

Feeling Expression using Avatars and Its Consistency for Subjective Annotation

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Abstract. Consumer Generated Media(CGM) is growing rapidly and the amount of content is increasing. However, it is often difficult for users to extract important contents and the existence of contents recording their experiences can easily be forgotten. As there are no methods or systems to indicate the subjective value of the contents or ways to reuse them, subjective annotation appending subjectivity, such as feelings and intentions, to contents is needed. Representation of subjectivity depends on not only verbal expression, but also nonverbal expression. Linguistically expressed annotation, typified by collaborative tagging in social bookmarking systems, has come into widespread use, but there is no system of nonverbally expressed annotation on the web. We propose the utilization of controllable avatars as a means of nonverbal expression of subjectivity, and confirmed the consistency of feelings elicited by avatars over time for an individual and in a group. In addition, we compared the expressiveness and ease of subjective annotation between collaborative tagging and controllable avatars. The result indicates that the feelings evoked by avatars are consistent in both cases, and using controllable avatars is easier than collaborative tagging for representing feelings elicited by contents that do not express meaning, such as photos.

1 Introduction

There has been an increase in development and utilization of social software that shares private information, such as photos and diaries, among a community or the general public. As each user publishes their own contents on the web, the amount of web content has increased rapidly. Therefore, it has become difficult to extract necessary information and much of the information that is available is left unused. The current mainstream method of information retrieval is to use keywords for the contents, but searching by subjective information, such as feelings or intention, is expected to allow users to find forgotten information. Therefore, we propose “subjective annotation” in which users annotate contents

with subjective information, and construct a content management system to store and browse the contents based on the subjective annotation.

Preliminary experimental results on expressiveness and ease of subjective annotation by collaborative tags used for classification in social bookmarking systems and blogs suggests that it may be difficult to express subjectivity using verbal expressions, such as tags. In this paper, we propose the usage of avatars as a means of nonverbal expression of subjectivity, and report verification of its validity by experiments on the consistency of feelings elicited by avatars over time for an individual or a group of people. We also compare the expressiveness and ease of subjectivity between avatars and tags.

2 Web Content Management and Annotation

Consumer Generated Media (CGM), such as weblogs (commonly referred to as “blogs”) and photos, which are published by users, have increased rapidly because the contents previously stored on local terminals are now available on the web. To manage this large amount of web content, social bookmarking services have appeared.

Social bookmarking services manage their contents from the bottom-up by sharing annotations, such as tags or keywords, which are added to the contents by users[1]. This enables the discovery of related contents through tags, and users can reach information that would otherwise be difficult to find.

However, increasing the number of tags makes it difficult for users to keep track of their tags. Social software stores the contents that are important to users, but there are few chances to browse these contents again. Even if tags are added to ease content searching, users will not search the contents without a clear purpose, and many of the contents that may be important for users may be left unused in social software.

3 Subjective Annotation

3.1 What is Subjective Annotation?

We propose “subjective annotation” which involves adding subjective information, such as feeling or intention, to the contents. Currently, it is common to annotate web contents using a number of tags. Most of these tags explain the contents objectively, and only a few tags indicate subjective information. The social bookmarking service del.icio.us⁴ has some tags that indicate subjectivity, such as “to be read,” which make it easier for users to determine how to use the contents. At the photo sharing service Flickr⁵, some photos are tagged “cute” or “cool,” and users can search and classify photos according to their own impressions and values[2]. Therefore, subjective annotation can assist users to make efficient use of web contents.

⁴ <http://del.icio.us/>

⁵ <http://flickr.com/>

3.2 Content Management System Based on Subjectivity

Here, we constructed a content management system based on subjective annotation that helps users to discover knowledge from their past experiences. The proposed system recreates their past feelings and excitement by using subjective annotation over a wide variety of contents and reminds users of their behaviors. The system targets the web contents of social software, such as photo sharing, social bookmarking, and schedule sharing services that are browsed only when users need them. To utilize wasteful accumulated contents, the system accumulates the contents with subjective annotation in social software and provides a content browsing environment based on subjectivity.

