TBear you see, where the scenery is so good!」 。 『Happy』 。 [Stand] 。

TBear : 「So tired, we finally came」 。 『Sorrow』 。 [Stand] 。

GBird : 「Hey, i can fly not tired」 。 『Delighted』 。 [Fly] 。








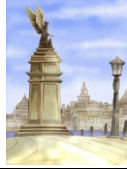




Theme : Animal Family Shanghai Tourism (Scene 2-3) 。
 Scene : Shanghai。
 Role : CPanda、TBear、GBird。
 Time : One Morning。
 GBird : 「You hurry up with it!」 。 『Happy』 。 [Fly] 。

CPanda : 「Wow! GBird you do not fly so fast」 。 『Sorrow』 。 [Run] 。

TBear : 「Do not come with him」 。 『Sorrow』 。 [Run] 。




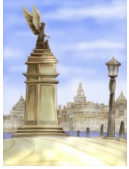



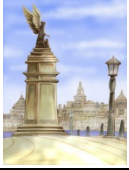



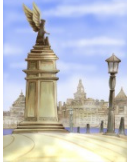
Figure 8. Animal Family Shanghai Tourism Comic Script

Table 3. Design Elements of Animal Family Shanghai Tourism

Design Elements				
Head	Body	Item	Font	Backgroup
			CPanda	
			TBear	
			GBird	

This content is divided into three split screen by the script in Figure 8. The first split screen is to specify the role of the Panda for the first person, in accordance with the requirements of the script's Control Symbols, the design elements of Table 3 is revised to Table 4, and complete Figure 9 comics.

Table 4. Design Elements of First Split Screen

Design Elements				
Head	Body	Item	Font	Backgroup
			TBear you see, where the scenery is so good!	
			So tired, we finally came	
			Hey, i can fly not tired	

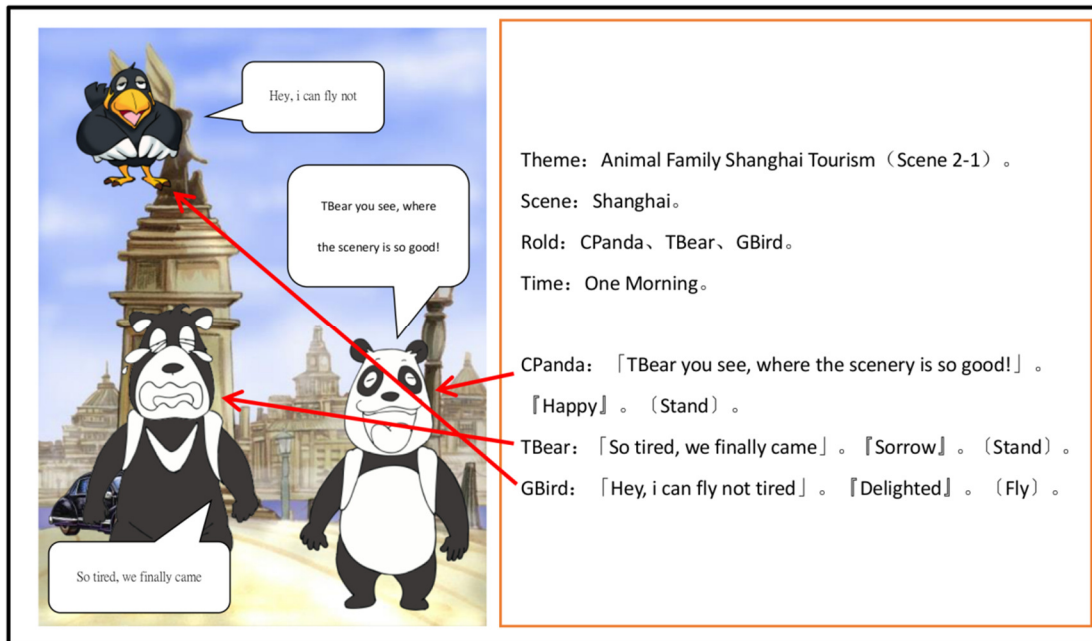



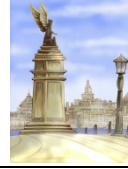



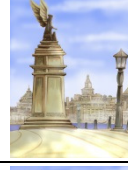



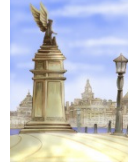


Figure 9. CPanda Dialogue First Person Make Comic Examples

The second split screen is Bear role for the first person, with the script to complete the design elements in **Table 5** and **Figure 10** comics.

