

# Proposal of a Data Presentation Technique Using Four-Frame Cartoon Expression for a LifeLog System

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**Abstract.** In recent years, research on lifelogging has increased because of developments in information technology. However, few studies have dealt with communication with other people using lifelogging technology. Therefore, we have developed the BlogWear system, which automatically generates weblog entries using lifelog data. The results of our previous experiment showed that a large number of entries from lifelog data have few changes, and readers quickly tire of them. Therefore, this study proposes a method that generates a four-frame cartoon expression from lifelog data. The contribution of this study is to show that the use of four-frame cartoon expressions can make viewing lifelog data more enjoyable.

**Keywords:** Lifelog · Four-frame cartoon · Blog · Communication support

## 1 Introduction

Recent developments in information communication technology have led many researchers to become interested in lifelog support systems. Lifelogs store information about a human's daily life as digital data. There are two lifelog recording methods: automatic recording and manual recording by the user [1–3]. The recording equipment is small and increasingly sophisticated. Research into lifelogging is an active area of study, especially the applicability of lifelogs [1–3].

Few studies have examined the exchange of lifelog data. However, with the development of web services, Consumer Generated Media (CGM) are gaining popularity. In CGM, users contribute content to form part of the service, but CGM has poor collateral compared with the size of the cost to contribute contents in before. However, micro-blogging media such as Twitter represent a solution to this problem. Micro-blogging services allow users to contribute short sentences.

It is easy for users to contribute short sentences or photos. This is regarded as one of the reasons for the development of micro-blogs. Therefore, we have developed the BlogWear system, which automatically generates weblog entries using lifelog data [4, 5]. The purpose of BlogWear is to promote communication

between the record person (logger) and the readers. BlogWear can automatically generate weblog entries using lifelog data, thus reducing the logger's burden of contribution. Experimental results indicated the following disadvantages of BlogWear: (1) BlogWear can create a lot of blog entries. (2) Minor differences in blog entries cause readers to become bored.

We found that these disadvantages decrease the logger's motivation. Thus, we propose a novel presentation method using four-frame cartoon expressions combining lifelog data. The purpose of this method is to summarize a lot of lifelog data and to add entertainment features to the content. We expect the method to motivate viewers' interest. Moreover, this should provide further motivation for the logger. The purpose of this research is to demonstrate the possibility of promoting communication by the automatic expression of lifelog data.

## 2 Related Work

The lifelog system is inspired by Vannevar Bush's concept of a memex [6]. A memex records everything that users see, hear, and read as digital data. This allows users to search a database for help in performing to their full potential. Microsoft developed MyLifeBits [7], which records everything that can be stored on a computer, such as images, music, e-mails, or the operational data of applications.

LifePod, which was developed by KDDI [8], combines a weblog and lifelog. This system uses a cellular phone and radio frequency identification (RFID). Users record their favorite things as lifelog data using a camera and the GPS of a cellular phone. By simply reading the RFID, LifePod users can record lifelog data. However, this system is less burdensome, because it does not involve amassing lifelog data; instead, it simply records a user's favorite activity. By nature, the lifelog system is mainly used by loggers. Our aim is to show a logger's lifelog data to a viewer with the aim of facilitating communication between the logger and the viewer.

Many researchers have focused on the effect of lifelogs. Sellen et al. conducted an experiment to investigate the effect that image data obtained through SenseCam [9] had on a viewer. Their results show that images automatically serve as long-term memory cues. Morishita et al. described the concept of the SpaceTag [10], in which the information provided varies with location and time. According to the results observed in an open experiment, SpaceTag benefits users who require location information, such as tourist information [11]. Kalnikaite et al. focused on the different effects of visual data and location data [12]. They confirmed that images promote a more genuine, detailed recall, whereas location data lead to inference.

Thus, many studies have reported the effects of lifelogs. However, these studies have focused on the effect of lifelog data on the loggers themselves. In contrast, in this study, we focus on the effect of lifelogs on both the loggers and their viewers. The purpose of this study is to investigate an approach for facilitating communication between loggers and viewers using lifelog data. We treat the

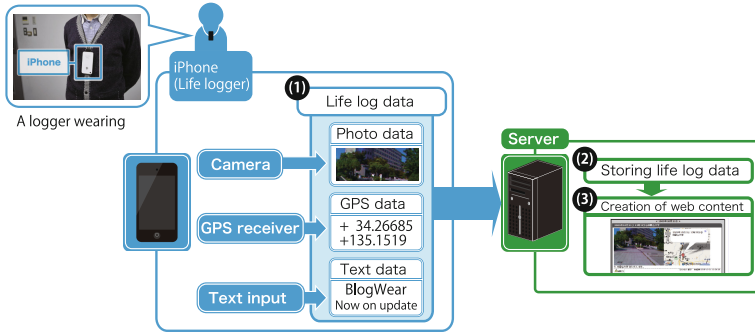


Fig. 1. System configuration of BlogWear.

behavior as a daily pattern. Our proposal uses a four-frame cartoon expression to produce a humorous impression of daily behavior.