3.3 Collaborative Tags for Subjectivity Expression

The expression of subjectivity must be considered to implement subjective annotation. Most annotations describe the contents in some way, and the expressiveness of the current annotation methods regarding subjectivity and user stress must be assessed. First, we adopted collaborative tagging, which is commonly used as a means of annotation of web contents, as an expression of subjectivity and perform an exploratory experiment on the expressiveness of subjectivity and user stress.

In the experiment, 20 participants add tags to 10 photos with subjective information, such as feelings and impressions, and answered a questionnaire survey. A wide variety of subjectivity, such as intention, feelings, and imagery, are used as tags. However, participants report feelings of stress regarding the difficulty of verbalizing subjectivity.

The questionnaire survey indicates that it is difficult to verbalize subjectivity with tags. Therefore, subjectivity must be expressed by a nonverbal method. We adopt an avatar for this purpose, as it seems suitable to express subjectivity such as feelings. It is easy to deal with avatars on computers and users often identify themselves with avatars. Therefore, avatars allow users to express their feelings naturally and they are able to express their feelings with gestures. In addition, recognition of avatars is consistent from person to person, even with different nationalities[3].

4 Avatars as Nonverbal Expression of Subjectivity

4.1 Controllable Avatars for Subjective Annotation

We adopted a controllable avatar to express a wide variety of feelings. The avatar has a variety of patterns of facial expressions, and arm and leg positions. Figure 1 shows examples of avatars and Fig. 2 shows all parts of the avatars. Users combine these face, arm, and leg parts to express their feelings.

The avatar used for nonverbal expression of subjectivity is shown in Fig. 1 as a cartoon character. There are three reasons why we use this type of avatar. First, we feel that Japanese users show a preference for animated illustrations



Fig. 1. Avatar examples

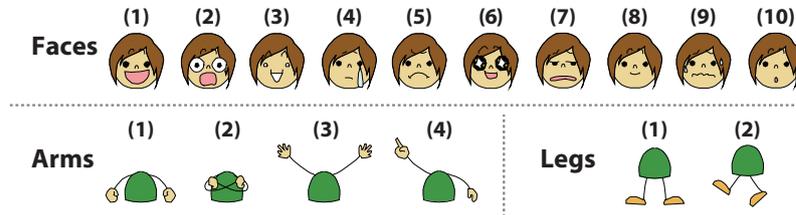


Fig. 2. The avatar consists of faces, arms, and legs

rather than realistic figures like the avatars in Second Life⁶. Second, Takahashi et al.[4] used two different imaginary cartoon characters that are neither humans nor animals. On the other hand, a human character was adopted as an avatar in this research, and enables the users' identities to be expressed by changing hairstyles or hair colors. Thus, the avatar of each user can be recognized visually. However, our avatars do not emphasize the users' identities, such as changing clothes and accessories, because the main focus of our avatars is expression of feeling based on facial expression and body movement. Therefore, our avatars are different from those used by Yahoo⁷. In addition, we will not refer to hairstyles of avatars in this paper.

4.2 Validity of Avatars for Nonverbal Expression of Subjectivity

The subjective information that is added by subjective annotation will be used as queries to search and classify contents. Furthermore, information filtering based on subjectivity of other users is possible by sharing subjective annotation among communities or the general public, similar to collaborative tags. To achieve this, the following factors must be assessed by experiments.

- Consistency of feelings elicited by avatars for an individual over time.
- Consistency of feelings elicited by avatars in a group of people.
- Comparison of feeling expressiveness between avatars and collaborative tags.

It is necessary to assess whether subjectivity, particularly feelings, elicited by avatars changes significantly over time for an individual, and also within groups of people. Moreover, the comparison of feeling expressiveness, satisfaction level

⁶ <http://secondlife.com/>

⁷ <http://avatars.yahoo.com/>

of their own expression, and adaptability of contents must be conducted between avatars and collaborative tags.