Table 5. Design Elements of Second Split Screen

Design Elements				
Head	Body	Item	Font	Backgroup
			Humph! GBird you will fly is not skill	
			Haha, you go slowly	
			Do not quarrel with you	

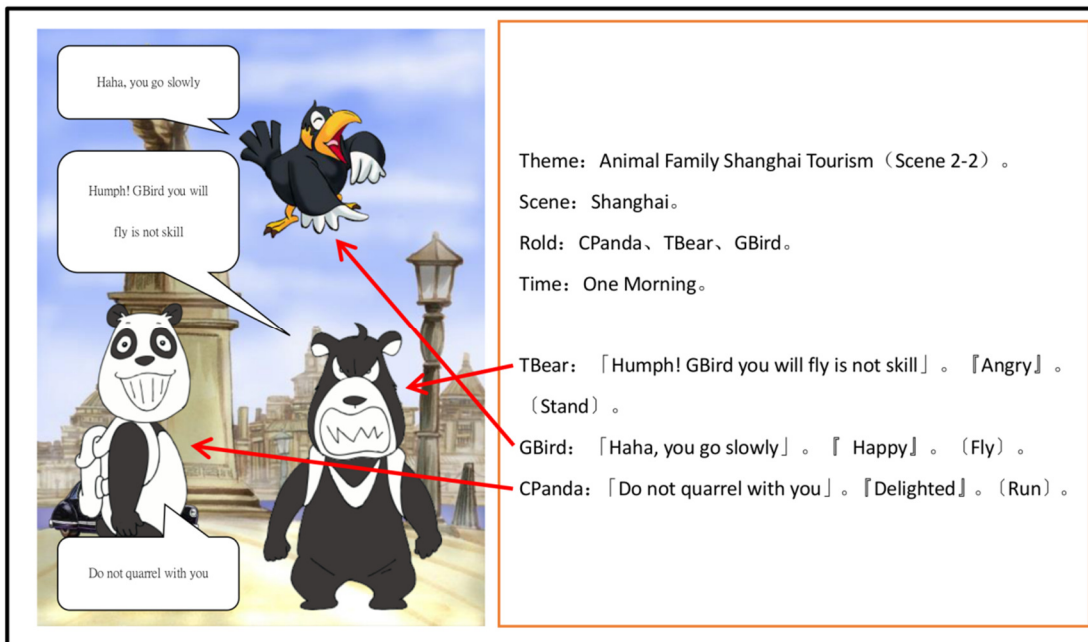


Figure 10. TBear Dialogue First Person Make Comic Examples

Finally, Bird role for the first person in the comic production, with the script to complete the design elements of **Table 6** and **Figure 11** comics. The experimental results show that the ICMS can change the expression, action and position of each role according to the different script contents, such as the appearance order or the distance ratio, and produce the corresponding comic image.

Table 6. Design Elements of Third Split Screen




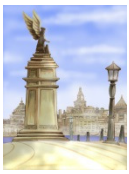



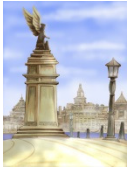



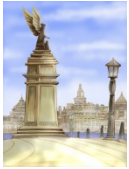
Design Elements				
Head	Body	Item	Font	Backgroup
			You hurry up with it!	
			Wow! GBird you do not fly so fast	
			Do not come with him	



Figure 11. GBird Dialogue First Person Make Comic Examples

After the cartoonist completes all the split screens, the design elements from Table 4 to Table 6 can be stored in the DED platform of **Figure 4** for use by other cartoonists.

This study tests the script in **Figure 11**, the original TBear lines and sad expression and walking action control code “TBear : 「Do not come with him」 。『Sorrow』 。〔Run〕。”, change into “TBear : 「I cannot walk! 」 。『Angry』 。〔Stand〕。”, Anger expression and standing action control code, found that the original TBear expression and action will be in accordance with the script control code changes and changes, and other characters in the order or distance ratio will also be produced in proportion to the corresponding comic image (as shown in **Figure 12**).