### 3 BlogWear Overview

This chapter describes a BlogWear system that automatically generates weblog entries using lifelog data. BlogWear uses images and geographical locations (latitude and longitude) of various loggers as lifelog data.

#### 3.1 System Configuration and Flow

Figure 1 shows the configuration of the BlogWear system. This system consists of an iPhone, a server, and a lifestreaming service. The iPhone records lifelog data and transmits them to the server. The server amasses lifelog data and generates and displays entries on BlogWear’s webpage. The lifestreaming service provides information about a user’s activities on the webpage. This study uses Twitter as the lifestreaming service.

The steps for recording lifelog data using an iPhone to generate entries are as follows.

1. Recording lifelog data  
The iPhone records lifelog data and generates information for entries.
2. Sending information for the entries to the server  
When the server receives information for the entries, it stores the information in its database.
3. Generating blog entries  
The server generates blog entries from its database, and automatically displays them on BlogWear’s webpage.

#### 3.2 Lifelog Application for iPhone

Our study used an iPhone as a tool for recording lifelog data. The iPhone can record image data and location data. The photo at the top-left of Fig. 1 shows an image of a logger wearing an iPhone.

**Lifelog Recording Methods.** We considered “automatic lifelog” and “manual lifelog” recording methods.

1. **Automatic lifelog.** The “automatic lifelog” records lifelog data automatically at preset intervals. We assume that this function is used when the logger wishes to record their daily life.
2. **Manual lifelog.** The “manual lifelog” records lifelog data at times determined by the logger. We assume that this function is used when the logger encounters a situation that they would like to record.

Recorded lifelog data are sent to the server at once.

**Classification of Lifelog Data by an Event.** BlogWear groups the activities, for example, meal times or going to school, that the logger encountered as “events.”

This function improves the reading of a great deal of lifelog data. The logger determines each event. In other words, this research considers an event to be a record period set by the logger.

## 4 Presentation Method of the Lifelog Data

We discuss the following three methods of presenting lifelog data.

1. List expression
2. Separate expression
3. Four-frame cartoon expression

We call the presentations made with the above-mentioned expressions “content.”

### 4.1 List Expression Method

The list expression shows lifelog data to a reader without processing. The left side of Fig. 2 shows an example of a list expression.

The list expression shows all photos recorded in the event in the photo space. The lower part of the screen displays routes on a map. The comments field shows a landmark at the recorded date and time, address and circumference. The address is shown to prefectural and city governments. This system uses reverse geocoding to find the address from the latitude and longitude.

### 4.2 Separate Expression Method

The separate expression separates content from communication services like weblogs and social network services (SNS). The left side of Fig. 2 shows an example of the separate expressions. A separate expression indicates each item recorded in the event separately. The content is shown in an article area. Each item of content has an address and a comment made by the logger. Articles generated automatically from lifelog data are indicated by a gray frame, and those formed manually are indicated by a blue frame. The left part of the separate expression screen displays routes on a small map.

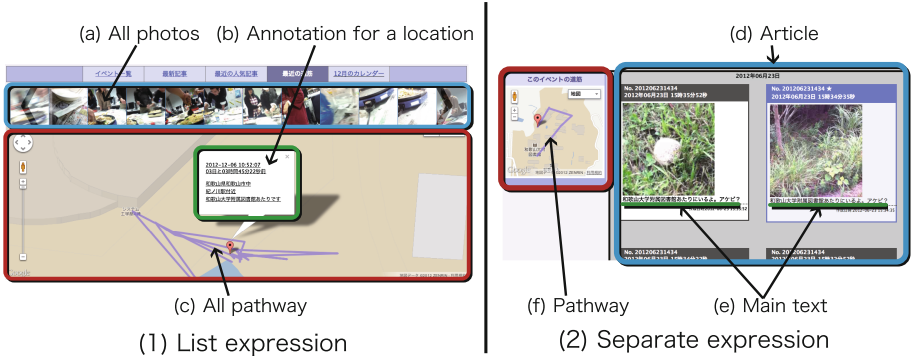


Fig. 2. Example of a list expression and separate expressions.