5 Consistency of Feelings Elicited by Avatars for an Individual Over Time

5.1 Experimental Overview

To facilitate use of avatars for personal information retrieval and experience browsing, the consistency of feelings elicited by the avatars over time was assessed based on a semantic differential method. Moreover, features of feelings over time for each avatar pattern are also discussed.

Avatars In this experiment, the variety of avatar faces was limited to face parts from (1) to (6) shown in Fig. 2 that are frequently used in a preliminary experiments of feeling expression. Leg parts were fixed to leg parts (1), because participants reported a greater effect of the arms than the legs in the preliminary experiment. A total of 24 avatars (6 face parts \times 4 arm parts) were presented to the participants.

Participants Two men and 2 women ranging in age from 23 to 25 years participated in this experiment. All participants were Japanese undergraduate or graduate students.

Measurement In this experiment, participants rate the feelings elicited by the avatars using a semantic differential method based on the two-dimensional model of emotion proposed by Lang[5]. Participants rated the arousal and valence from 0 (lowest) to 100 (highest) for each avatar pattern on six continuous scales. A total of 144 stimuli (24 avatar patterns \times 6 scales) were presented to the participants.

Each scale was anchored with a pair of antonymous words in Japanese, determined hierarchically. In the preliminary experiment, participants label each avatar pattern with various words indicating feelings. Then, pairs of antonymous words were made from frequently used words. The pairs of words were reduced to the six pairs shown below, which are frequently used in the areas of social psychology and personality psychology, according to the survey results of scale construction of pairs of Japanese antonymous words in a semantic differential method reported by Inoue et al[6]. The approximate translations in English are as follows:

- Arousal
 - scale 1 (intensity): intense - calm
 - scale 2 (activeness): active - passive
 - scale 3 (strength): strong - weak
- Valence
 - scale 4 (joy): joyful - sad
 - scale 5 (amusement): amusing - boring
 - scale 6 (favor): likable - disagreeable



Fig. 3. Experimental setup

Process

1. After receiving instructions, participants were trained to evaluate feelings.
2. Avatars were presented on the computer screen (see Fig. 3). Moreover, the order of presentation of faces and arms was counterbalanced across the trials.
3. Participants evaluated the feelings elicited by the avatars on each scale. The order of scales was randomized for each avatar. The time limit was set to 40 s for each avatar pattern to induce an intuitive response.
4. Twenty-four avatars were presented by iterating steps 2 and 3. After evaluation, participants answered the questionnaire.
5. From step 1 to 4 was defined as a trial. Six trials were conducted at the following intervals: 1 h, 2 h, 1 day, 2 days, 4 days.
6. More than 2 weeks after step 5, participants were presented with all avatars and means of their evaluated values for each scale. Participants indicated their satisfaction level from 0 to 100.

5.2 Results and Discussion

We evaluated the standard deviation of the spread in the evaluated values for feelings elicited by each avatar pattern and defined that as the statistical value. Feelings elicited by the avatar pattern that were more than $\text{mean}+1SD$ were particularly inconsistent. Conversely, feelings elicited by the avatar pattern that were less than $\text{mean}-1SD$ were particularly consistent. There was an average of 21 avatar patterns that were more than $\text{mean}+1SD$ for participants. These patterns correspond to only about 14% of the entire 144 stimuli (24 avatar patterns \times 6 scales). Therefore, feelings elicited by avatars were generally consistent over time for individuals. Moreover, Table 1 shows the amounts of avatar patterns outside the $\text{mean}\pm 1SD$ range of arousal and valence.

There were more avatar patterns that were more than $\text{mean}+1SD$ in scales of arousal (see Table 1). On the other hand, there were more patterns that were

less than $\text{mean}-1SD$ in the scales of valence (see Table 1). Therefore, valence elicited by avatars is more consistent over time than arousal for an individual.

