PHOTMOSPHERE: A System for Amplifying Connection between Memory and Record

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Photographs capture information on situations or circumstances that give some clue about peopleaa past activities. They remind people of not only their personal activities and experiences but also social events that take place at a certain time (e.g., news, fashion) and place (e.g., local festivals, sightings). We aim to use such information to help people recollect past events and to acquire novel information by connecting their memory and social records, for example, news reports. Toward this purpose, we introduce PHOTMOSPHERE, a system that helps users recollect past events by connecting memory (photographs) and records (news). We conducted an experiment to observe an effect of showing news with photographs. The participants were shown either only photographs they had taken or both news reports and photographs they had taken. They were then asked to describe their recollections under both conditions. We found that, in many cases, the news reports helped the participants remember events, but not in some cases, for instance, when the subject of the photograph was a person or an object. On the basis of this result, we reformulate the design criteria of the PHOTMOSPHERE.

1. Introduction

People store information about a lot of events, experiences, and activities in their memory. This form of memory is called "episodic memory"[Tulving 72]. It is believed that memories of people's own experiences and activities include feelings as well as temporal and spatial information. In recent years, digital tools have been widely used to support storing/capturing such the information. Digital camera, for instance, has made it easier to take photographs and save such memories. Since photographs capture information about situations and circumstances, they provide clues regarding people's past activities. They remind people of not only their personal experiences and activities but also social events that have taken place at a certain time (e.g., news, fashion) and place (e.g., local festivals, sightings). We aim to use such information to expand people's memories, for instance, to help them recollect past events and to acquire novel information.

As mentioned above, a photograph can be treated as a clue for remembrance. It, however, sometimes fails to remind people of events surrounding them. One of the causes is that the impact of the photograph and their feelings and thoughts on them fade over time. To solve this problem, we utilize other clues that remind people of events, activities, and experiences. They include life logs such as diaries, weblogs, webmail, and Twitter. Popular music from the period and the news reported at that time are also sources of such information. For instance, you may remember episodes or experiences on your travel with friends when

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you read your own diary or you may remember the scene of your graduation when you listen to your favorite music. By focusing on such the coincide phenomena, we develop a system named PHOTMOSPHERE, that helps people recollect past events and occurrences. To achieve this purpose, it couples "memory" of people's experiences and activities and "record" of such information.

The rest of this paper organizes as follows: Section 2 describes a prototype version of the PHOTMOSPHERE. Then, we conducted an examination to observe the effect of showing news with photographs simultaneously in section 3. On the basis of the result, we conducted an experiment to observe the accuracy of participants' recollection of news in section 4. Through these results, we reformulate the design criteria of the PHOTMOSPHERE in section 5.

2. PHOTMOSPHERE

We aim to recollect people of past events by coupling their photographs and other clues that they remember remind people of events, activities, and experiences. We utilize news to connect the photograph with the memories associated with it as clues, because people tend to have a vivid recollection of news about crime and disaster that had a strong impact on people[Brown 77]. In addition, photographs contain personal and private information, while news bears social and public information. Therefore, we believe that news is the appropriate medium to complement memory so that people can remember information that they are unable to recollect by simply seeing photographs.

Figure 1 shows an image of the PHOTMOSPHERE, and Figure 2 shows its interface. In Figure 2, (1) displays the digital photograph and (2) displays the news. To switch between photographs, users can press the "PREV" and "NEXT" buttons, indicated by (3) in Figure 2. Our system

Table 1: Two conditions and two phases in examination

	(A) Seeing photographs phase	(B) Explanation phase
Condition I	Photographs only	Photographs only
Condition II	Photographs with news	Photographs with news

Figure 1: Image of the PHOTOMOSPHERE

Figure 2: Interface of the PHOTOMOSPHERE

displays news by the date of the displayed photograph; this can be assessed by touching the "display news" button, as shown in (4) in Figure 2. About 15 words are presented per topic and the news is sourced from the headline news appeared on Yahoo! JAPAN Web page. What is presented is a summary of the news; therefore, image viewing is not hampered. Additionally, to ensure that there is no information overload and the words are not too small to read, the news is displayed all at once in 4 bullet points and the news presented is constantly updated.

To identify the date of photographs, we use metadata called EXIF that is embedded in the photographs. We use Web API by Yahoo! JAPAN to get news. Our system does not present users news that is exact time of the date when the photographs were taken. The duration of news is longer if the news is older. Additionally, it displays news that has been on Yahoo! JAPAN for the longest time. This is because we prefer to not use unimportant news for this purpose. In the system, we use JavaScript to create representation and the programming language Ruby to retrieve news.

