

Support for Seamless Linkage between Less Detailed and More Detailed Representations for Comic Design

Junko Ichino¹, Tomohiro Makita¹, Shun'ichi Tano¹, and Tomonori Hashiyama¹
¹ University of Electro-Communications, Tokyo, Japan
 {ichino, makita, tano, hashiyama}@is.uec.ac.jp

Abstract. Through a study of comic design practice, we observed that comic designers created three components—character-config, plot, and storyboard—and used a trial-and-error approach with iterative progression from less detailed to more detailed representations during the early stages of design. However, existing comic design tools do not support these tasks very well. In the light of these observations, we created a system that helps comic designers in the early stages of design. Our prototype supports sketching input, allows seamless movement backward or forward among the different granularities of representations across the three components, and concurrent use of multiple related sheets. We performed an informal evaluation with one professional designer and found that she reacted positively to the concept and was interested in using such a system in her work.

Keywords: Comic (Cartoon) design, sketching, early stages of design, trial-and-error and pen-based computers.

I. INTRODUCTION

In recent years, design support tools for professional designers have become widespread. These existing tools tend to focus on the final (finishing) stage of design. Therefore, a designer who uses these tools often repeats the process of trial-and-error with paper and pencil in an early stage. The designer must switch to the computer-based tool after paper-based freehand sketching. This makes it difficult for the designer to think creatively. In addition, objects in these tools are neatly displayed. The research also indicates that a designer usually sticks to a minor modification, such as a one-dot shift [1]. Most designers therefore prefer to sketch early ideas on paper. Because of these factors, a study on support for the initial phase of design activity is being investigated actively (e.g., [2–4]).

Our research considers Japanese comic design work as a creative design activity [5]. Comics are an important part of

Financial support acknowledgments are placed in the unnumbered footnote on the first page. The given, middle and family name of the responsible author, as well as his e-mail and mailing address, phone and fax should be listed separately for the purpose of further communication.

Paper titles should be written in uppercase and lowercase letters, not all uppercase. Full names of authors are preferred in the author field, but are not required. Put a space between authors' initials.

Japanese culture, and they are also popular in other countries. Comic design has much in common with other types of design, but it is also emerging as its own discipline with its own practices and its own set of problems. A typical flow of comic design is shown in Figure 1. In an early stage of comic design, comic designers usually first create a character configuration (*character-config*), generally represented by both pictures and words, which gives details about comic characters, and they create a *plot*, generally represented by words, which is the scenario of the comic. Based on the character-config and the plot, they create a *storyboard*, generally represented by both pictures and words, which is a series of rough comic sketches (see Figure 2). They then make a draft in pencil, refining the storyboard. After this, they ink in a penciled drawing and give the sketch finishing touches.

Some tools (e.g., [6–9]) provide support for comic design. They, however, focus on the finishing stage of comic design and do not support the sequence of comic design activities in the early stages leading from character-config and plot to storyboard (see Figure 1).

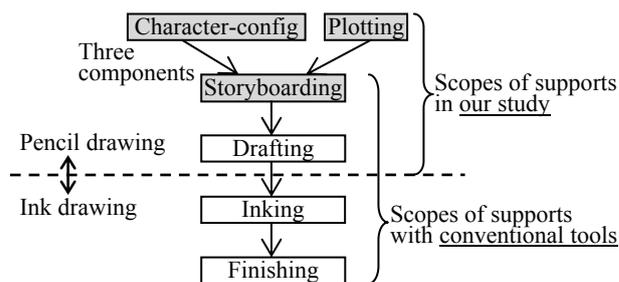


Fig. 1. Typical flow of comic design.

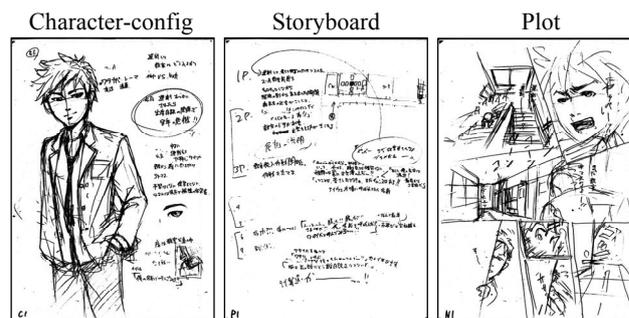


Fig. 2. Three components in trial-and-error stage.

Moreover, to support a designer during the early stages of design, we need to grasp how designers draw a rough sketch. However, it seems that no reports of observations of the comic design process have been published to date. Therefore, it is still not clear what activities a comic designer performs during the early stages of design.