Figure 4 shows the transition of the total evaluated values for each participant throughout all trials. The figures show that the total evaluated values of arousal change more drastically than valence throughout all trials.

The evaluated values of valence, such as “joy” and “favor,” are simply increased and evaluated more positively due to the mere exposure effect[7]. However, the evaluated values of arousal decrease from the first to the third trial, which may have been due to loss of novelty with three trials in one day.

Furthermore, two weeks after the experiment, participants reported the satisfaction level of each avatar pattern and its average evaluation value throughout all trials. The satisfaction level is defined as the statistical value, and we inspected the frequencies of face parts and arm parts in avatar patterns that were less than $\text{mean}-1SD$. Face parts (2) (see Fig. 2) appeared frequently in avatar

Table 1. Avatar patterns outside the $\text{mean}\pm 1SD$ range

Participant	$>+1SD$		$<-1SD$	
	Arousal	Valence	Arousal	Valence
A	17	2	5	14
B	9	9	7	12
C	17	9	2	14
D	14	8	5	15

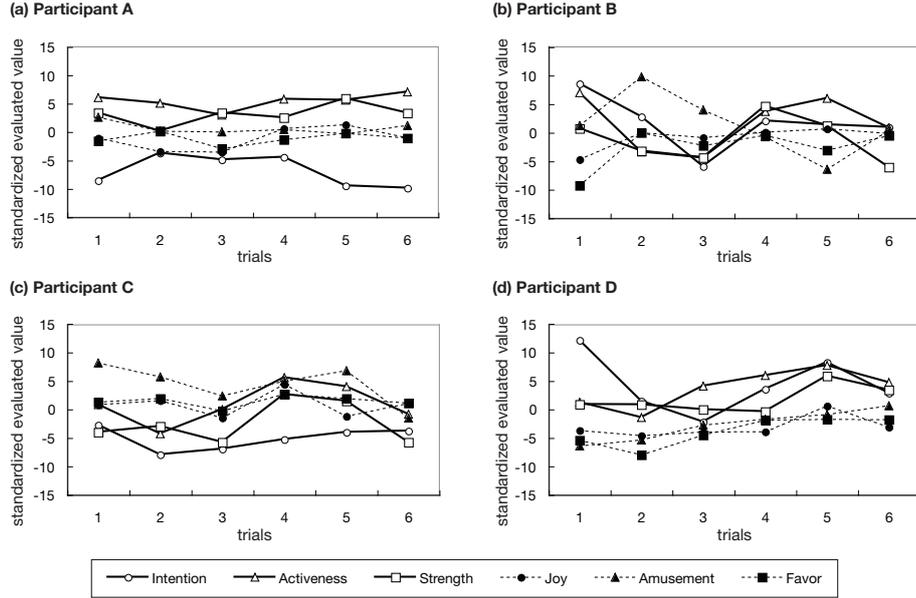


Fig. 4. Total evaluated value of each scale

patterns that were less than $\text{mean}-1SD$. The satisfaction level of face parts (2) tended to be low, as it is difficult for participants to determine whether the feeling is positive or negative from the surprised face and the evaluation of valence is inconsistent. On the other hand, arm parts (3) (see Fig. 2) appeared frequently in avatar patterns that were more than $\text{mean}+1SD$. The satisfaction level of arm parts (3) tended to be high, as waving arms emphasized the feeling expressed by avatars and made a deep impression on the participants.

Taken together, these observations indicate that feelings elicited by avatars are consistent over time for an individual.

6 Consistency of Feelings Elicited by Avatars in a Group of People

6.1 Experimental Overview

We examined use of an avatar as a query for information filtering in a group of people as with collaborative tags. The consistency of feeling elicited by avatars in a group of people was assessed based on a semantic differential method in the same way as in the experiment described in Chapter 5. Features of feelings generated by participants are also discussed.