### 4.3 Four-Frame Cartoon Expression Method

The purpose of the four-frame cartoon expression is to summarize lifelog data and add an entertainment factor to the lifelog. We think this will arouse readers' interest. Moreover, we think that this will increase the number of readers, thus motivating the logger. Figure 3 shows an example of a four-frame cartoon expression on a screen. The four-frame cartoon expression creates one four-frame cartoon from each event.

## 5 Four-Frame Cartoon Generation Function Using Lifelog Data

We have developed a four-frame cartoon expression function for combining lifelog data.

### 5.1 Design Policy

The purpose of the four-frame cartoon expression is to encourage readers' interest, which will then motivate the logger.

1. Addition of an entertainment factor  
 The results of previous experiments indicate that the lifelog of daily behavior patterns of a logger is tedious for readers. Therefore, we use four-frame cartoon expressions to add an entertainment factor to the content generated from lifelog data.
2. Maintaining motivation by a change in content  
 Our experiments suggested that readers rapidly tire of the minor changes in presentation data. Therefore, the proposed method generates the content of lifelog data at random.

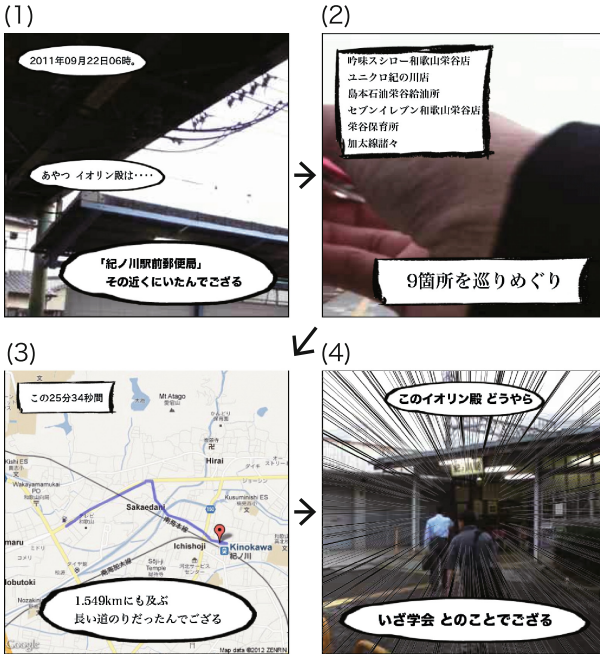


Fig. 3. Example of a four-frame cartoon expression.

### 3. Summary of lifelog data

The conventional BlogWear system showed all lifelog data as a separate expression. Our experimental results showed that these separate expressions are redundant for presenting all lifelog data to readers.

Therefore, our four-frame cartoon expression function generates a reduced amount of content, and generates four frames with a few story branches.

Thus, the method summarizes lifelog data from one event in one four-frame sequence, with the aim of reducing the readers' burden.

## 5.2 Processing of Each Frame

The four frames are created as follows.

**First Frame.** The background of the first frame is the most recent photo in each event. The words shown in the first frame present the BlogWear user's name and the most recently recorded landmark. The first frame is an introduction to each story. The purpose of the first frame is to arouse readers' interest. The first frame gives the latest information about a BlogWear user (logger) to a reader. The reader can easily grasp the logger's behavior from one event.

**Second Frame.** The background of the second frame is a randomly selected photo from each event. When the photo selected as the background has been recorded manually, the system draws “concentration lines” around the photo. A concentration line expresses the movement of a person or thing using additional lines peculiar to the cartoon. The system shows at most five landmarks from the event as words in a balloon. The total number of landmarks in the event is also indicated. This frame summarizes and presents information on all movement in the event. The randomly selected photo will unfold in a way that the reader cannot predict.

**Third Frame.** The third frame shows a map that has all the positional information recorded in the event. The words in a balloon state the time elapsed during the event, and the distance of the migration pathway. The words for its length are indicated according to the length of the displacement. We change how the story is unfolding by showing a map as the background. The background of the third frame is not a photo, but a map. This is the big difference from the other frames.

**Fourth Frame.** The background of the fourth frame is a randomly selected photo. When the photo selected as the background was recorded manually, the system draws concentration lines on the photo. This is like the processing of the second frame. The fourth frame displays a comment made by the logger. This comment, which is only shown in the last frame, is what the logger would most like to say about the event.

### 5.3 Changing the Function of Words

Our four-frame cartoon generation function can dynamically change the word style. The purpose of this function is to modify the content of the four frames. We have nine types of speaker, such as a normal Japanese person, provincial Japanese, samurai drama-inspired Japanese, a delinquent youngster, and so on.