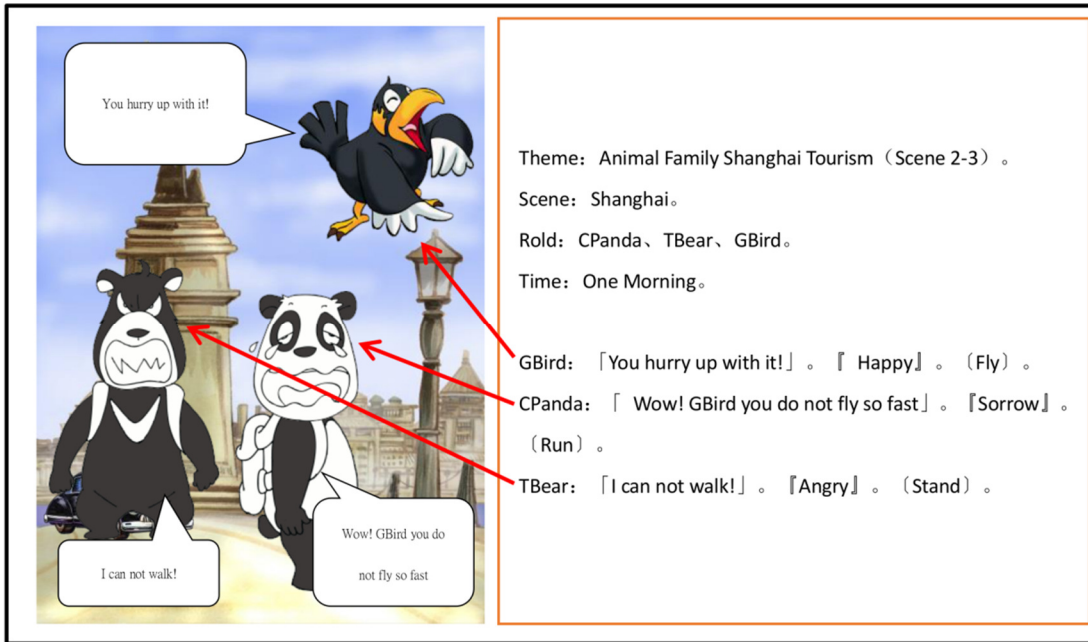


Figure 12. Edit TBear Script Make Comic Examples

COMIC FRAME MAKE SYSTEM ANALYSIS

Comic Frame Design Analysis

Comic frame design, the main purpose of the design is to guide the reader in accordance with the comic designer, Set the comic reading order to read (Arai & Tolle, 2010), and thus into the comic continuous image design, Brought the story of the situation, so that readers feel the story of the changes.

General graphic comic design in the visual expression, and cartoon animation is not the same, Cartoon animation is mainly a fixed play cartoon animation screen, and the continuous production of a different design screen to provide to the viewer to watch, While the performance of comics more static plane design screen, Must be by the reader to follow the comic frame set the order, in order to watch the comic frame in the comic design content. The comic designers in the design of comics, in addition to the design of the comic frame to develop the main reading order, but also take into account the comic layout as a whole to the design aesthetic, as well as the comfort of reading in the comic design of the overall technology is not An easy thing, comic designers must go through long practice, with a lot of accumulated experience.

After the above experimental analysis, the author's comic script, through the "comic script database" system analysis of the script content, the role of dialogue is the first person or second person or third person, and then the analysis of these content the message is sent to the "Design Element Integration Database" to produce a comic picture. This study follows the previous experimental analysis, designed to the first person and the second person and the third person of the comic frame, and the Institute designed comic frame, Through the survey of 500 questionnaires, most of the investigators' backgrounds were art designers or comic lovers, and the contents of the survey were the first person and the second person, as well as the third person comic frame, and the reading order of the comic frame, According to the results of the questionnaire to develop the first person and the second person and the third person of the comic frame style version and comic frame reading sequence design (Figure 13).

