Anticipation of Affective Influence of Visual Effects

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Abstract

We have investigated affective influence derived from the visual effects in moving images. In this paper, we confine ourselves to transition, especially dissolve, as one of the visual effects.

We found that the influence of transition can be anticipated by the impressiveness of the pre-transition and post-transition images. If both images are simple, the post-transition image is dominant in affective influence. And if both are complex, more impressive images are dominant in affective influence. Moreover, in the former case, the influence is independent of duration of transition, while in the latter case, the dominance of the post-transition image increases with the duration of transition.

Keywords: Affective influence, Visual effect, Transition, SD method, Impressiveness

1 Introduction

We conduct researches into evaluating the visual effects of the digital video. Visual effects are important elements that are applicable to the wide range of the image media such as television, movies, video games, and WWW pages. The visual effects design is considered as the skill of enhancing the stage effects of the television (ITE, 1999). We can express the word of the "television" in a different word: the "whole of an image". The optical treatment has been their basis in the movies using films, but in recent years they have been used actively in the image production since computers were introduced into the image production process. Complicated visual effects become now possible by the development and diffusion of the computer technology. Moreover innumerable variations of visual effects have been made easily by changing parameters.

The image media, especially the digital media have meaningful relations with the computers. And recently the application range of visual effects has been getting so extensive, for example they are used for the desktop interface using operating systems of personal computers.

Visual effects are often applied in the transition part between consecutive pair of cuts. Transition is sometimes thought to be as important as the cut itself (Katz, 1996).

There are many software products for image editing in the market that are provided with several kinds of effects on transition such as "dissolve", "wipe", "chroma key", and so on. Transition often suggests a change of the time and the space and a movement in a play movie, and various transitions not based on established concept are applicable to a commercial film, a music video and so on (Katz, 1996). In any case an image-maker expects the observer to understand affective meaning by transition. The table 1 summarizes the literature concerning the meaning of the cut in image editing and the affective meaning (Katz, 1996).

Table 1: Some meanings of transitions and their affective meanings.

The kind of transition	The meaning of the image	Affective meaning
Cut	A present stop	Powerful, Rhythmical, Force, Comical
Dissolve	The mediation of the time of the non-continuance and the space	With a profound meaning
Focus in / Focus out	The loss of consciousness	
Transformation	Cut itself is made the target of the interest.	
Fade	The episode and the mesotomism of the story	
White in / White out		(There is no mood generally recognized.)

Usually, visual effects are designed intuitively and empirically by anticipating the affective meaning of the observer, but without systematic considerations based on visual cognitive science or engineering psychology. We have investigated affective influence derived from the visual effects in moving images. In this paper, we propose a method for anticipation of the affective meaning of the visual effects, and we confine ourselves to transition, especially dissolve, as one of the visual effects. This evaluation method assists the designers to apply the visual effects suitably to image products.

2 A technique to analyze the emotional meaning of the image

The Semantic Differential (SD) Method by C. E. Osgood is often used for evaluating emotionally dynamic functions (Sneider, 1969). There are actual results of the research into the mental effects produce which many sensuous stimuli such as color, color scheme, lighting, tone, and so on. Studies of the color science have mainly conducted with paper as the indication media. Recently, many researches are carried out with computer displays in place of paper (for example, Horita, 1998). In their

research, it was found that single color derives three factors proposed by C. E. Osgood, that is, Evaluation (*E*), Activity (*A*), and Potency (*P*) are recognized in the same way as the case of paper. It was also reported that the three factors are derived from music, effect sound, shapes, symbolic words, images, and so on.

The SD method was modified by T. Matsuoka to refine the analysis of affective influence (Matsuoka, 1995). In the method, adjectives are divided into five steps according to the difference of the frequency of the "negative" and the "positive". Under the usual SD method, every participant chooses the numerical evaluation (from -3 to 3) of the meaning of the color every time the combination of all the adjectives of three factors changes. On the other hand, the modified SD method asks every participant to choose the adjectives he/she thinks to be suitable freely. The modified SD method is considered as the way the character of the meaning is easy to grasp, and it is also considered to be effective especially in the color.

By the way, Junichi Nakano classified the image information into quadrant: (complicated and simple.) and (vague and clear) which cross each other. (Figure 1) (Uejo, 1990).