3. Examination

3.1 Purpose

Our system helps users recollect events by presenting photographs with news. The purpose of this examination is to observe the extent to which details are recollected by participants when photographs are presented with news. Therefore, we conducted an examination to compare two conditions: presenting photographs alone and presenting photographs with news.
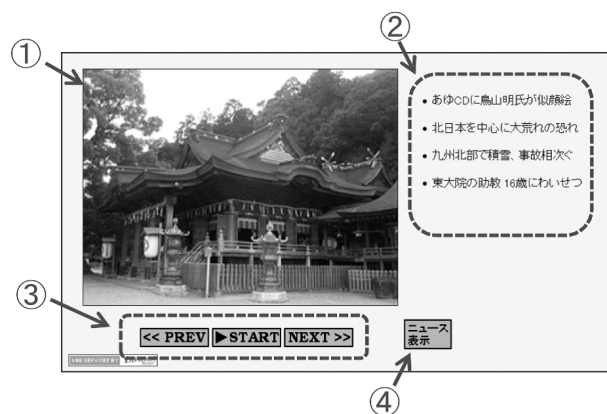
3.2 Advance Questionnaire

Before this examination, we administered a questionnaire to 28 students, who are measuring informatics. With this questionnaire, we investigated the frequency of news watching among participants, the categories of news that they often watch, and the frequency with which they take photographs. With regard to the frequency of news watching, we asked a question about each medium, that is, TV, mobile phones, newspapers, and the Internet. Categories of news are domestic news, international affairs, economics, entertainment, sports, computers, and science. On the frequency with which they take photographs, we asked a question with regard to each device, that is, digital cameras and mobile phones. We selected 8 participants (6 men and 2 women who are not affiliated to our laboratory) on the basis of their answers to this questionnaire. The participants of this examination are people who often follow news without distinction between the types of media and also take photographs.

3.3 Preparation

We asked 8 participants to bring 30 digital photographs each, instructing them not to bring photographs that were downloaded from the Internet, processed size, and printed. Of the 30 photographs, 15 had to be of themselves or an acquaintance of theirs, and 15 had to be of objects, landscapes, buildings, and so on (anything except themselves or their acquaintances). We asked them to bring two types of photographs because the extent of recollection may differ depending on the object of the photograph.

3.4 Procedure

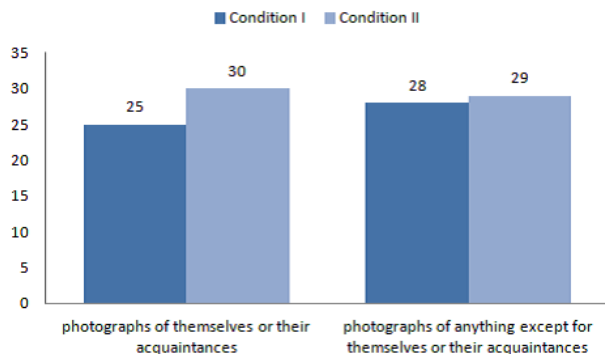We used two conditions in this examination. In Condition I, we presented the photographs alone and Condition II, we

Figure 3: Number of correct answers (month level)

Figure 4: Number of correct answers (day level)

presented the photographs with the news. Each condition involved two phases: (A) the seeing photographs phase, and (B) the explanation phase. Table 1 shows the two conditions. The order of presentation of the two conditions was alternated between participants. We recorded this examination with a video camera.

Before we conducted the examination, we selected 8 photographs per condition; 4 of the participants or their acquaintances, and 4 of other objects. In this time, we took care not to overlap the date of photographs in each condition. We printed the photographs and the accompanying news on paper and presented it to participants. In Condition I, we presented the photographs one by one to each participant in (A), the seeing photographs phase. We did not control the duration that they observed the photographs. When they finished seeing all the photographs, we proceeded to (B), the explanation phase. In this phase, we asked participants to speak about what they remembered after they were shown the photographs again. This time, we questioned them about how detailed their recollections were regarding the date when they took the photographs. If they could not identify the month, they were asked to identify the month. If they could not identify the day, they were also asked to identify the day. This question was asked until they answered, "I can't remember" or "I don't know." In Condition II, we conducted the same procedure as Condition I, but we presented not only the photographs but also news.