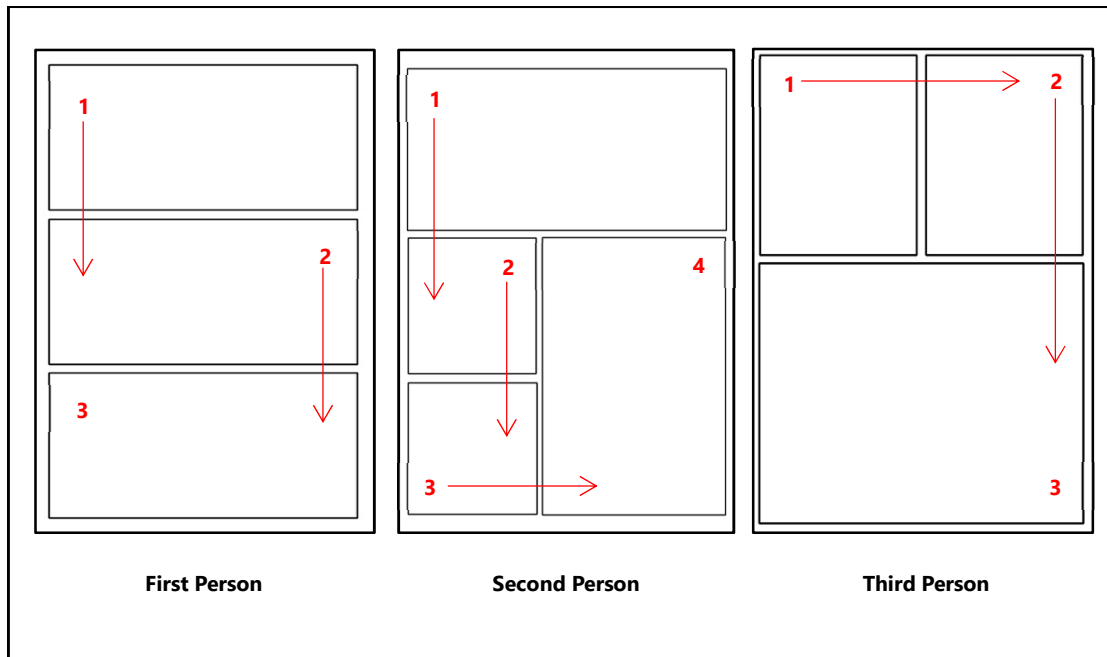


Figure 13. Comic Frame Design Type Analysis

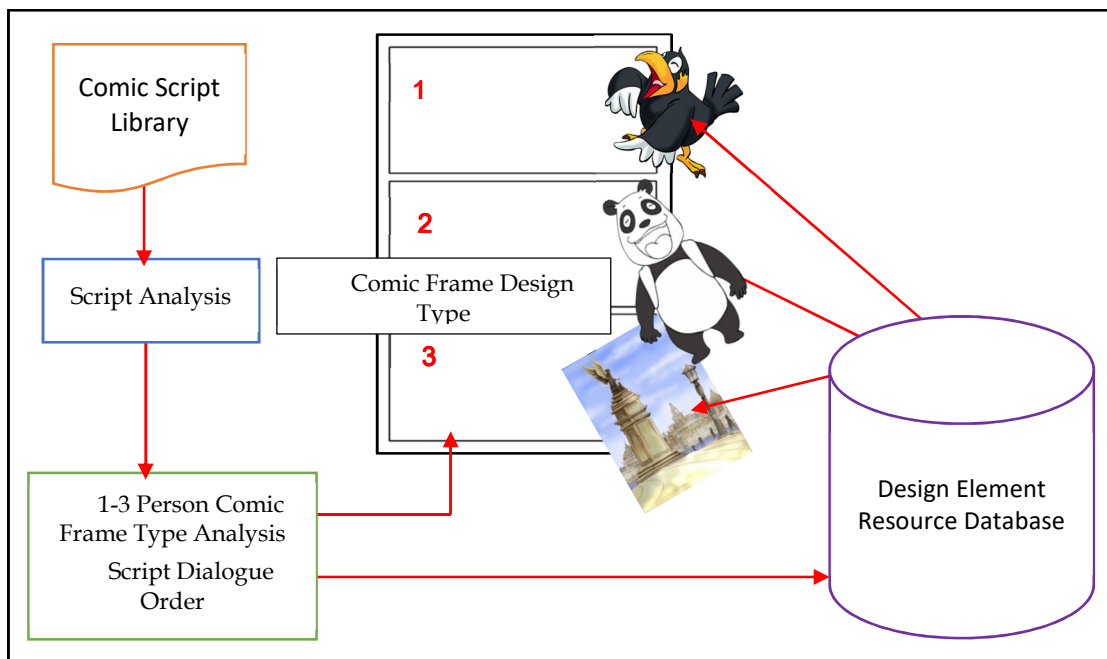


Figure 14. Comic Frame Make System Process

Comic Frame Make System Process

This study collects the comic scripts of the creators and classifies them into comic script databases for analysis, will analyze the content of the comic script content belongs to 1-3 person, and then specify the generation of exclusive roles 1-3 person called comics frame type, and then the system will be in accordance with the analysis of the cartoon script within the role of the dialogue sequence, the role of walking and other attribute parameters, and "Design Elements Integration Database" within the design elements to match, to find the corresponding comic modeling elements, and comic frame Integration, comic design designers need to have frame style of the contents of the comic design (Figure 14).