The purpose of our system is to support the designer's creative activities in the early stages of comic design focusing on the three components: character-config, plot, and storyboard. We have taken a fresh look at comic design in order to determine what kinds of tools would be helpful to support designers. In this paper, we describe some of our observations of comic design practice and introduce a system aimed at supporting the early stages of the comic design process.

II. RELATED WORK

A study on support for the initial phase of design activity is being investigated actively. Hoeben et al.'s research [2] focuses on sketching on physical paper and does not provide computationally useful functions. Sasaki et al.'s research [4] supports the drawing up of a rough sketch. They designed and implemented three types of user interfaces, "historical view", "spatial view", and "time-line and partial undo/redo", based on the results of a behavior analysis in drawing experiments with some designers. SketchPoint [3] helps presenters design informal presentations via freeform sketching. In SketchPoint, presenters can quickly create presentations by sketching slide content, overall hierarchical structures, and hyperlinks. Some studies (e.g., SILK [10], DENIM, DEMAIS) allow designers to draw quickly initial sketches of a graphical user interface. The designer can illustrate behaviors by sketching storyboards, which specify how the screen should change in response to end-user actions.

Some tools (e.g., ComicStudio [6], COMICWORKS) provide support for comic design. They focus on the finishing stage of comic design (see Figure 1). POM [8] shows a user a storyboard created using a genetic algorithm, utilizing a database with a lot of storyboards drawn by comic designers. This system does not assist a user who is exercising his/her creativity in a process of trial-and-error, but performs storyboard creation for the user. Kato et al. developed a support system for story creation using some pictures with fuzzy inference [7]. DMP [9] is a system designed to automate the production of digital movies with various visual effects like three-dimension animation, real images, and their composition. The system can understand an inputted screenplay through a parser and then automatically converts it into a relevant motion picture. These systems, however, do not support the sequence of comic design activities in the early stages leading from character-config and plot to storyboard.

To support a designer during the early stages of design, we need to grasp how designers draw a rough sketch. There have been some studies (e.g., [3, 4]) on monitoring the actions of the person performing a design activity. However, it seems that no reports of observations of the comic design process have been published to date.

Therefore, it is still not clear what activities a comic designer performs during the early stages of design.

III. USER OBSERVATIONS

To make an objective observation of comic design processes, we carried out a main experimental observation of comic designers, on the basis of the abovementioned questionnaires (omitted here) and preliminary experimental observation (omitted here). We observed each designer's drawing behavior and detected his/her characteristic behavior.

A. Experiment Design

Design

Participants draw a comic about a given subject. The experiment covered from the beginning phase to the draft phase (see Figure 1). The assignment was to complete seven pages of storyboards. Drawing character-configs and plots was optional.

Participants

Four subjects (1 male and 3 female) in their 20s participated in the experiment, including one professional comic designer and three comic course college students.

Environment

The experiments were individualized for each participant. The participant's behavior drawing a comic was recorded using three digital video cameras on the basis of preliminary experimental observations. One captured a general view (see Figure 3(a)), another a detailed view (see Figure 3(b)), and the third the eye-gaze view (see Figure 3(c)). Paper with a size of 364 mm x 257 mm was used exclusively for drafting comic. There were no restrictions on the number of sheets of paper used, paper layout, or paper movement during this experiment. Each sheet was given a different colored mark (see Figure 3(d)) to enable us to discriminate among several sheets during video replay. All drawing was done in pencil.

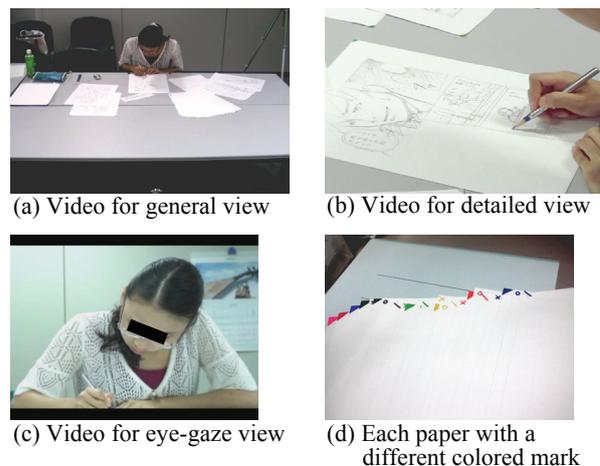


Fig. 3. Scenes during the experiment.

Task

The comic theme "thrilling campus-life story" was chosen. The keyword "thrilling" is related to the horror and fantasy genres among the participants' favorite genre. We

expected them to be able to conduct creative design activities related to their favorite genre. This theme was shown to participants just before this experiment.

