Development of Embodied Visual Effects Which Expand the Presentation Motion of Emphasis and Indication

Yuya Takao¹, Michiya Yamamoto¹, and Tomio Watanabe²

¹ 2-1 Gakuen Sanda Hyogo 669-1137, Japan

{yuya.takao,michiya.yamamoto}@kwansei.ac.jp

² 111 Kuboki Soja Okayama 719-1197, Japan

watanabe@cse.oka-pu.ac.jp

Abstract. Although visual presentation software typically has a pen function, it tends to remain unused by most users. In this paper, we propose a concept of embodied visual effects that expresses emphasis and indication of presentation motions using a pen display. First, we measured the timing of presentation motions of pen use achieved while in sitting and standing positions. Next, we evaluated the timing of underlining and explanation through a synthesis analysis from the viewpoint of the attendees. Then, on the basis of the results of our measurements and evaluation, we developed several visual effects. These visual effects, which express the embodied motions and control the embodied timing, are implemented as system prototypes.

Keywords: Human interaction, presentation, timing control, visual effect.

1 Introduction

Recently, the number of situations requiring the use of information devices in presentations is increasing. Presentation software and video have become particularly popular elements of visual presentations. In addition, some researchers supports presenter's gesture, gaze and other forms of paralanguage by displaying presenter's figure in slides or by enabling presenters to control presentation system with bare hand [1],[2], or the other researchers have developed presentation support system by building more useful function with Pen display [3]. However, presentations using information devices can decrease the presenter's embodied motions and actions. Moreover, although presentation software generally includes a pen function, most users seem to avoid using it. One reason for this may be a difficulty for users to make themselves understood via embodied motions and actions while using information devices. In addition, the timing of the drawing and other pen effects are generally awful [4].

By focusing on the entrainment of embodied rhythms, the author in [5] has promoted the study of essential human interaction. As an example, the authors have analyzed greeting interactions between a human and a robot and between a human and a CG character, which made clear that a difference in timing to generate communicative actions and utterances can alter the effects of communication [6]. On the basis of these results, it will become possible to support communication to audiences by generating visual effects and delay the timing.

In this paper, we support a presentation that uses information devices by introducing the presenter's embodied motion and actions into a system via a pen display. We then control the drawing timing using visual effects. To achieve this, we first analyzed the drawing timing of a presenter accustomed to the pen function and then conducted an evaluation of the audience response. Next, we developed the embodied visual effects.

2 Concept

There are several approaches to support visual presentations using information devices. For instance, various wireless presenters are available in the market, and many researchers have made progress in the area of visual effects for presentations using laser pointers [7],[8],[9],[10]. However, using a laser pointer is useless in a large venue as the audience cannot see the presenter's motions and actions, and the pointer controlled by the presenter may be blurred on the screen.

In this study, we use a pen display to enhance the presenter's embodied motions and actions with the pen function. We chose a pen display as it is intuitively suitable for gesture inputs and expanding the embodiment. For this purpose, when we use a pen function to emphasize a part of a slide, visual effects are displayed on the slide. In this study, we propose two kinds of effects, one is for introducing the presenter's actions and the other is for controlling the timing when emphasizing certain aspects of a slide (Fig. 1).

Fig. 1. Concept of the embodied presentation system

3 Drawing Experiment by a Presenter

3.1 Experimental Setup

In our previous study, we made it clear that the timing needed to use a pen function as a pointer or for making utterance during presentations varies significantly and that the

timing is difficult to control equally. However, this was because the subjects used in the study were not accustomed to using the pen display. Therefore, we analyzed the presenter's motions and actions during a presentation by assuming that the presenter typically uses a pen display instrumentally. Figs. 2 and 3 show the system configuration. In each presentation, the slides are displayed on a pen display (WACOM, DTI-520), and the presenter explains and underlines the slides on a display. A PC records the utterances by using microphone (ELECOM, HS-HP03BK) and timing of underlining motions. There were six slides used (Microsoft, PowerPoint 2007) in the presentation, and the words were underlined in red.

Fig. 2. System configuration for a sitting position

Fig. 3. System configuration for a standing position

During the experiment, the presenters repeated the same slides for 15 min, after which they took a 5-min break before repeating the presentation again for an additional 15 min. Each experiment was performed by 10 Japanese students, 20–24 years in age. The subjects each gave presentations for an audience in both sitting and standing positions. While the subjects gave their presentations in a sitting position, the system sent the presentation data to a listener in another room (Fig. 4). For their standing presentations, we set up a video camera (SONY, HVR-1500A) to record the subjects (Fig. 5).