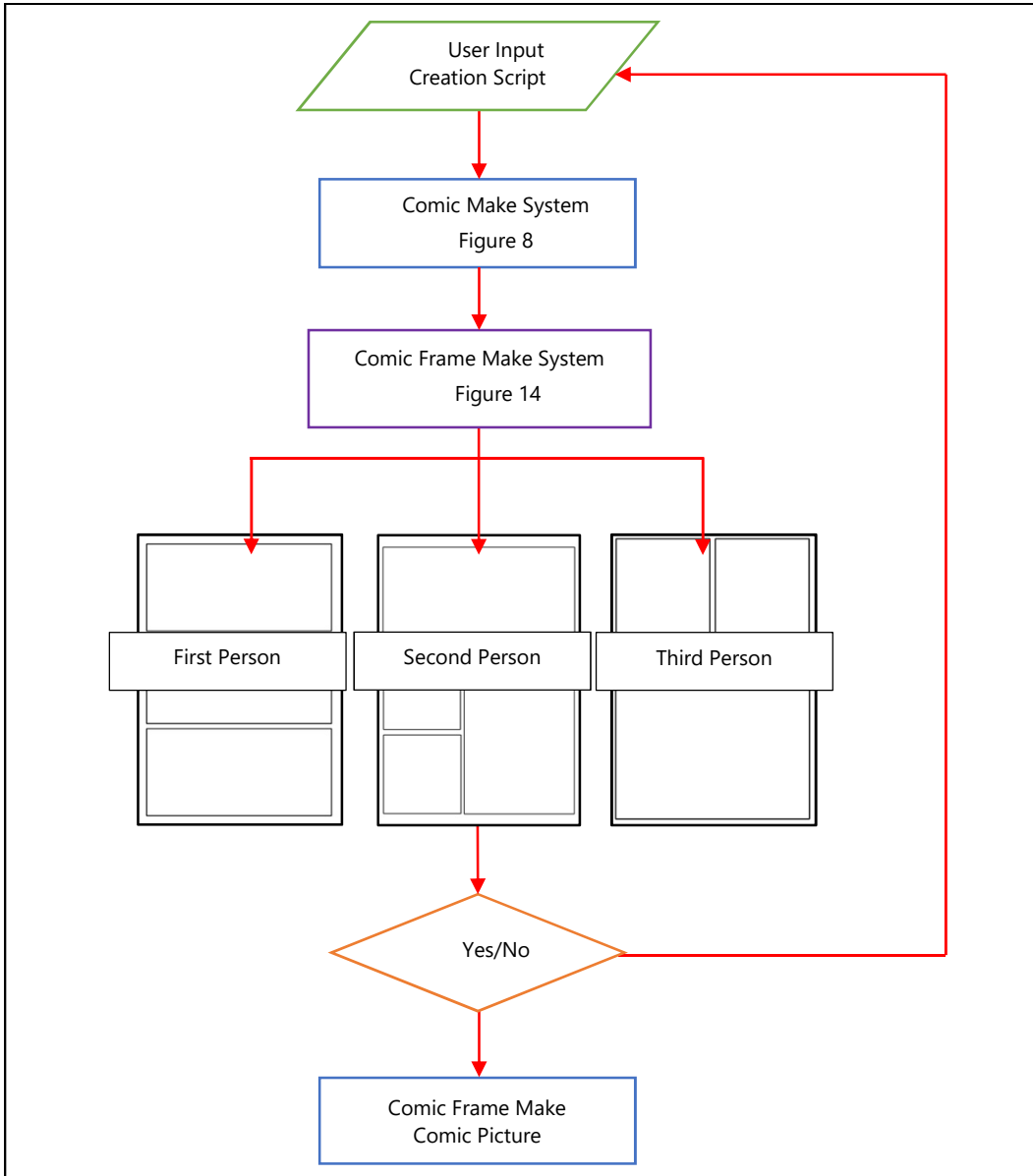


Figure 15. Comic Make System Integration Comic Frame Make System Process

Comic Make System Integration Comic Frame Make System Process

This study provides the creator to input the comic script files created by the comic, and these comics into the comic production system within the comic script database, comic script content of the group analysis and comparison, the performance of the comic script analysis and comparison, such as the role of dialogue order, the role of the interaction between the role of the location and other related parameters, passed to the comic frame system to integrate the system, analysis and create a dedicated 1-3 person comic frame type, and then comic production system produced by the comic modeling elements integration, resulting in creators created by the comic script content, the layout with a comic frame style Content, comic design modeling graphics, and respond to the creator, and if the comic design of the resulting graphic design, non-creator want comic design style, the creator can try to modify the comic script content, and then re-submitted to the system, re-produce comic graphics, until the creation of Satisfaction (Figure 15).