3.5 Result and Discussion

Figure 3 and 4 show the number of times that participants identified the month and the day when they took photographs of each object (themselves or their acquaintances and other objects except for themselves and their acquaintances). In both condition of the month and the day, there is hardly an effect of presenting news when the objects of photographs are anything except for themselves or their acquaintances. On the other hand, when the objects of photographs are themselves or their acquaintances, there is a little effect of presenting news. Looking the results, we thought that they are easy to remember when they took photographs because news effected their recollection about
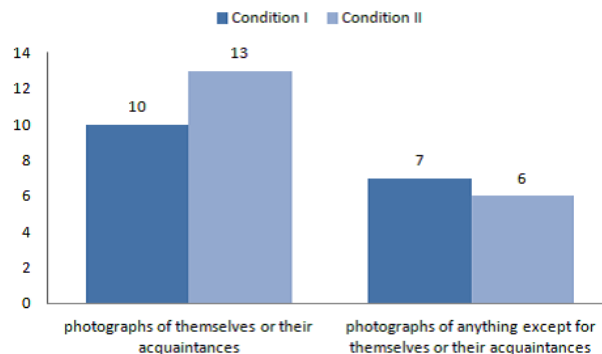
photographs of themselves or their acquaintances. However, we could not confirm a significant difference because of the limited number of participants in this examination.

In addition, we administered a simple questionnaire after this examination. Though we selected participants who often saw news, some of them did not anticipate that the presentation of news would have an effect on recollection. We believe that this is because some news are not necessarily connected with people's memories of the experiences and activities depicted in the photographs, even though people are familiar with the news content. That is, while people are aware of events in the news, the presentation of news is not effective in aiding recollection.

Based on the avobe discussion, we conducted a new experiment paying attention to the relationship between news and people's memories of their experiences and activities.

4. Experiment

4.1 Purpose

The purpose of this experiment is to observe how accurately participants remember when particular news articles happened. This is because we believe that people identify the dates of events that make news by correlating them with memories of events from their own lives. To achieve this end, we asked participants whether they knew of the particular news, when they believed it happened, and why they thought so.

4.2 Procedure

In this experiment, 41 participants between the ages of 16 and 58 years were given a sheet containing a keyword related to the news presented and a 100-word Japanese article on it.

First, we asked them whether they knew of the particular news. Second, if the answer was yes, we asked them whether they remembered when it happened. With respect to this question, we asked them to rate their recollection on a scale of 1 to 5, from "I don't remember at all" to "I remember exactly." We asked them to remember the date when news happened, even in cases where they did not remember the date at all. Finally, in order to investigate why chose a particular date, we asked them to tell us about the reasons

Table 2: Result of experiment

degree of remembrance	ratio
news articles that participants knew	76 % (187/246)
news articles that participants identified the year correctly	16 % (30/187)
news articles that they identified the year almost correctly (± 1 year)	42 % (79/187)

for their conjecture. We allowed them to describe not only the reason but also their thought processes while trying to remember the date. In this experiment, we used 6 different pieces of news.

- Bovine Spongiform Encephalopathy (BSE) (Dec 23, 2003-Jul 2004)

- Socrates in Love: a novel and movie in Japan (novel: Apr 2004 movie: May 2004)

- The 2005 World Exposition, Aichi, Japan (Mar 25, 2005-Sep 25, 2005)

- A meat bun contained cardboard (July 8, 2007)

- "I'm different from you," the Japanese Prime Minister's statement (Sep 1, 2008)

- The Lehman Shock (Sep 15, 2008)

Before this experiment was conducted, participants chose, on a scale of 1 to 5, the frequency with which they saw news in each medium, namely, TV, radio, the Internet, and newspaper. This was done to investigate the relation between the accuracy of the date chosen and the frequency of seeing news. In addition, we conducted a preliminary experiment on the news item "Japan wins women's soccer World Cup" in order to understand the methodology of this experiment.

4.3   Result and Discussion

Table 2 shows the rate of particular news that participants knew, that they identified the year correctly, and that they identified the year correctly within the interval of a year before and after the actual year. The rate of particular news that they knew is 76%; a numerator (187) is a number of participants who chose "yes" to a question whether they knew, and a denominator (246) is 41 participants multiplying 6 pieces of news. Among them, 16% correctly identified the year of occurrence of the news event. The reason why we selected "year" as a degree of selection is that they hardly identified the month and the day. We found that though participants are aware of the event, they often fail to remember the exact year of its occurrence. We also found that 42% guessed correctly within the bracket of a year before and after the actual year of occurrence of the event. In this case, more than half of the participants answered incorrectly. Responses to a question why they thought the year, regarding the older news for which the date was not identified correctly suggested that participants often answered "by guesswork" and "somehow."

On the other hand, in the case of news that they identified correctly, many provided answers that pointed to their experiences, activities, or age, for example, "when I was a junior high school student," "when I worked at my previous workplace." That is, people try to remember the exact year that the news event occurred by connecting this to their own experiences or age. However, we observed some instances when they did not answer correctly, although they made the connection with their experiences. We believe this is because the time that they recollected was different from the actual time of occurrence of the event (e.g., a participant assumed that the year of the opening of her salon was 2006, though it was actually 2004). This could also be because the content of the news is connected to their experience or activity, but the year does not form a connection with the time of their experience or activity.