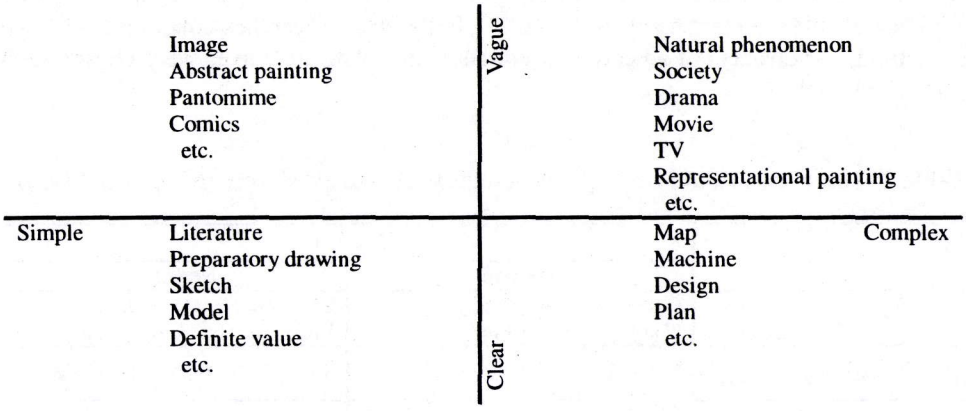

Figure 1: A classification of image information (Adapted from (Uejo, 1990))

Images, for example, single color images belong to the second quadrant (simple, vague). On the other hand, animated images belong to the first quadrant (complex, vague) from the viewpoint of the affective meaning.

We found in our previous research that transition between a pair of single color images derived affective influence with three factors "*E, A, P*" (Soga, 1998). Therefore, we premise the affective meaning of the visual effects of animated images also contains the same three factors. We propose an additional measure of the modified SD method proposed by T. Matsuoka, namely, "Positive and Negative Value" of "*E, A, P*".

3 Experiment

The affective meaning of digital effects are examined. The environment in which images are actually appear is not in the same condition. The difference of the affective meaning based on this difference is predicted to exist. In our experiments, 'dissolve (cross fade)' is used among various kinds of transitions, for the purpose of the collection of fundamental information. 'Dissolve' has been considered recently as a fresh sense again though it is one of transitions used extensively from the film age (Katz, 1996). It is pointed out that if the transition time is set up from 13 milliseconds to 100 milliseconds "effects of subliminal perception" may appear (Sakamoto, 1999). Therefore, the transition time was limited to the range from 0.5 seconds to over 1 minute, which was the applicable general time of dissolve.

3.1 Method

As the way of grasping mental effects in the digital video quantitatively the modified SD method was used in this experiment. In the SD method, adjectives are settled on both ends of three semantic scales "*E, A, P*". In the past researches concerned with the SD method, various sets of adjectives were adopted. The adjectives were chosen such as shown in Table 2.

Table 2: Three factors and correspondent adjectives (Adapted from (Matuoka, 1995))

Three factors	Adjectives	
	Positive	Negative
Evaluation	Good, Fortunate, Happy, Comfortable, Pleasant	Bad, Unfortunate, Sad, Uncomfortable, Unpleasant
Activity	Noisy, Hot, Cheerful, Fast, Near	Silent, Cold, Lonely, Slow, Far
Potency	Brave, Difficult, Exacting, Heavy, Strong	Timid, Easy, Easeful, Light, Weak

A participant was asked to operate the program for the experiment. This program was indicated unintentionally one after another in the screen of the digital video. The screen of the questionnaire was indicated on the display after that. Then the participant was asked to choose the adjectives that he/she thought agree with the impression created by the images. This task was repeated for every case. The specification of the experiment data is shown in the table 3.

Table 3: The specification of Digital Movie used for the experiment

Format	QuickTime Movie
Size	200*150 dots
Compression	Cinepack, Best
Frame rate	12 fps (frame per second)

In the experiment, two animated images (color images) were used. The one image is an animated image (hereafter called M) of snow which keeps falling and a snow-covered mountain. The other is an animated image of fierce flame (hereafter called B). The images used for the experiment were indicated in the same coordinate location for the white background. The size was 200 x 150 dots, which was chosen to playback smoothly in consideration of the ability of the CPU in the experiment. The participants in this experiment were the junior college female students (from 18 years old, 20 years old) of information processing major with some years of computer experiences.

4 Results

4.1 Affective meaning of sample images without transition

Table 4 shows a comparison of each tabulated number of three factors "*e, a, p*", when two animated images of a flame (B), and a snow-covered mountain (M) were seen respectively. (Table 4).

