Design Support Tool Using Pen Device for Simplification of Animation Design

Taiki Maruya[1(✉)], Shun'ichi Tano[1], Tomonori Hashiyama[1], Mitsuru Iwata[1], Junko Ichino[2], and Yoichi Hyono[1]

[1] Graduate School of Information Systems, University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan
maruya@media.is.uec.ac.jp, {tano,hashiyama,miwata}@is.uec.ac.jp, hyono@cori.com

[2] Faculty of Engineering, Kagawa University, 2217-20 Hayashicho, Takamatsu, Kagawa 761-0396, Japan
ichino@eng.kagawa-u.ac.jp

Abstract. Content using animation is widely available, and animation is often used in educational content to promote the understanding of mechanical structures and concepts. However, animations are currently created with software that requires complicated operations and programming. Such software inhibits intuitive and creative animation design. In this study, we analyze animations and determine the factors that inhibit intuitive and creative animation design. Moreover, we have developed a design support tool to make designing animations easier.

Keywords: Animation design · Pen device

1 Introduction

Animation is widely used in educational content on computers. Animated explanations of concepts and mechanical structures have become common in educational content due to the spread of e-learning. Animated explanations promote a user's understanding of concepts and mechanical structures, and abstract concepts that cannot be easily visualized by a user can be expressed by using animation. However, these animations are created with high-performance animation design software that has complicated interfaces and script language programming used for displaying the complex movements and changing attributes of animated content. For this reason, it is difficult for people who lack knowledge of and experience in animation production to create these animations, and therefore most animations are almost always created by professionals.

In addition, high-performance animation design software obstructs creative, intellectual animation design due to its complicated GUI. To compensate for the complicated GUI, there are some tools that enable the intuitive creation of animations by freehand drawing. However, these tools are not generally used due to the lack of support for the complicated movements that animated explanations require, resulting in completed animations that are of poor quality.

C. Stephanidis (Ed.): HCII 2015 Posters, Part I, CCIS 528, pp. 49–54, 2015.
DOI: 10.1007/978-3-319-21380-4_9

In this study, we have developed a design support tool to make designing animations easier and implemented a prototype of the tool.

2 Analysis of Animation

Animations were analyzed to identify the types of animation that the tool should support. We classified animation into two levels of expression: external and internal. The external level of expression was defined as animation that highlights elements of content designed to attract a user's attention and elements of decoration designed to entertain a user, such as flashing banner advertisements. The internal expression level was defined as animation that promotes a user's understanding, such as animations that illustrate mechanical structures.

Animations that belong to the internal level of expression are mainly used in four areas. The GUI animations of operation systems are used for usability improvement. PowerPoint animations are used to explain content; however, creating complicated animations in PowerPoint is difficult. Likewise, motion graphic animations and web animations are used for expressing complicated concepts. Therefore, these animations are used for explanations. However, since creating complicated explanatory animations is difficult, these animations can usually only be designed by experts. Therefore, a support tool for novice animators is require (Fig. 1).

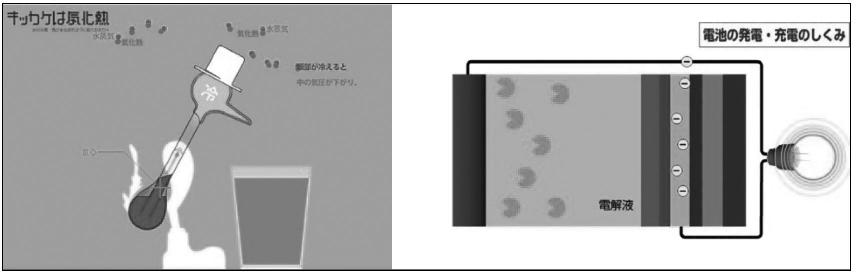

Fig. 1. Examples of animations having an internal level of expression

3 Related Work

Animation design is classified into object design and motion design processes. We investigated previous design methods and previous studies on each design process. In object design, high-performance drawing software is usually used. However, using the complicated GUI and feature-rich drawing tools found in high-performance drawing software distracts the user from visualizing the overall concept of the design. SILK [1] and DENIM [2] solve this problem by using handwriting in the GUI design and web design. In motion design, movie making software is usually used. However, complicated software operations and programming skills are necessary to use movie making software; therefore, design in accordance with intention is difficult. KOKA [3] enables the user to intuitively define motions by drawing an effect line with a pen device, which solves this problem.