Procedure

Each person took part in the experiment for about 6 hours and took a rest for a few minutes every hour. Before beginning the experiment, participants were told to almost finish drawing seven pages of storyboards within five hours and to refine the storyboards in the last hour, if possible. This was to observe how a designer refines his/her storyboard.

B. Behavior Observation Method

In order to perform more objective and quantitative analysis of recorded designers' behavior, we used a time sampling method, which is a type of observation method used in psychology. This method makes possible quantitative analysis such as frequency of occurrence and duration, by separating behavior at specified time intervals and recording occurrences of a target behavior. First of all, we watched the video to the end and identified the observed designer's behavior. Based on them, we decided target behaviors and made the checklists (Table 1). The time interval of observations was ten seconds.

C. Results and Considerations

Frequency of Drawing

The frequency of drawing is shown in Figure 4. This means the total number of cells checked as drawing behavior in checklists every 10 seconds shown in Table 1. Character-configs and storyboards were treated separately by dividing them into text and sketches. They first drew a skeletal shape (hereafter called "skeletal drawing") with thin lines, then gradually thickened the lines, and finally drew the real shape (hereafter called "solid drawing") such as face and body with thick lines (see Figure 4, left). Sketches were therefore divided into skeletal drawings, solid drawings, and others. For character-configs and storyboards, all the designers described them using text and pictures. For pictures, all of them also made a skeletal drawing.

This result indicates that designers use both less detailed representations (skeletal drawing) and more detailed representations (solid drawing) in the early stages of comic design (point (1)).

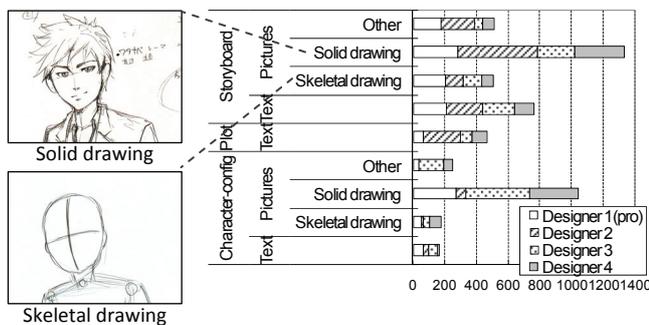


Fig. 4. Total number of cells checked in designer's drawing behavior.

TABLE 1: EXAMPLE OF BEHAVIOR CHECKLISTS.

paper {layout position}, gaze direction	storybo	gaze direction			
		NI	I4	I3	I2
character-config / plot	gaze direction				
	paper position				
	paper layout				
	gaze direction				
	paper position				
	paper layout				
	gaze direction				
	paper position				
	paper layout				
	gaze direction				
	paper position				
	paper layout				
new layout	total number of frames				
	total number of changed frame				
	delete thick line				
	delete thin line				
	add thick line				
	add thin line				
	total number of parts	0	0	0	0
	line effect				
	crowd				
	small article				
	stair				
	ground				
door					
window					
inner wall					
building					
outer shape					
line					
number of scenes					
position on page					
add, modify, and delete	total number of word balloons				
	number of word balloons				
	total number of phrases				
	number of parent phrases				
	number of phrases				
	outline box				
	position on page				
	standard page				
	lettering				
	new page				
	total number of parts	0	0	0	0
	body				
lower part of body					
upper part of body					
solid drawing					
skeletal drawing					
head					
chin					
mouth					
nose					
eye					
hair					
face line					
solid drawing					
skeletal drawing					
number of characters	1	1	1	1	
set a standard	a	a	a	a	
position on page					
new phrase					
total number of phrases	1	2	3		
number of parent phrases					
number of phrases	1	2	3		
lettering					
set a standard	a	a	a	a	
new phrase	x				
thinking					
start of new paper					
number of active sheets	1	1	1	1	
time	0:00:10	1	1	1	1
	0:00:20	1	1	1	1
	0:00:30	1	1	1	1
	0:00:40	1	1	1	1
	0:00:50	1	1	1	1

Temporal Transitional Number of Accumulated Drawing Objects

The professional designer's temporal transitional total number of drawing objects for each component is show in Figure 5. This is the accumulated number of drawing objects every 10 seconds, as shown in Table 1. The number

was increased by additions and decreased by deletions to the original sheet. In this graph, the number of objects greatly decreased, especially in the early part of the six-hour experiment. We looked at this video for this time and found out that they deleted their detailed description and went back to the skeletal drawing. That means that they moved not only from less detailed to more detailed representations, but also back again from more detailed to less detailed representations.

These results show that designers move back and forth between less and more detailed representations in the early stages of comic design (point (2)).