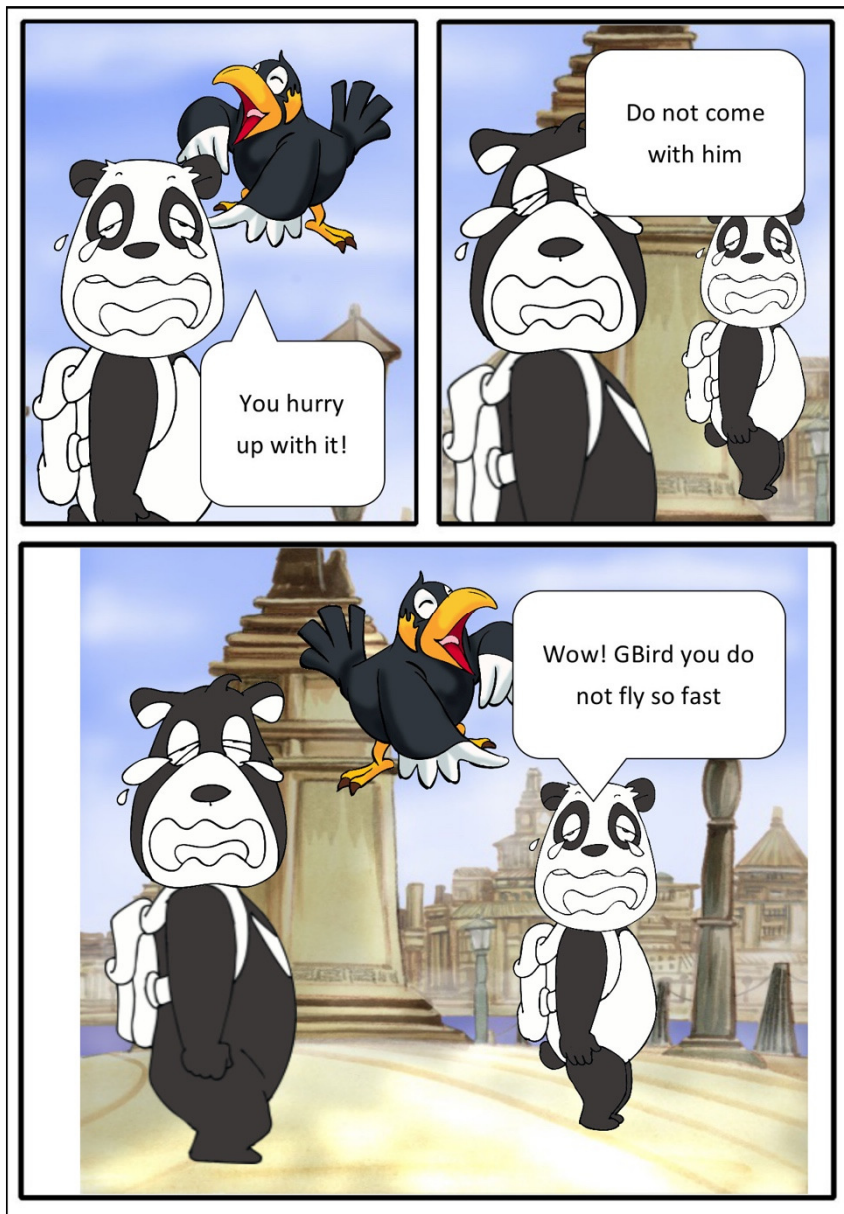


Figure 16. System Make First Person Comic Frame Example

Comic Make System Integration Comic Frame Make System Examples

This study will be the creation of the "animal family Shanghai Tourism" comic script a total of three episodes, enter the "comic script database" to provide a systematic analysis of these three comic script content, and comic production system integration frame system, Produced in accordance with the content of the comic specified 1-3 person called comic frame style modeling experiments.

The study found that the system produced the first person of the comic frame style, the ratio between the comic role and the distance, as well as the proportion of the comic background and the angle and the role of the dialog box display position is correct (Figure 16), and the system produces a second person comic frame style modeling, found that the comic characters between the role of the more incorrect, and the comic role of the dialog box is too large cover the role of comic role, Abnormal condition (Figure 17), and the system produces a third person comic style of frame style, the normal situation and the second person's comic frame style modeling almost, but the situation is slightly better (Figure 18).