Design A $6(\text{faces}) \times 4(\text{arms})$ within-subject experiment was performed. The avatar parts used in this experiment were the same as those described in Chapter 5. Overall, 24 avatars were presented to the participants.

Participants Twenty men and 4 women ranging in age from 21 to 27 years participated in this experiment. All participants were Japanese undergraduate or graduate students.

Measurement This experiment was performed based on the semantic differential method in the same way as the experiment described in Chapter 5. The pairs of antonymous words anchored on the six scales were also the same as those in Section 5.1. A total of 144 stimuli ($24 \text{ avatar patterns} \times 6 \text{ scales}$) were presented to the participants.

Process

1. After receiving instructions, participants were trained to evaluate feelings.
2. Avatars were presented on the computer screen. Moreover, the order of presentation of faces and arms was counterbalanced across the participants.
3. Participants evaluated the feelings elicited by the avatars on each scale. The order of scales was randomized for each avatar. The time limit was set to 40 s.
4. Twenty-four avatars were presented by iterating steps 2 and 3. After evaluation, participants answered the questionnaire.

6.2 Results and Discussion

We evaluated the semi inter-quartile range of standardized evaluated values for each scale, for each avatar to inspect the spread of feelings, and defined that as the statistical value. The feelings elicited by avatar patterns that were more than $\text{mean}+2SD$ were particularly inconsistent. Conversely, the avatar patterns that were less than $\text{mean}-2SD$ were very consistent. There were 7 avatar patterns that were more than $\text{mean}+2SD$. These patterns account for only about 7% of the total of 144 stimuli (24 avatar patterns \times 6 scales). Therefore, feelings elicited by avatars are consistent in a group of people as a whole.

Meanwhile, the amounts of patterns outside the $\text{mean}\pm 2SD$ range of the semi inter-quartile range are summarized for arousal and valence (see Table 2). There were more patterns that were more than $\text{mean}+2SD$ in scales of arousal. On the other hand, there were more patterns that were less than $\text{mean}-2SD$ in the scales of valence. There are two reasons why valence elicited by avatars is more consistent than arousal. First, scales of valence are nominal, and users could recognize feelings from facial expressions. The other reason is that arousal is an interval scale and its degree is inconsistent even within an individual.

Table 2. Avatar patterns outside the $\text{mean}\pm 2SD$ range

$>+2SD$		$<-2SD$	
Arousal	Valence	Arousal	Valence
7	0	0	2

Avatar patterns and scales that were more than $\text{mean}+2SD$ are discussed in detail. Valence shows a much wider spread than arousal when the avatar consists of face parts (3), because it is difficult to determine between pleasure and displeasure from the excited face. Moreover, the evaluation of scale for joy is particularly consistent as compared to the other scales.

Two-way ANOVA of the 6(faces) \times 4(arms) patterns was conducted for each of the following scales to inspect the features and effects of feelings elicited by avatars.

Intensity The interaction between faces and arms was marginally significant ($F(15, 345) = 1.58, p < .1$). Fisher’s least significant difference (LSD) post hoc test was used to test the differences in pairwise comparisons. The face parts (2), (3), and (5) were different from (1), (4), and (6) ($p < .05$). Therefore, these face parts increase arousal. Meanwhile, arm movement also affects intention, and arm part (3) was significantly different from arm parts (1), (2), and (4) ($p < .05$).

Activeness The main effects of faces and arms were significant ($F(5, 115) = 38.42, p < .01$; $F(3, 69) = 23.53, p < .01$, respectively). However, there was no significant interaction between faces and arms ($F(15, 345) = 1.13, n.s.$).

Strength The interaction between faces and arms was marginally significant ($F(15, 345) = 1.74, p < .1$). On LSD post hoc test, face part (4) was significantly different from the other face parts ($p < .05$).

Joy The interaction between faces and arms was significant ($F(15, 345) = 2.18, p < .05$). On LSD post hoc test, the face parts (1) and (3) were significantly different from the other face parts ($p < .05$).