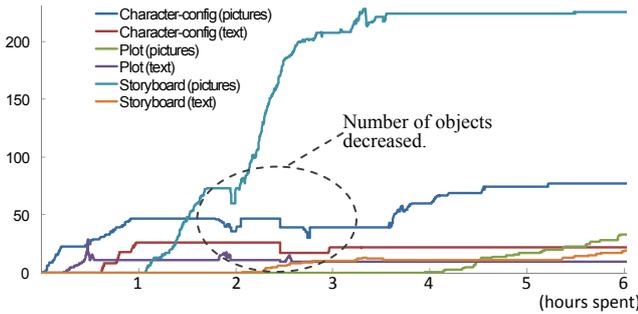


Fig. 5. Temporal transition in total number of objects drawn for each component.

Parallel Design of Three Components

Since we frequently observed all subjects exhibiting the behavior of creating several sheets of paper in parallel and switching among them, we analyzed the temporal transitional of two types of behaviors for all created sheets: (i) the editing behavior and (ii) the reference behavior, which means the subject's gaze turning onto the sheet. The data for the professional designer is shown in Figure 6. For the first hour, she created the two sheets of character-configs and one sheet of plot, switching among these sheets. She started to create storyboards in the second hour. At the same time, she also changed her character-configs and plot. When we observed the videos of all subjects, we found that they often moved back and forth between less and more detailed representations across the three components, such as redrawing a picture in more detail on the storyboard sheet from a less detailed picture on the character-config.

These results indicate that designers switch among three components instead of completing them in series during the early stages of comic design. Additionally, we recognized that they moved back and forth between less and more detailed representations not only for each component, but also across components (point (3)).

Concurrent Reference to Multiple Sheets of Paper

Since we frequently observed designers looking back at all of their sheets, we checked the number of sheets they referred to in various time periods: 10, 30, and 60 s. The data for the professional designer in 30 s is shown in Figure 7. She repeated the process of trial-and-error through the act of referring to several papers frequently.

We conclude that designers refer to several sheets at short intervals in the early stages of comic design (point (4)).

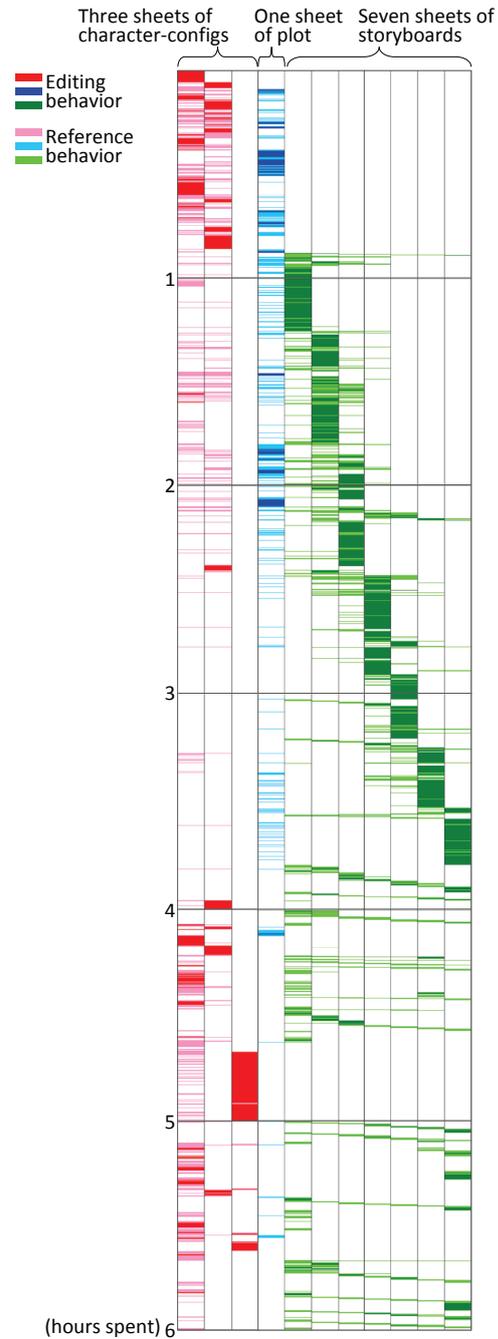


Fig. 6. Pro-designer's temporal two transitional behaviors: editing and reference.

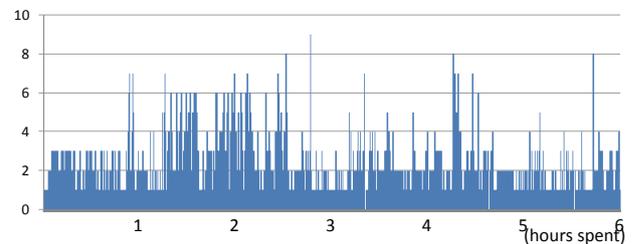


Fig. 7. Number of sheets referred to by pro-designer in 30s.