Animation creating software that enables the user to design both objects and motions exists. With such software, similar problems to those found in SILK, DENIM, and KOKA occur in both processes. K-Sketch [4] solves these problems by having object design performed by handwriting and motion design defined by the stroke of a pen device.

Three problems have been pointed out by previous studies.

1. Objects must be designed before motions.
2. Quality of the finished animations remains low.
3. Supported motions are restricted.

First, in existing tools, motion can be predicted from the form and direction of the object, which inhibits free motion design. Second, using handwriting in the design process is effective; however, handwriting design tools cannot generate the regular objects and motions that are made with high-performance drawing tools. Third, it is difficult to define the timing between a large number of motions and the motions of joints. We designed our tool to solve these problems. Figure 2 shows the functions necessary for the proposed tool.

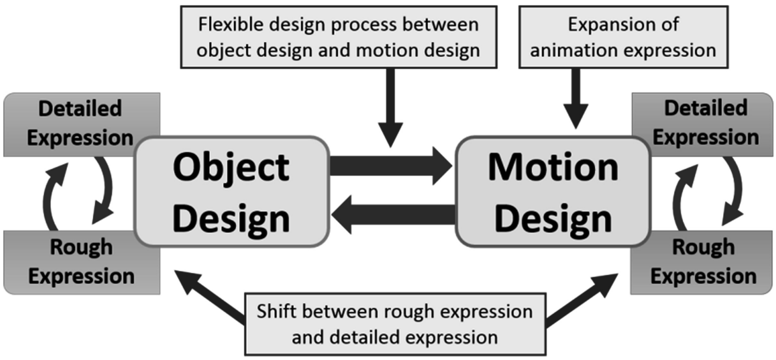

Fig. 2. Necessary functions for proposed tool

4 Tool Design

4.1 Basic Interaction

The basic definition method for motion in our tool is a real-time parameter definition based on freehand drawing input using the pen device. This is based on a recording method used by K-Sketch. First, the user chooses the kind of parameter to record from the list. Next, the user presses the "record" button and makes the system record the wait state and then the position of the stroke pen on the canvas. The position parameter defines the input of the pen stroke, and the traced outline of the motion appears on the canvas. The rotation parameter is recorded by drawing circular strokes around the center of the canvas. The scale and transparency parameters are recorded by drawing a vertical stroke on the canvas. The color parameter is recorded by drawing a stroke on the color-bar displayed on the canvas.

4.2 Flexible Design Process Between Object Design and Motion Design

Our tool comprises two screens: a motion design screen and an object design screen, and the user can create animations while transitioning between the two screens. The user can take a trial and error approach depending on the animation, making a flexible designs process in the creation of animations possible while designing both objects and motions.

4.3 Shift Between Rough Expression and Detailed Expression

Our tool can shift between rough expression such as freehand drawing and detailed expression such as that found in the design of geometric figures and fonts. This function is realized by character recognition and figure recognition algorithms. The user can progressively shift the level of detail by operating a slider in the UI. Therefore, this function provides not only design by the rough expression of freehand drawing but also results in orderly, completed animations.

4.4 Expansion of Animation Expression

Functions are included that enable expressions that were not supported in previous tools. The first is a function that matches the timing between motions. In our tool, the simple action of drawing a line across the traced outline of multiple motions matches the timing of the motions. The second is a function that gives an object a joint. In our tool, joints are made by the simple action of overlapping two objects and choosing an axis for the joint. Furthermore, a fine adjustment to a parameter of the function enables the user to express subtle changes through freehand drawing. The position parameter is changed by dragging the path of the traced outline. The rotation, scale, and transparency parameters can be changed by drawing a stroke on the graph that expresses the value of the parameter. The color parameter is changed by using an original UI that can define gradation between any two points (Fig. 3).