Amusement The interaction between faces and arms was significant ($F(15, 345) = 2.31, p < .01$). On LSD post hoc test, face parts (1) and (3) were significantly different from the other face parts ($p < .05$).

Favor The interaction between faces and arms was significant ($F(15, 345) = 2.25, p < .01$). On LSD post hoc test, arm parts (3) was significantly different from arm parts (1) and (2) when face parts was (3) or (6) ($p < .05$).

Taken together, these observations indicate that feelings elicited by avatars were consistent in a group of people and facial expressions affect valence, while arm movements affect arousal, although face parts (2), (3), and (5), which express surprise, excitement, and anger, respectively, increase arousal.

7 Comparison of Feeling Expressiveness between Avatars and Tags

7.1 Experimental Overview

The expressiveness, gap in expression according to the contents, ease, and satisfaction of expression were compared between avatars and collaborative tags representing nonverbal and verbal expression, respectively. In this experiment, participants expressed their feelings elicited by contents consisting of articles as verbal contents and photos as nonverbal contents using avatars or tags.

This experiment was performed using all of the avatar parts shown in Fig. 2. The participants expressed their feelings elicited by contents with a combination of these avatar parts. The format of collaborative tags was open-ended, and participants were permitted to use multiple tags for a single content. Furthermore, participants were allowed to skip the expression if they felt difficulty in expressing their feelings.

The contents were articles and photos on the web. Practically, top 10 bookmarked articles in Yahoo!Japan News⁸ as of September 5th, 2007 and top 10 bookmarked photos in Zorg⁹ (photo sharing service) as of August 1st, 2007 were chosen for this experiment.

Participants Twenty men and 4 women ranging in age from 21 to 27 years participated in this experiment. All participants were Japanese undergraduate or graduate students.

⁸ <http://headlines.yahoo.co.jp/>

⁹ <http://www.zorg.com/>

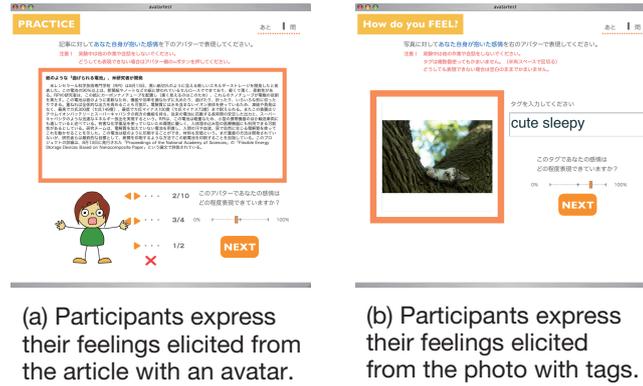


Fig. 5. Experimental setups

Process

1. After instruction, the participants were trained to express their feelings using avatars or tags regarding the sample article and the sample photo. Moreover, the order of using avatars and tags was counterbalanced across the participants.
2. Ten articles and 10 photos were presented on the computer screen (see Fig. 5). The participants expressed their feelings regarding the contents using avatars or tags, respectively. The presentation order of articles and photos was counterbalanced across participants.
3. The participants expressed their feelings regarding the same contents in the same way as in steps 1 and 2 using tags or avatars that have not been used before.
4. After evaluation, the participants answered the questionnaire about their satisfaction.
5. More than 2 weeks after step 4, participants were presented with all of the contents and the avatars or tags expressing their feelings. Participants answered the satisfaction level from 0 to 100.

7.2 Results and Discussion

Figure 6 shows the results of 3 questionnaires on the satisfaction of feelings expression by avatars and tags. The participants responded regarding which of the two expression methods they preferred. Each questionnaire was about the entire contents, articles, and photos. In all questionnaires, none of the participants indicated a preference for tags over avatars.