IV. SYSTEM CONCEPT

A. Concept 1. Seamless Linkage between Less Detailed and More Detailed Representations

Point (1) suggests that comic designers draw each

component at various levels of detail, instead of at one specific level. In addition, point (2) suggests that they work on each component not only from less detailed to more detailed representations, but also back to less detailed from more detailed representations and have a rethink. In other words, they conduct a bidirectional process. Moreover, points (2) and (3) show that designers move back and forth between three components and create them in parallel, rather than in sequence. And they conduct the bidirectional process not only for each of the three components, but also across all three.

Our first concept for supporting designers' creative activities in the early stages of comic design is therefore that a designer should be able to move seamlessly in both directions: both from less detailed to more detailed representations and from more detailed to less detailed representations, not only for each component, but also across all components. This concept is shown in Figure 8.

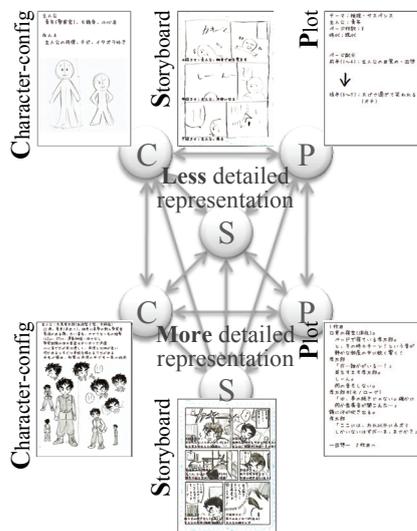


Fig. 8. Seamless linkage between less detailed and more detailed representations.

B. Concept 2. Concurrent Use of Multiple Sheets

Points (3) and (4) suggest that a comic designer repeats the process of trial-and-error through the act of referring to several sheets and editing them at short intervals. They refer to previously sketched sheets frequently. While going backward or forward among the different granularities of representation, they frequently look back at related sheets that they sketched before, modify these sheets, and modify the current sheet with the sheets laid side by side.

Our second concept is therefore that a designer should be able to use multiple related sheets concurrently. This concept is shown in Figure 9.

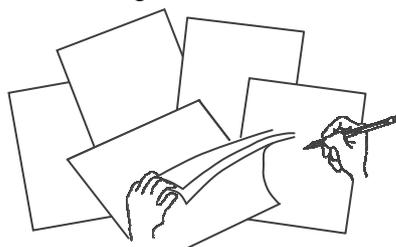


Fig. 9. Conceptual diagram of concurrent use of multiple sheets.

V. IMPLEMENTATION

A. Seamless Linkage between Less and More Detailed Representations

To realize concept 1, seamless linkage between less and more detailed representations, we made our system treat the three components in the same manner with no distinction. This is because we found that all three components consisted of text and pictures and that they were very similar in terms of how the designer went backward or forward among the different granularities of representation. Therefore, there is no need for individual support for each component.

Specifically, we achieve a function that allows users to refer to a continuously varying representation between less and more detailed representations and to shift to any level of representation detail. These representations were extracted from among objects drawn on a tablet display by the user. The classification of representation detail level is performed using stroke attribute information such as stroke location and pen pressure, based on observed characteristics of designers' behavior described in the section User observation.

Distinguishing between Text and Pictures

We realized that there were different features between text and pictures in terms of less and more detailed representations. Our system provides different supports for them. This requires that the system can distinguish between text and pictures. Our system focuses on stylus pen pressure during sketching on the pen tablet. We noticed that most designers who participated our experiment wrote letters with a constant pen pressure and drew pictures with a continually varying pen pressure. Some text and a picture on the tablet display provided by the professional designer and the maximum stylus pen pressure of each stroke are shown in Figure 10.

The two graphs suggest that a picture contains many strokes drawn with low pressure, while text contains few or no light strokes. We considered how our system could utilize these features to tell one from the other in real time. First, each stroke in text and a picture is classified as either a low- or high-pressure stroke. Next, a sequence of strokes is determined to be or not to be a sequence containing either many light strokes. If it is, the sequence of strokes is judged to be text. If not, it is judged to be a picture.

Seamless Linkage between Less and More Detailed Representations in Text

From our observations of designers, we found that when they started writing text objects, less detailed representations were placed on the left of the sheet with little or no indent, while more detailed ones were placed near the right side of the sheet, i.e., with a large left indent. Our system supports seamless linkage in text by using these characteristics.