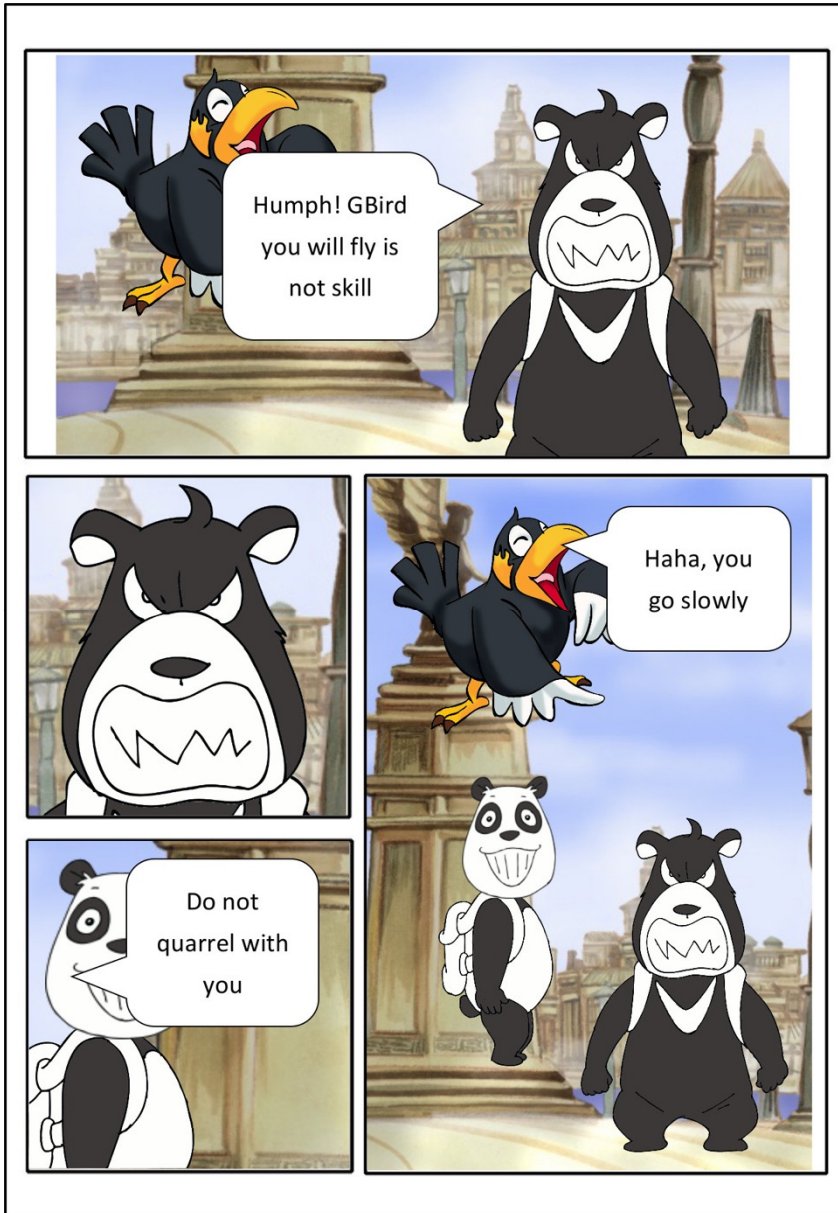


Figure 17. System Make Second Person Comic Frame Example

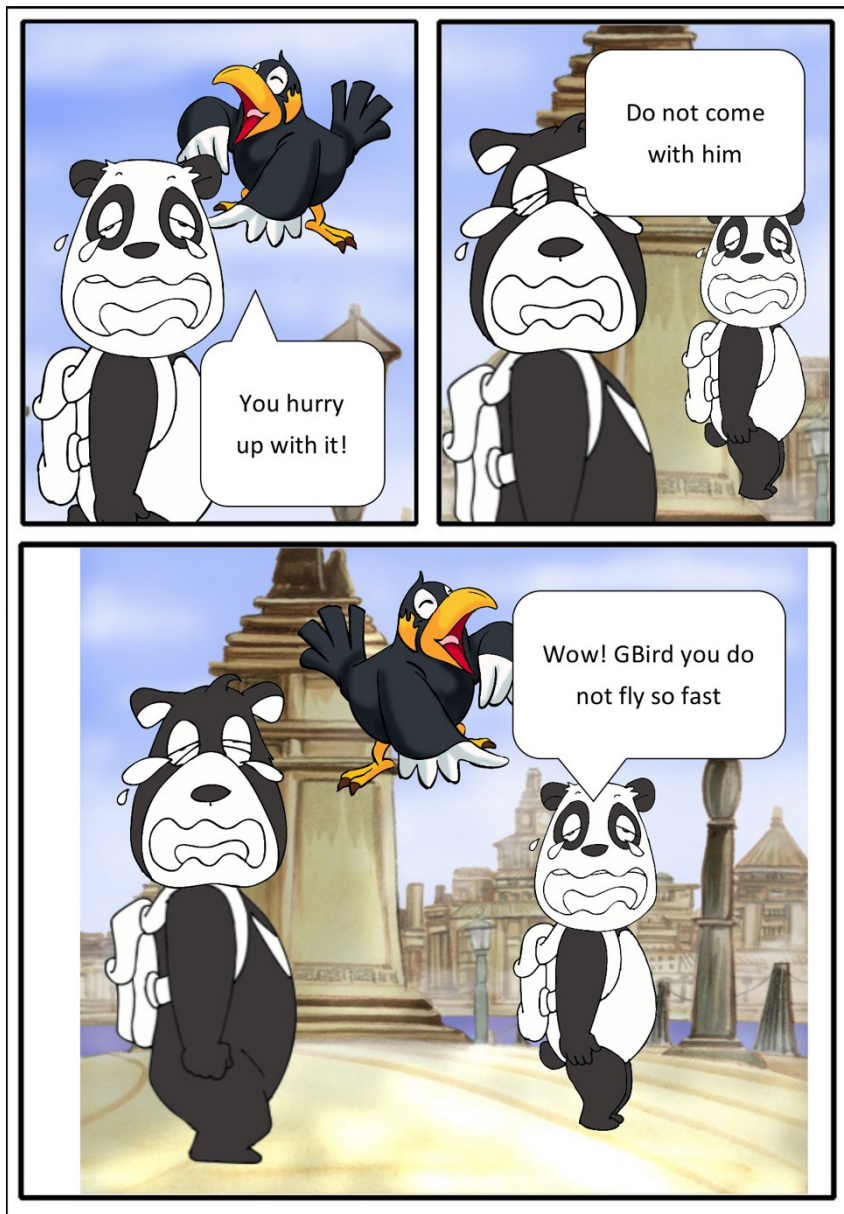


Figure 18. System Make Third Person Comic Frame Example

From the above experimental results can be found, the system produced by the comic frame style modeling the more the number of comic images produced by the wrong situation will be relatively high proportion of this part of the need for more creators continue to modify the comic script Practice, and compare the comic script changes between the data analysis, the gradual improvement.

COMIC SCRIPT CREATION EDUCATIONAL APPLICATION ANALYSIS

In this study, the author has produced the "Questionnaire for the use of comic script creation system" in the application of comic script creation, and has designed six questions about the use of this system by the subject, and the application of this system to comic bookwriter education of the relevant satisfaction issues, to investigate and study. In this study, a total of 2000 questionnaires were collected, and most of the subjects were art designers or comic lovers. The way of this experiment was to let the subjects learn to use the system, write their own comic script, and let the system produce comics Modeling drawings, if the subjects are not satisfied with the system produced comic modeling files, they try to modify the comic script, until the system to produce their own satisfaction with the comic modeling picture, and in the subjects experienced such a creative comic Script, produce comic modeling process, then let the subjects fill out the questionnaire, and statistical analysis of the contents of the questionnaire.

Table 7. Comic Script Creation Educational Application Questionnaire

The Comic Script Creation System Usage Questionnaire	Very Agree ----- Very Disagree					
	6	5	4	3	2	1
1. This system can help me create comic scripts.	565	689	580	23	30	13
2. I will continuous to use this system to creation comic scripts.	548	632	437	165	127	91
3. I think this system can help comic creation education applications.	881	524	516	17	31	31
4. I think this system can improve the interest of learners.	855	528	542	40	23	12
5. I would recommend other people to use this system.	459	617	636	64	125	99