With regard to all contents, more than 70% of the participants indicated a preference for expressing their feelings using avatars (see Fig. 6(a)). This may have been because an avatar can express feelings that are difficult to verbalize, and an avatar can describe the degree or strength of a feeling.

On the other hand, 58% and 67% of participants indicate a preference for avatars for expression of feelings regarding articles (see Fig. 6(b)) and for photos (see Fig. 6(c)), respectively. Moreover, 38% and 8% of participants indicate that tags are better than avatars for articles and for photos, respectively. Based on the opinions of the participants, it is not difficult to express feelings with tags in the case of articles, as articles themselves are in verbal format. However, the meanings of photos cannot be defined clearly, and it is difficult to verbalize feelings elicited by photos.

In this experiment, participants were allowed to skip expression of feelings if they decided that expression with the suggested method is impossible. The number of skips was 21 times using avatars and 42 times with tags. Thus, it seems easier for users to use avatars than tags.

Furthermore, more than two weeks after the annotation experiment, participants were presented with all of the contents and the avatars or tags expressing their feelings. Participants answered the satisfaction level about the combination of their annotation and the contents. The satisfaction level was standardized for

Table 3. Averages of standardized satisfaction level on combination of feeling expression and each content

	Articles	Photos
Avatar	0.073 (0.945)	-0.033 (1.063)
Tag	-0.069 (1.176)	-0.043 (1.258)

Note. A value in parenthesis is standard deviation.

Which expressed your feelings about the contents better, avatars or tags?

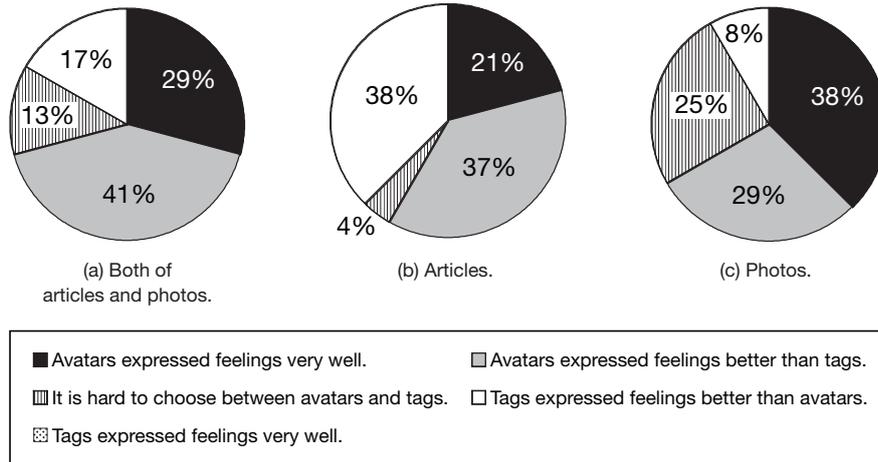


Fig. 6. Results of questionnaires about satisfaction level of feeling expression

each participant except the contents that were not annotated. The averages of satisfaction level are shown in Table 3.

The results shown in Table 3 confirmed that avatars are preferable over tags when presented with both articles and photos. Some participants also responded that the combination of avatars and contents helps them to remember how they felt about the contents. On the other hand, some participants reported differences in their feelings toward some of the combinations of avatars and contents between the annotation experiment and two weeks later. Overall, avatars may support recall of how users felt when they annotated the content and the influence of the changes in feeling toward the contents must be verified in future studies.

8 Related Work

There have been many studies using avatars: creation of co-presence in online communication[8], interpretation of avatar’s facial expressions[9], description language for avatar’s multimodal behavior[10], *etc.* However, there have been only a few studies using avatars for feeling extraction. In this section, we will mention representative studies using avatars for feeling extraction.