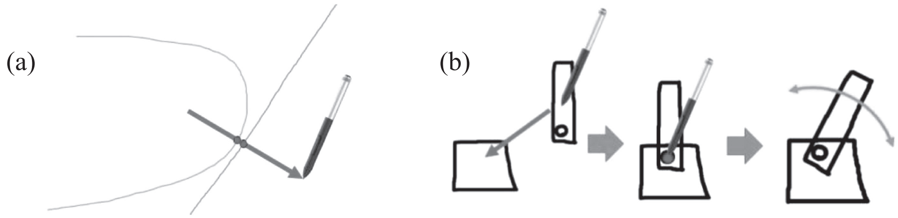

Fig. 3. (a) Example of timing matching function: match timing at red points (b) Example of joint creating function: drag objects and overlap them, and then tap axis (Color figure online).

(a)

(b)

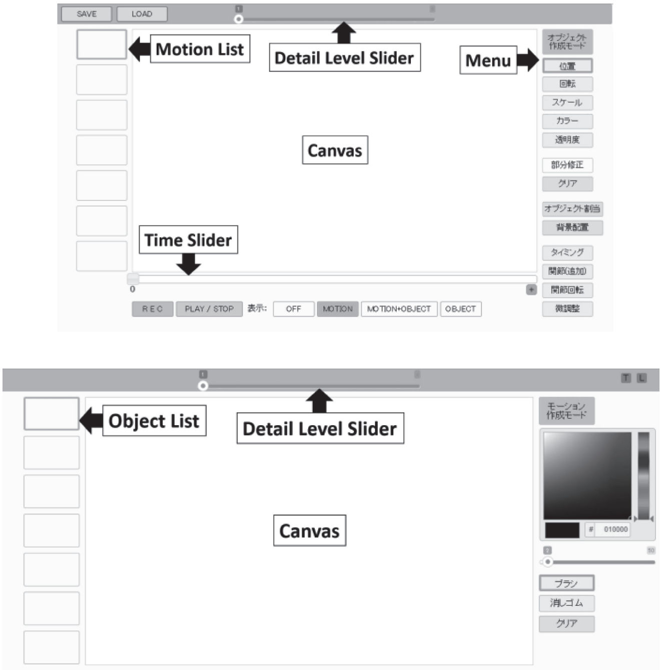

Fig. 4. (a) Motion design screen, (b) Object design screen

4.5 Prototype Tool

The prototype tool was implemented on a Windows PC. It was developed using JavaScript and worked on a web browser. The hardware used for input and output was a liquid crystalline pen tablet (Cintiq 24HD Touch) produced by Wacom. The prototype system included all of the functions described in Sect. 4 of this paper. However, character recognition and figure recognition support exist only for some characters and figures (Fig. 4).

5 Conclusion and Future Work

In this study, we have analyzed animations and pointed out problems in designing animations. Furthermore, we have developed and prototyped a design support tool for creating animations that aims to solve the problems inexperienced people have with animation production. In our future work, we will evaluate our tool and confirm the effectiveness of the proposed functions. In addition, we will improve the character recognition and figure recognition performance of our tool.

References

1. Landay, J., Myers, B.: Interactive sketching for the early stages of user interface design. In: CHI 1995 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 43–50 (1995)
2. Lin, J., Newman, M., Hong, J., Landay, J.: DENIM: finding a tighter fit between tools and practice for web site design. In: CHI 2000 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 510–517 (2000)
3. Kato, Y., Shibayama, E., Takahashi, S.: Effect lines for specifying animation effects. In: Proceedings of the IEEE Symposium on Visual Languages and Human-Centric Computing, pp. 27–34 (2004)
4. Davis, R., Colwell, B., Landay, J.: K-sketch: a 'kinetic' sketch pad for novice animators. In: CHI 2008 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 413–422 (2008)