## 6 Experiment

We carried out an experiment using the three lifelog presentation methods. We used pre-prepared log data. The experimental subjects were university students, graduate students, and staff at Wakayama University, Japan.

The experiments considered the following items.

1. How does each kind of presentation method stimulate readers' interest?
2. How does each kind of presentation method contribute to understanding the behavior of the logger?
3. How does each kind of presentation method influence the communication between logger and reader?

## 6.1 Experimental Lifelog Data

We used the lifelog data obtained from our past experiments. These lifelog data include both photos and positional information. The logger who generated the data is a graduate student of Wakayama University. These lifelog data gave a total of 36 events. Each event was used to generate the content for each of the presentation methods, giving a total of 108 content items.

## 6.2 Subjective Task

In the experiment, we showed 36 contents in each expression to all 18 subjects using the three presentation methods. The subjects then scored the content on four evaluation axes. The presentation order of the content was changed for each subject to remove order effects. Each subject answered a questionnaire after the task was completed. Each subject estimated while getting rest accordingly.

## 7 Results and Discussion

Figure 4 shows the evaluation results for each subject. Table 1 presents the questionnaire survey results. We used the following five-point Likert scale for the content evaluation and questionnaire survey—1: Strongly disagree, 2: Disagree, 3: Neutral, 4: Agree, and 5: Strongly Agree.

### 7.1 Amusement Value of the Content

The evaluation score for “I thought the content was amusing” in Fig. 4(1) shows that there is no significant difference in each presentation method. The four-frame cartoon expression scored more highly than the other presentation methods, as shown by the mode value of “I thought the content was amusing” in Table 1(1).

Some of the positive comments for our four-frame cartoon expression method were as follows.

- This expression relates a daily event humorously.
- This expression caught the eye with a unique expression.
- I think this expression has new value.

Some comments about the list expression were as follows.

- Positive comment: This expression is concise and easy to understand.
- Negative comment: When the situation is not readable from a photo, this expression is boring.

This expression is tired and a little monotonous. We found that the amusement of the list expression and separate expression methods depend directly on their own amusement value. Lifelogs deal with daily data, the nature of which often becomes mannerism. Therefore, we think that content presented by the list expression or separate expression methods also has a nature that often becomes mannerism. The four-frame cartoon method generates its own amusement in an expression. We think that the four-frame cartoon expression method may prevent content becoming tired.



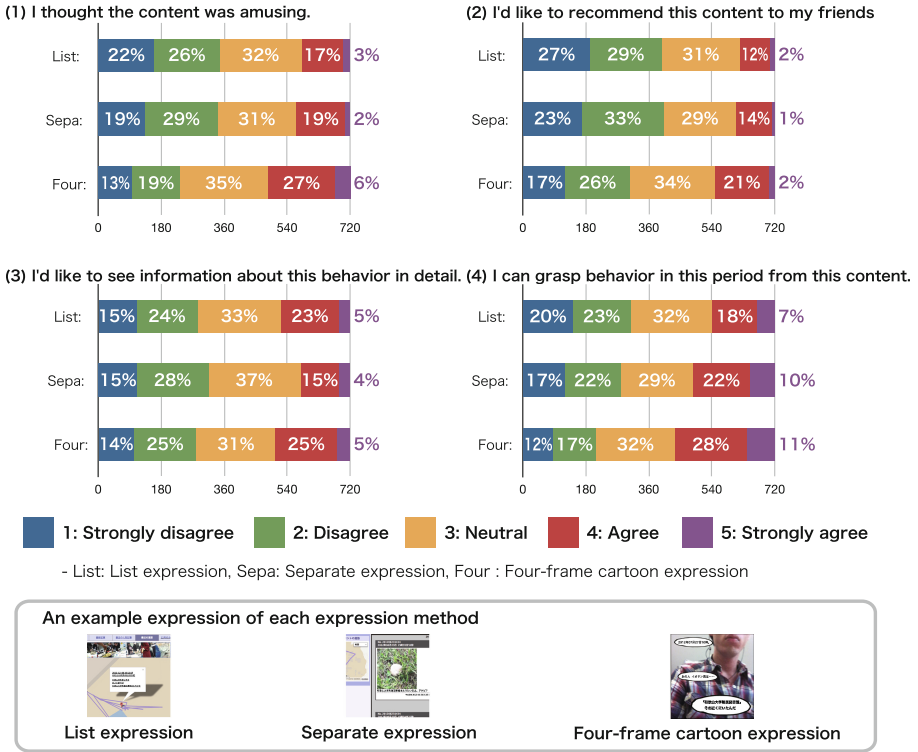


Fig. 4. Results of content evaluation by examinees.