Takahashi et al.[4] constructed TelMeA, an asynchronous communication support system, that represents the relations among participants and the relations between contents and conversations by the behavior of static avatars. The purpose of TelMeA is similar to ours, because TelMeA was designed to ease interpretation of feelings difficult to express verbally by combining contexts and behaviors of avatars. However, we define feeling expressions by avatars as part of subjective annotation, and plan to use them like collaborative tags for information retrieval and classification in content sharing. Therefore, we verified the consistency of feelings elicited by avatars. Moreover, our avatars can express feeling not only toward contents with clear context but also those with unclear context, such as photos.

Another case, PrEmo[11], is a tool to assess emotional responses toward consumer products. In PrEmo, avatars have 14 behaviors consisting of 7 positive and 7 negative behaviors. Users rate each avatar based on the feelings elicited by the products. This tool enables product impression analysis based on users’ feelings. The purpose of PrEmo is similar to ours because it is designed to analyze feelings elicited by targets. However, the results of feeling analysis for each product using PrEmo are mapped together in the emotion space structured by 14 avatar behaviors. Therefore, users cannot easily share their feelings elicited by each product. Moreover, in PrEmo, the rating for each avatar only indicates that the feeling that each avatar represents is present in the users’ feeling elicited by products. On the other hand, our avatar can express not only the presence of feelings, but also their degrees.

9 Conclusion

We propose subjective annotation where users add subjective information, such as feelings and intention, to contents. As it is particularly difficult to verbalize a feeling, we adopt avatars to express feelings. To use an avatar as the interface of subjective annotation, the consistency of feelings elicited by avatars over time for an individual, and also the consistency in a group of people were assessed. The results indicate consistency for both cases, although the variation of arousal is wider than that of valence.

In addition, a comparison was conducted regarding feeling expressiveness and satisfaction level between avatars and collaborative tags. The results indicate that avatars are more suitable than tags for expression of feelings, particularly in cases with contents that include no context and no message, such as photos. Overall, avatars can be used for expression of subjective annotation. In future studies, we will improve the control interfaces of avatars to make them more intuitive and continue to verify the practical usefulness of subjective annotation with avatars.

References

1. Mathes, A.: Folksonomy - Cooperative Classification and Communication Through Shared Metadata. Master's thesis, Graduate School of Library and Information Science University of Illinois Urbana-Champaign (2004)
2. Golder, S.A., Huberman, B.A.: Usage patterns of collaborative tagging systems. *Journal of Information Science* **32**(2) pp.198–208 (2006)
3. Ekman, P., Friesen, W.V.: Constants across cultures in the face and emotion. *Personality and Social Psychology* **17**(2) pp.124–129 (1971)
4. Takahashi, T., Bartneck, C., Katagiri, Y., Arai, N.: TelMeA - Expressive Avatars In Asynchronous Communications. *International Journal of Human-Computer Studies (IJHCS)* **62**(2) pp.193–209 (2005)
5. Lang, P.J.: The emotion probe: Studies of motivation and attention. *American Psychologist* **50**(5) pp.372–385 (1995)
6. Inoue, M., Kobayashi, T.: The Research Domain and Scale Construction of Adjective-pairs in a Semantic Differential Method in Japan. *The Japanese Journal of Educational Psychology* **33**(3) pp.253–260 (1985)
7. Zajonc, R.B.: Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology* **9** pp.1–27 (1968)
8. Ishii, Y., Watanabe, T.: An Embodied Video Communication System in which Self-referentiable Avatar is Superimposed for Virtual Face-to-face Scene. *Journal of the Visualization Society of Japan* **23**(1) pp.357–360 (2003)
9. Koda, T., Ishida, T.: Cross-cultural Comparison of Interpretation of Avatars' Facial Expressions. *Transactions of Information Processing Society of Japan* **47**(3) pp.731–738 (2006)
10. Prendinger, H.: MPML : A Markup Language for Controlling the Behavior of Life-like Characters. *Journal of Visual Languages and Computing* **15**(2) pp.183–203 (2004)
11. Desmet, P.M.: Measuring Emotions. In: *Funology: from usability to enjoyment*. Kluwer Academic Publishers pp.111–123 (2003)