Fig. 4. Experimental set up for a sitting position

Fig. 5. Experimental set up for a standing position

Fig. 6. Results obtained during a sitting position

3.2 Results

Fig. 6 shows the difference in timing between an utterance and drawing motion during a sitting presentation. The data indicates the average time for the first two and last two presentations. When the timing of drawing is faster than that of utterance, the data shows a positive value. As a result, the values obtained from 7 of the 10 subjects are positive during the first half, while the values obtained from 9 of the 10 subjects are positive during the last half. Next, Fig. 7 shows the difference in timing between an utterance and the drawing motion during a standing presentation. As a result, the values obtained from 9 of the 10 subjects are negative during the last half. However, based on video confirmation, it took 0.5–1.5 s from the start of a drawing motion to the beginning of the actual underlining. Fig. 8 shows the difference in timing between

an utterance and the start of a drawing motion during a standing presentation. We found that the timing of the underlining motion occurs about 0.5 s later than the utterance and that the timing of the beginning of the drawing motion is 0–1.0 s faster than the utterance. Fig. 9 illustrates these relationships. Namely, both standing and sitting presentations show similar trends in their drawing timing.

Fig. 7. Start of an underlining motion

Fig. 8. Start of a motion

Fig. 9. Results obtained during a sitting position

4 Evaluation Experiment by Audience

4.1 Experimental Setup

To clarify the preferred timing of an utterance and underlining motion for audiences during a presentation, we performed an evaluation experiment based on the results presented in Chapter 3. We referred to two types of timings. The first is the data for when a drawing motion is 270 ms faster than an utterance, while the other is the data for when the drawing motion is 280 ms later than an utterance. There were three kinds of patterns compared: (a) an underlining motion set 270 ms earlier than an utterance, (b) no control used, and (c) an underlining motion set 280 ms slower than an utterance. During the experiment, patterns (a) through (c) were subjected to a paired comparison for both the types of timing data. Two of the six patterns (2 data $\times$ 3 patterns) were selected randomly. The subjects were instructed to select their “preferred” pattern between the two. The experiment was given to 12 (6 male and 6 female) Japanese students.

4.2 Result

Here, the Bradley-Terry model was fitted to the results for a quantitative analysis, as shown in the following equations.

$$P_{ij} = \frac{\pi_i}{\pi_i + \pi_j}, \text{ and} \tag{1}$$

$$\sum_i \pi_i = const.(=100), \tag{2}$$

where π_i is the intensity of preference for pattern i , and P_{ij} is the probability that i is judged better than j .

The left-hand side of Table 1 shows the results of the paired comparisons for data on the drawing motion 270 ms faster than an utterance. Based on the Bradley-Terry model, preference π was estimated as shown in the left-hand side of Fig. 10, where (c) was rated twice that of (b) and (a), which were almost equal. The right-hand side of Table 1 shows the results of the paired comparisons for data on the drawing motion 280 ms slower than an utterance. On the basis of the Bradley-Terry model, preference π was estimated as shown in the right-hand side of Fig. 10, where (a) is rated more than twice as high as (b), which was rated higher than (c).

From these results, the pattern in which the underlining motion and utterance are generated at the same time was preferred by most of the audience members.

Table 1. Results of a paired comprison

Underlining motion 270 ms faster than an utterance.					Underlining motion 280 ms slower than an utterance.				
	Faster	0	Slower	Total		Faster	0	Slower	Total
Faster		5	4	9	Faster		9	9	18
0	7		4	11	0	3		8	11
Slower	8	8		16	Slower	3	4		7

Fig. 10. Comparison of π based on the BT model

5 Embodied Visual Effects

5.1 Configuration of the System

On the basis of the results presented in Chapters 3 and 4, we found that an underlining motion is faster or slower than an utterance during presentations with a pen, but when the timing of an underlining motion and utterance are the same, audience reaction was rated high. Therefore, we have developed visual effects that can fill in the gap by changing the presenter's timing to the actual motion and adjusting it to the utterance. Fig. 11 shows the system configuration. This system is composed of a pen display (WACOM, DTI-520), a PC, a projector, and a screen. In the presentation software, visual effects are shown on slides (Microsoft, PowerPoint 2007), and the slides are shown on a pen display and a screen.

Fig. 11. System configuration

5.2 Visual Effects That Reflect Presenter's Action

During a presentation, the presenter's actions can attract an audience. Herein, on the basis of the results presented in Chapter 4, we have developed two visual effects that introduce 0.5-s motions and actions of a presenter, as shown in Fig. 12, as there is a gap of about 0.5 s between an utterance and an emphasis.

Therefore, we developed two visual effects that reflect a presenter's action. From the results presented in Chapter 4, it can be said that there is a gap of about 0.5 s between an utterance and an emphasis, and the developed visual effects reflect a 0.5-s action.

The Appearing Finger is one of these effects. When a presenter touches a pen display, the display shows a semi-transparent finger-shaped icon, the color of which gradually changes to black for 0.5 s. This effect is displayed to represent a finger appearing on a slide.