If the user specifies the object to shift to a less detailed representation, the lines in the object are hidden in the order of categories from lowest to uppermost. On the other hand, if the user specifies the object to shift to a more detailed

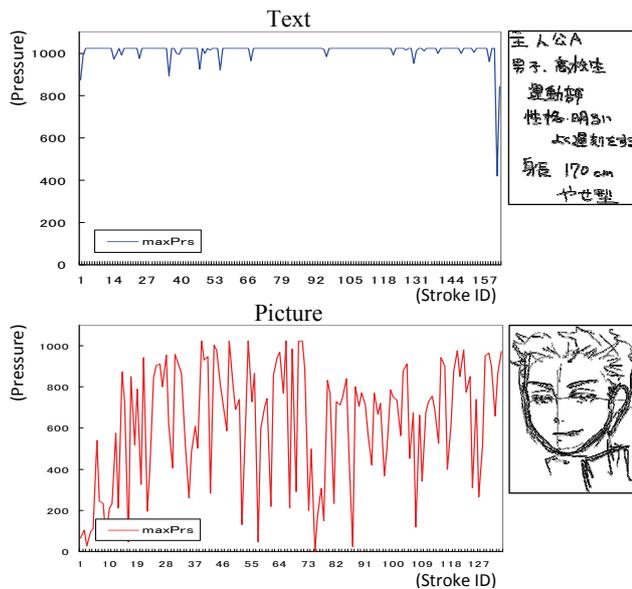


Fig. 10. Maximum pen pressure for each stroke of text and picture.

representation, the lines in the object are redrawn in the order of category from uppermost to lowest. To realize this function, we developed two different kinds of interfaces. One is pen-pressure-based manipulation (see Figure 11, left). After a user places the stylus pen on the point where the selected object is on the tablet, if she/he increases the pen pressure, the object gradually shifts to a less detailed representation, and if she/he decreases the pen pressure, the object gradually shifts to more detailed representation. The other interface is slider-bar-based manipulation.

Seamless Linkage between Less and More Detailed Representations of Pictures

From our observations of designers, we found that when they drew a picture object, the less detailed the representation was, the thinner the drawn lines were, and the more detailed the representation was, the bolder the lines were. Our system supports seamless linkage for pictures by using these characteristics.

If the user specifies the object to shift to a less detailed representation, the strokes of the object are hidden in the order of pen pressure from highest to lowest. On the other hand, if the user specifies the object to shift to a more detailed representation, its strokes are redrawn in pen-pressure order from lowest to highest (see Figure 11, right). The order of hiding or redrawing depends on the stroke pen pressure, regardless of the stroke input order. Since a user can select an object in a limited specific part of a window, such as a face and hair, she/he can shift to any representation detail level appropriate for the current focus of attention.

Seamless Linkage between Less and More Detailed Representations over Components

To support seamless linkage between less and more detailed representations over components rather than just within each individual component, we developed a function that allows a user to copy objects from one component (tablet) to another. The system exchanges data with other



Fig. 11. Pen-pressure-based seamless linkage.

tablet computers over a computer network. When the system copies an object, it creates a two-way link between the source and destination objects. This lets the user shift the destination object to any representation detail level.

B. Use of Multiple Sheets

Multiple Tablet Displays

To realize our concept 2, concurrent use of multiple sheets, we introduced a client-server system and connected several pen tablet personal computers (PCs) to it. The hardware construction is shown in Figure 12. We assume that a user treats one tablet PC as one sheet of paper for one of the three components.

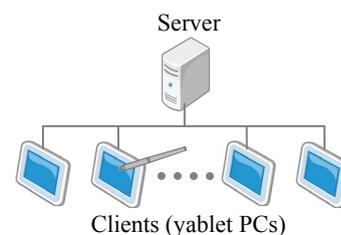


Fig. 12. Hardware Construction.

Thumbing through outputs

To enable users to thumb through outputs by using multiple tablet displays, we provided a capability for highlighting related objects on several displays. We made it

possible for a user to refer to several objects on multiple displays continuously without lifting the displays. A user can add a two-way link between objects across components (tablets). This enables the system to store information about related objects. When one of a pair of linked objects is clicked, the other related one on another display is highlighted in green. For instance, as indicated in Figure 13, if a page number object in the plot and related storyboard are linked together, then simply clicking on these page number objects in the order of page number will highlight each storyboard on different displays one after another.