Table 4: The comparison of the impressions of the animated images.

	e+	*e*−	*a*+	*a*−	*p*+	*p*−
B	0	23	13	14	21	1
M	6	9	2	40	3	16

The number of the participants: 16

Dissolve was not given to the digital images in the first experiments. The difference between any two of "Evaluations, Activities, Potencies" was statistically significant: (Evaluation (F (1,62), P=.0145<0.05); Activity (F (1,30), P=.0044<0.01); Potency (F (1,30), P=.0004<0.0l)). It is considered that impression of these images varies. As for the image of the flame (B), evaluation (negative) and potency (positive) are prominent. This can be thought to convey an impression of a very unpleasant image but a very powerful feeling when it is interpreted from the meaning of each factor. As for the image of a snow-covered mountain (M), active (negative), potency (negative) are prominent in the same way. This can be thought to be a very delicate image but not a very active one. It was found that by using the modified SD method the affective meaning of the image could be grasped from this result.

According to the result of the first experiment it is possible to say these two sample images derive different affective influence, as we expected in the beginning.

Table 5 shows the comparison between the animated images and single colors in impressions. The impression of the image of snow-covered mountain (M) is different from that of white, and the impression of the image of flame (B) is different from both black and red.

Table 5: The comparison between the animated images and single colors.

	White	M	Black	Red	B
Evaluation	+2	0	0	-2	0
Activity	-1	-2	-1	0	+2
Potency	-2	-1	+2	+2	+2

4.2 Affective meaning of the edited images with transition

We make a comparison between the affective meaning of animated images and those combined with transition 'dissolve'.

ANSI/SMITE258M-1993 is a standard of transitions including "wipe", but unfortunately the standard of dissolve has not been established. We adopted "cross dissolve" built in "Premiere" developed by Adobe Corporation, which is an animation editing software. The transition time was set to the next three: 0-second (None); 1.03-seconds (31 frame, Middle); and 2.06-seconds (62 frame, Long). As for these scenes we adjusted the time of the non-gradation part of pre- and post- transition, so that the total time should be within 4.8-seconds (144 frame). As for the order of two images, both ways of presentation $B \Rightarrow M$ and $M \Rightarrow B$ were provided.

We referred to the following result in adopting 'dissolve', and in deciding the transition time. We instructed junior college girl students of information processing to produce about 30 second digital images with the womanly sensitivity expressed freely. As the result, most of them were apt to choose 'dissolve' as a transition, and the average transition time they practiced was 1.03-seconds (31 frame). This fructification shows it is within a range from 0.5 seconds to over 1 minute, which is the general time of dissolve in the image editing spot. The results of gradation of the image and cut image, and its affective meaning were summed up and analyzed (Tables 6, 7).

Table 6: A comparison of the impression of movies

	Effect Time	e+	e-	a+	a-	p+	p-
B	None	0	23	13	14	21	1
B->M	Long	0	8	6	26	10	6
	Middle	0	19	10	22	14	4
	None	1	17	7	22	16	7
M->B	Long	0	14	14	15	16	2
	Middle	0	23	6	19	17	5
	None	0	21	6	21	17	2
M	None	6	9	2	40	3	16

The number of the participants: 16

Table 7: The impression of movies and its construction

	Effect Time		M	B
B->M	Long	e		*
		a		
		p	*	
	Middle	e	*	
		a	*	
		p	*	
	None	e		
		a		
		p	*	
M->B	Long	e		
		a	**	
		p	**	
	Middle	e	*	
		a		
		p	**	
	None	e	**	
		a		
		p	**	

*:A significant difference
**:A certain significant difference
The number of the participants: 16

According to the result, a statistically significant difference was recognized in the frequency of each "e,a,p" of the scene of the digital video, compared between $B \Rightarrow M/M \Rightarrow B$ and M/B, in whichever order of presentation. This shows that the affective meaning that an edited image brought was different from the image of the snow-covered mountain regardless of the order of the cut. We compared this fructification with our previous research using single color images (Soga 1998). Table 8 shows the result of the experiment.

Table 8: The impression of compare with transition color

	Effect Time		Red	Blue
Blue->Red	Long	e		
		a		**
		p		
	Middle	e		
		a		**
		p		
	None	e		
		a		**
		p		
Red->Blue	Long	e		
		a	**	
		p		
	Middle	e		
		a	**	
		p		
	None	e		
		a	**	
		p		

*:A significant difference
**:A certain significant difference
The number of the participants: 26

The participants of the experiment with single color images were 26 junior college female computer experienced students who major in information processing from 18 to 20-year-old. A combination of the single colors was edited with dissolve in the same way as the former experiment, and the specification was the same as that of this image editing. The experiment was conducted on a comparison of scenes where colors change gradually and the affective meaning of the color which composes the edited image. This experiment shows a comparison of each "e,a,p" factor about Blue and Red which were main elements of the gradation of the colors from Red to Blue and vice versa. The affective meaning of the edited image is close to that of the color indicated later. And the fructification was the same though several experiments were

done by using each color of "Red, Green, Blue, Cyan, Magenta, Yellow" including this example. Then we obtained the fructification that the affective meaning of edited images was different from that of the color indicated first. The notable point is that the influence of the order of the image of the single colors edited in this way is greatly different from the one in the research of this time where the images of actual objects were used.