The second effect is a Zooming Finger. When the presenter touches a pen display, the display shows a large finger-shaped icon, which gradually becomes a smaller icon for 0.5 s. This effect represents a presenter's finger approaching the slide.

5.3 Visual Effects Control the Timing of Emphasizing Subjects

We have developed two additional effects by controlling the timing of an emphasized motion of a presenter, as shown in Fig. 13.

A Square Line is one of these effects. This effect occurs when the presenter draws an L-shaped line. When the presenter draws such a line, a semitransparent square composed of the start and end points of the line are shown.

The other effect is a Square Zoom. This effect also occurs when the presenter draws an L-shaped line. When this occurs, the square area composed of the start and end points of the line is zoomed 1.5 times.

These effects designate a presenter’s drawing action. Thus, the presenters are conscious of their drawing, and the timing gap is filled naturally.

Fig. 12. Visual effects that express embodied motions

Fig. 13. Visual effects for controlling embodied timing

6 Conclusion

In this study, we developed a concept of embodying visual effects that expand the presentation motions of emphasis and indication using a pen display. First, we measured the presentation motions of pen use by focusing on the timing while in sitting and standing positions and we made it clear that an underlining motion has about a 0.5-s lag behind an utterance. Next, we evaluated the timing of underlining and explanation using an analysis by synthesis from the viewpoint of the audience, and we made it clear that the audience prefers a pattern in which the underlining motion and utterance begin at the same time. Then, on the basis of the results of our measurements and evaluation, we developed two visual effects that express embodied motions. We also control embodied timing as a prototype of the system. Concretely, the first effect expresses embodied motions (Fig. 12) and the other is the visual effect that controls embodied timing (Fig.13). Hereafter, we will confirm the effectiveness of these effects.

Acknowledgements. This work under our project “Embodied Communication Interface for Mind Connection” has been supported by “New IT Infrastructure for the Information-explosion Era” of MEXT KAKENHI. Also, our project “Generation and Control Technology of Human-entrained Embodied Media” has been supported by CREST of JST.

References

1. Tan, K.-H., Gelb, D., Samadani, R., Robinson, I., Culbertson, B., Apostolopoulos, J.: Gaze Awareness and Interaction Support in Presentations. In: ACM International Conference on Multimedia, HPL-2010-187, pp. 643–646 (2010)
2. Cao, X., Ofek, E., Vronay, D.: Evaluation of alternative presentation control techniques. In: Conference on Human Factors in Computing Systems: CHI 2005 Extended Abstracts on Human factors in Computing Systems, April 02-07, pp. 1248–1251 (2005)
3. Anderson, R., Anderson, R., Simon, B., Wolfman, S.A., VanDeGrift, T., Yasuhara, K.: Experiences with a Tablet PC Based Lecture Presentation System in Computer Science Courses. In: Proceedings of the 35th SIGCSE Technical Symposium on Computer Science Education, SIGCSE 2004, vol. 36(1) (2004)
4. Yamamoto, M., Watanabe, T.: Time Lag Effects of Line Drawing to Reading Utterance in the Emphasis and Indication of Displayed Text; Human Interface 2008, DVD-ROM, pp. 545–548 (2008) (in Japanese)
5. Watanabe, T.: Embodied Communication Technologies and Their Applications. Institute of Systems, Control and Information Engineers 49(11), 431–436 (2005)
6. Yamamoto, M., Watanabe, T.: Time Lag Effects of Utterance to Communicative Actions of Human-Robot Greeting Interaction. Journal of Human Interface Society: Human Interface in Japan 6(3), 343–350 (2004) (in Japanese)
7. K.F.: A Laser Pointer/Laser Trails Tracking System for Visual Performance; Human-Computer Interaction - INTERACT 2005 (LNCS3585). In: Costabile, M.F., Paternó, F. (eds.) INTERACT 2005. LNCS, vol. 3585, pp. 1050–1053. Springer, Heidelberg (2005)

8. Murata, Y., Shizuki, B., Tanaka, J.: Shadowgraph: A presentation tool using a pen shadow. WISS in Japan, pp. 73–78 (2008) (in Japanese)
9. Nagai, H., Yamamoto, M., Watanabe, T.: A Speech-Driven Embodied Entrainment System with Visualized and Vibratory Nodding Responses as Listener. Transactions of the Japan Society of Mechanical Engineers in Japan 75(755), 163–171 (2009) (in Japanese)
10. Wesugi, S., Kubo, T., Miwa, Y.: Tool-type interface system supporting for an expansion of body image toward a remote place - Development of virtual shadow interface system. In: Proceedings of Society of Instrument and Control Engineers, pp. 912–917 (2004)