6. I expect this system to continue to develop other functions for comic script education.	620	517	640	125	72	26

This study collects the questionnaires and analyzes the respondents' questions, and finds out the distribution of the system satisfaction indicators, and the system can help the comic creation education related applications, and can improve the learner's interest Questionnaires on the issue, get a relatively high level of consent (Hosler & Boomer, 2011). The results of this study show that the system is designed to create a comic script by the creator of the comic script, with a considerable degree of fun (Deterding et al., 2011, May; Kam et al., 2008; Lazarinis et al., 2015), can improve the interest of learners (Kim, 2008), and can help learners used in comic story writing writing exercises, and tested It is hoped that the sustainable development of this system, for the development of comic bookwriter creation of other functions, is a worthy of continuous research direction (Table 7).

CONCLUSIONS AND FUTURE WORK

This paper analyzes the creative factors of comic design and the development process of cartoon script creation, and designs the Design Element Integration Database system through CDRIM architecture, and provides the system platform for comic group to share the design works, and these comic design elements of the content grouping, easy to manage. This study analyzes the content structure of the comic script and designs the script control symbol, which can control the expression and action of each role and so on, and make the comic image for the system.

After the experiment, this study realizes the cartoonist or comic bookwriter, can write the script directly through the imagination, and the creation of the script into the system, to achieve the direct occurrence of the scene and the role of expression and action and location size of the integrated comic image professional cartoonist design comics constitute the context of the comic of reference, with the reduction of the traditional production of comic design manpower and capital as well as time and other costs, as well as non-professional creative comic design training courses.

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