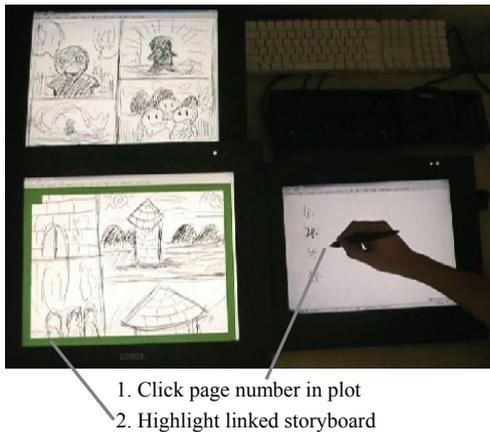


Fig. 13. Thumbing through outputs.

VI. TRIAL USE

We conducted a first trial experiment using our prototype and tested the effectiveness of our method during the actual design process.

A. Experiment Design

One participant drew a comic about the given subject using the prototype. One professional comic designer who participated in the experiment reported in the section User observation participated in this experiment again. Here assignment was to complete two pages of storyboards. Input/output devices included three pen tablet liquid crystal displays (see Figure 14). She was asked to draw the two pages of storyboards on the center tablet display and to use the left and right tablet displays as she liked. The comic theme of “feel fine youth story” was chosen because we thought that this theme has a reasonable level of abstraction and that a designer would need a certain amount of trial and error. The participant took part in the experiment for about 1 hour.



Fig. 14. Scenes from the trial experiment.

B. Results and Considerations

The completed two pages of storyboards, the plot, and the character are shown in Figure 15.

The total numbers of operations using the main functions during the experiment are listed in Table 2. The designer used the undo function a lot of times. The seamless linkage functions were used several times. On the other hand, the function for thumbing through outputs was never used. This may be because this function offers little benefit when the task involves only two pages. Regarding this point, she commented:

“While I didn’t use this function during the experiment, I thought it would be quite useful when designing a multi-page comic.”

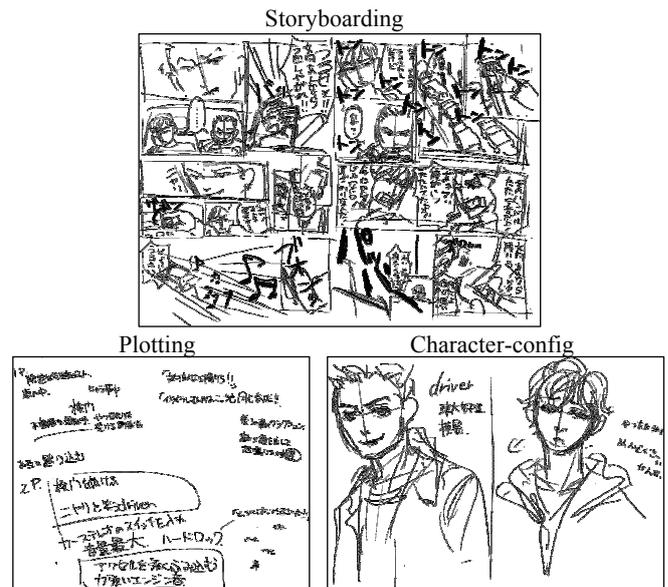


Fig. 15. Completed drafts.

TABLE 2: TOTAL NUMBERS OF OPERATIONS USING MAIN FUNCTIONS DURING THE FIRST TRIAL EXPERIMENT.

Operation	Total number of operations
Undo	40
Seamless linkage for picture (slider-bar-based manipulation)	5
Seamless linkage for text (slider-bar-based manipulation)	7
Seamless linkage for picture (pen-pressure-based manipulation)	3
Seamless linkage for text (pen-pressure-based manipulation)	1
Thumbing through outputs	0

The participant was asked to evaluate questions according to a five-grade scale. The questions about the functions of the seamless linkage between less and more detailed representations and the participants’ answers (higher scores are better) are shown in Figure 16. Most of the evaluations were positive. Slider-bar-based manipulation was given higher marks than pen-pressure-based manipulation. It seems that this is because she found it difficult to operate using pen pressure because the pen device had low sensitivity and the pen pressure operation slowed down the computer, which had 1

gigabyte of memory in this experiment. In addition, she later sent an e-mail saying:

“Right now I am drawing a lot of character faces. I recall that tool and wish I could use it during trial-and-error processing such as changing only the character’s hairstyle.”