## 7.2 Possibility of Communication

The results for “I’d like to recommend this content to my friends” in Fig.4(2) shows that the four-frame cartoon expression method scores slightly higher than the other presentation methods. We found that the four-frame cartoon expression method is more attractive than the other techniques. However, “I’d like to give feedback (comment and evaluation) on the content” in Table 1(2) shows that there is no significant difference. Some positive comments on our four-frame cartoon expression method were as follows.

- I have something to say about the content (four-frame cartoon expression).
- I would like to comment or evaluate the content of the four-frame cartoon expression method.

About the list expression method, a subject commented that “I would like to comment if I want to know more detail.” About the separate expression method, subjects commented that “The expression tends to make a comment like Facebook,” and “I’d like to make a comment in each photo.” Each presentation expression displays features of effective communication in the experimental results. The four-frame cartoon expression method triggers communication about the quality of the

**Table 1.** Results of questionnaire survey.

Question items	Method	Evaluation					Median value	Mode value
		1	2	3	4	5		
(1) I thought the content was amusing.	List	0	4	5	9	0	3.5	4
	Sepa.	0	2	6	9	1	4	4
	Four	0	1	3	6	8	4	5
(2) I'd like to give feedback (comment and evaluation) on the content.	List	2	2	5	6	3	3.5	4
	Sepa.	1	3	3	5	6	4	5
	Four	1	1	4	9	3	4	4
(3) The content was useful to grasp the behavior of a logger.	List	1	2	7	6	2	3	3
	Sepa.	0	2	6	6	4	4	3, 4
	Four	0	2	11	2	3	3	3
(4) I'd like to see content continually.	List	1	3	6	8	0	3	4
	Sepa.	1	4	5	8	0	3	4
	Four	1	0	4	8	5	4	4
(5) I'd like to make content with myself, too (I'd like to use this system.)	List	3	3	3	9	0	3.5	4
	Sepa.	1	5	6	5	1	3	3
	Four	0	3	4	6	5	4	4

four-frame cartoon expression. The list expression method provides communication by awakening interest in the behavior of the logger. The separate presentation method provides communication by making the photo a trigger.

### 7.3 Presented Information

The results for ‘I'd like to see information about this behavior in detail’ and ‘I can grasp behavior in this period from this content’ in Fig. 4(3) and (4) shows that there is no significant difference between each presentation method.

Some of the positive comments on our four-frame cartoon expression method include:

- This expression provides a good volume of information for precisely grasping behavior.
- This expression is fascinating but incomprehensible.
- This expression was summarized too much, and a small part could not be grasped.
- This expression is more interested in amusement than the user's behavior.

The following positive comments were made about the list expression method.

- This expression is useful for grasping behavior across a big map.
- This expression transmits the user's rough behavior well.

The following negative comments were made about the list expression method.

- This expression could not grasp detailed behavior.
- I cannot understand the situation from a photo.

The separate expression method received the following comment.

- This expression can grasp the moment, but grasping the whole event is difficult.

Readers expect to be amused more than to grasp the logger’s behavior from the four-frame cartoon expression method. The list expression helps give a rough grasp of behavior, and the separate expression method is helpful for obtaining small nuggets of information about behavior. We found that the four-frame cartoon expression method is less likely to give readers information about the logger’s behavior than the other presentation methods.

#### 7.4 Continuity of Use

There is no significant difference between the responses for “I’d like to see content continually” and “I’d like to make content myself, too (I’d like to use this system)” in Table 1(4) and (5). The following responses about the four-frame cartoon expression method were given in the questionnaire.

- This expression may be good for telling others that I have gone out in a funny way.
- This expression method can formulate an original story. Hence, it becomes pleasant.

The subjects considered the list expression to provide the clearest information. Of the separate expression method, subjects commented that “It does not change with other SNS,” and “The function of Facebook and Twitter is enough.” We think that the four-frame cartoon expression method can trigger continued use of lifelog systems.

## 8 Conclusion

We have developed an automatic blog article generation system called BlogWear. The results of previous experiments indicated that relatively few changes across a great many blog articles generated from lifelog data reduced users’ motivation. Therefore, we proposed a novel lifelog presentation method using a four-frame cartoon expression. The contribution of this paper is to show that the four-frame cartoon expression method offers something novel to readers compared with other expression methods.

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