We can presume from these two experiments there is a possibility that the affective meaning of the edited image depends not only on the kind of transition, but also on the impressiveness of each image. The impression of a single color is delicate, and that of combined and edited images is influenced by the image indicated just immediate before (the color indicated later). On the other hand, the impression of the edited images with transition is strongly influenced when the affective meaning of each original image is deep and clear like those of the burning flame and the snow-covered mountain.

4.3 Anticipation of the affective meaning of the images with transition

The result of the table 6 shows that the impression of animated images with transition depends on neither the transition time nor the order of the image, and that the value of evaluation (negative) is high in most cases. Therefore, it is possible to say that these images gave observers very unpleasant impression.

From the viewpoint of the transition time no significant difference was recognized in each "evaluation, activity, potency" as a result of the analysis of variance. In order to examine and analyze the relation between the affective meaning and the impression derived from transition, we introduce a distance D (1).

$$D = \sqrt{(e_0 - e_1)^2 + (a_0 - a_1)^2 + (p_0 - p_1)^2} \tag{1}$$

In the expression (1), "e_0, a_0, p_0" indicate the standard value for each image used for the pre-transition and post-transition, and "e_1, a_1, p_1" are the total value of "e, a, p" when edited image with transition is indicated. Each impression is arranged by considering the value that negative value was subtracted from the positive value of three factors of the table 6 as the point of the space and these points are retailed in the space which 3 shafts of "evaluation, activity, potency" compose. The total fructification by the expression (1) is shown in the table 9. Each value shows a distance from the affective meaning of the images of the flame and the snow-covered mountain. The table 10 is made up about the example of the single color in the same way as mentioned. We examined about a changing from the flame to the snow-covered mountain concerning the table 9.

Table.9: A transition of the affective meaning by dissolve.

	Effect Time	B	M
B->M	Long	24.72	21.19
	Middle	12.08	32.80
	None	16.43	28.25
M->B	Long	9.06	41.06
	Middle	12.65	33.85
	None	14.18	32.39

In this case, a distance between the impression of the edited images and that of the flame is 14.18, 12.65, 9.06 respectively in the order of the transition time Long, Middle, None each. In other words, it is understood that in the case of the flame the distance of the impression approaches gradually. As for the case of the impression of the snow-covered mountain, there is a tendency that the distance falls apart gradually in order of 32.39, 33.85, 41.06 in the same way.

It is recognized in almost all examples that the longer the transition time is, the closer the image indicated later approaches.

However, the table 10 shows clearly that there is no tendency like this in the case of a single color.

Table 10: A transition of the affect of meaning for a-color by dissolve

	Effect Time	Red	Blue
Red->Blue	Long	42.39	9.43
	Middle	52.44	11.66
	None	35.19	11.49
Blue->Red	Long	18.47	34.01
	Middle	17.94	36.47
	None	19.87	36.29

Like this, this experiment may show that the degree of the gradation of the impression could be anticipated by measuring a distance in the space mentioned above between the impression of a standard image and that of the edited images.

5 Conclusion

The affective influence derived from the transition in animated images was analyzed by using a modified SD method, where it was measured by three factors: *E* (evaluation); *A* (activity); and *P* (potency). We found that the influence of transition can be anticipated by the impressiveness of the pre- and post-transition images. If both images are simple, the post-transition image is dominant in affective influence. And if both are complex, more impressive images are dominant in affective influence. Moreover, in the former case, the influence is independent of duration of transition, while in the latter case, the dominance of the post-transition image increases with the duration of transition. As a derivative, we propose a criterion of impressiveness, namely the depth of affective influence.

It was proved that the affective influence caused by the difference in applicable time of visual effects can be shown by measuring a distance between the standard point and the points of edited images with transition in the "*a, e, p*" space. As for this specific example, it seems that the longer the time is when images of actual objects are edited with dissolve, the closer the impression comes up to the impression of the image indicated later. Moreover, it is quite interesting and important that the difference between the affective meaning of the actual images and that of a single colored images. There is a possibility that the strength of impression influences the affective meaning of the edited images regardless of the editing way.

It was confirmed by this research that the affective meaning of the image information indicated in the display could be anticipated by using the modified SD method. The duration of image used in our experiment was very short, but the applicable range of this technique is expected to be larger.

Finally, we should consider, in the way of modified SD method, that the difference was not detected between two cases that negative and positive values are of the same and that there is no selection. It is necessary to investigate further about this matter.

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