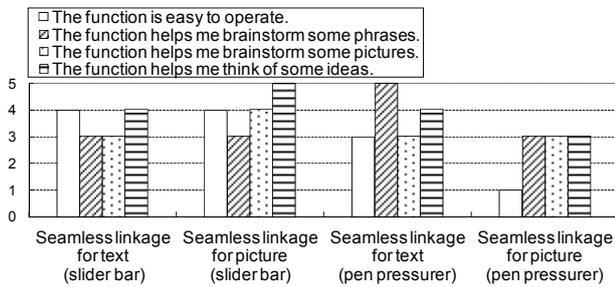


Fig. 16. Scores for the four questions about the seamless linkage function in the questionnaires on a 5-point scale.

VII. DISCUSSION AND FUTURE WORK

A. Quantitative and objective analysis of human behavior by the time sampling method

In this paper, we analyzed the comic designers' behavior quantitatively using the time sampling method. This method suggested that in the early stages of design, comic designers create three components and that they use a trial-and-error approach with iterative progression from less detailed to more detailed representations. While one of the merits of this method is that we can analyze human behavior quantitatively, it takes long time to watch a video and make checks on a list. The strengths and the limitations of the time sampling method for analysis of human behavior from our user study are summarized below.

Strengths

- We can gain accurate, objective, and quantitative data by following our checklists.
- We can examine frequency of observed human behaviors. Frequency information also helps evaluate the impact of individual differences. Moreover, it is useful for development of measure for human behavior.
- We do not cause interference with subjects' behavior, and do not have to establish rapport with them.

Limitations

- It is subjective to decide target behavior. The experimental observation therefore may end in failure if we cannot focus on adequate behavior. In our study, we specified target behavior of comic designers on the basis of the abovementioned questionnaires (omitted here) and preliminary experimental observation (omitted here).
- Target behavior is limited to a certain high-frequency one. Behavior which is not included in the checklists is not left.
- It requires a lot of time to complete the checklists. In our study, we spent about six times the time of actual recording time to do it.

B. Evaluation experiment

In this paper, we only did evaluate our prototype by one professional designer.

The more the number of pen tablet liquid crystal displays, the more we can expect effects of the function for thumbing through outputs. We couldn't evaluate the effects on the function in the trial use because our system included only three tablet PCs. We need to prepare many tablet PCs and to evaluate the effectiveness of the function.

There was little pen-pressure-based manipulation since because the pen device had low sensitivity. It is necessary to use a pen device with high sensitivity in our system.

From these results of the trial use, we will conduct long-term experiments by many designers to evaluate the effectiveness of our system and to identify the problems. In the evaluation experiment, it can be considered that we will use the time sampling method and apply our checklists used in our user observation.

VIII. CONCLUSION

Our study showed that in the early stages of design, comic designers create three components—character-config, plot, and storyboard—and that they use a trial-and-error approach with iterative progression from less detailed to more detailed representations. These observations give clues for the design of a sketch-based system supporting comic designers in the early stages of design. Our prototype system allows designers to move seamlessly backward or forward among the different granularities of representation across the three components, and concurrently use multiple related sheets. In an informal study with one professional designer, we found that she was enthusiastic about our system's concepts and would like to use such a system in her work.

REFERENCES

- [1] Tano S (1999) Analysis of obstruction and promotion of human creative work by information systems. In: Proc Human Interface Symposium '99, Osaka, Japan, pp 791-796 (in Japanese)
- [2] Hoeben A, Stappers PJ (2005) Direct talkback in computer supported tools for the conceptual stage of design. Knowledge-Based Systems Journal, 18 (8), pp 407-413
- [3] Landay Li Y, Guan JA, Ren X et al (2003) Sketching informal presentations. In: Proc ICIM 2003, Vancouver, Canada, pp 234-241
- [4] Sasaki Y, Iwata M, Tano S et al (2007) Evaluation of design support tool based on behavior analysis of designers. Journal of IPSJ, 48 (3):1113-1124 (in Japanese)
- [5] Ichino J, Makita T, Tano S et al (2009) Support for seamless linkage between less-detailed and more-detailed representations for comic design. In: Ext. Abstracts CHI 2009, Boston, USA, pp 3979-3984
- [6] Comic Studio Pro 4.0. <http://www.comicstudio.net/>
- [7] Kato S, Onisawa T (2006) The Support system for story creation using pictures. In: Proc 22nd Fuzzy System Symposium, Sapporo, Japan, pp 451-456 (in Japanese)
- [8] Kobayashi Y, Ishiwaka Y (2008) Manga builder "POM". Japan Society for Software Science and Technology, 25 (1):82-88 (in Japanese)
- [9] Shen J, Miyazaki S, Aoki T et al (2003) Intelligent digital filmmaker DMP. In: Proc ICCIMA'03, Xi'an, China, pp 272-277
- [10] Landay JA, Myers BA (1995) Interactive sketching for the early stages of user interface design. In: Proc CHI '95, Denver, USA, pp 43-50