Table 3 shows the rate of participants who gave a particular answer to each question regarding each news item. A numerator is a number of participants identifying the year when particular news happened, and a denominator is the result obtained on subtracting the number of participants who did not know particular news from the 41 participants. The year "BSE" occurred in was recollected by 8% (the lowest), and 39%, (the highest) recollected the year "I'm different from you" occurred in. Table 4 shows the rate in a case that the exact year is within the interval of a year before and after the actual year. The year of occurrence of "The 2005 World Exposition" and "BSE" was identified by about 25% (the lowest) and "I'm different from you," by 67% (the highest). The percentage of participants that identified the year of "I'm different from you" correctly is this high because they associate this occurrence with the time that the Prime Minister came into power, rather than with their own experiences. With regard to "The 2005 World Exposition," those who were present at the event identified the year correctly, but those who were not present there were unable to identify it. "BSE" is the oldest of all the news items; therefore, participants' memories of it were unclear. Therefore, it is likely that identifying the year of "BSE" was more difficult than for the other news items. However, in instances where participants identified the year correctly, the association was most likely made with their age.

After the experiment, we administered a simple questionnaire. According to the results, most participants experienced difficulty in remembering the exact time of occurrence of the news. One participant said, "because my days have been the same in the past several years, I did not notice the year, though I am familiar with the news itself." Based on this opinion, we observed that a significant occurrence or

Table 3: Rate of participants who gave a particular answer to each question regarding each news item

news article	ratio
"Bovine Spongiform Encephalopathy (BSE)"	8 % (3/38)
"Socrates in Love"	19 % (7/37)
"The 2005 World Exposition"	13 % (4/32)
"A meat bun contained cardboard"	12 % (4/34)
"I'm different from you"	37 % (7/19)
"The Lehman Shock"	14 % (4/28)

Table 4: Rate in a case that the exact year is within the interval of a year before and after the actual year

news article	ratio
"Bovine Spongiform Encephalopathy (BSE)"	26 % (10/38)
"Socrates in Love"	51 % (19/37)
"The 2005 World Exposition"	22 % (7/32)
"A meat bun contained cardboard"	50 % (17/34)
"I'm different from you"	63 % (12/19)
"The Lehman Shock"	50 % (14/28)

a clear memory of the environment and the conditions surrounding the event are necessary to remember the precise time. Another participant said, "I remember the person and the place that was mentioned in the news, but I don't remember when the event took place." Hence, it is necessary to connect news to people's experiences and conditions in order to help them correctly remember the time when the news happened.

5. Reformulating the Design

Upon analyzing the results, we found that the news needs to be impactful or well known and also strongly connected to people's memories of their experiences and activities to support recollection. However, clues that aid recollection are not always included in the news that is collected on the basis of the date of photographs. PHOTMOSPHERE is based on the awareness that people's feelings and thoughts about photographs fade over time, but they can remind people of their experiences and activities. Through examination and experiment, we found that news that is connected to experiences or activities is more memorable. Therefore, we add a function in the PHOTMOSPHERE that enhances memorization by connecting the "memory" of the event surrounding the photograph and the "record" of the actual events.

The PHOTMOSPHERE becomes a system that helps people expand their memory by serving 2 functions: to memorize news by using photographs that are strongly connected to their feelings, thoughts, and reactions, and to bring back the memories of photographs that are weakly connected to their feelings, thoughts, and reactions by using news. To achieve this end, we believe that it is necessary to establish strong connections between not only "memory" and "record" but also "time." Therefore, we design a system to expand people's memories by connecting the "memory" of their experiences and activities and the "record" of past events with "time."

6. Related Works

In this section, we overview related works that utilizes photographs.

Focusing on taking photographs and recording videos by a mobile phone, Numa et al. aim to change the mindset of users and redesign the relationships between people and information using mobile phones as expression tools[Numa 09]. This study designed and produced a workshop program called "Keitai Trail!" to collect and connect participants' "story." This study is similar to the point that collects information related to their experiences and connects them. However, this study pays attention to help people express (i.e., output), while our study pays attention to help people recollect (i.e., input).

Sumi et al. propose the PhotoChat to encourage users to facilitate conversations about photographs among them and discover the individual interests of each other by integrating photographs and notes[Sumi 08]. This system can be also used to expand user 's memory by combination visual and textual information. However, this system focuses on communication and sharing with others, while our system is used by alone not multiple people.

He et al. believe that "memories" consist of not only what was seen, along with time and location information, but also includes expressions and actions[He 06]. Therefore, this study proposes the u-Cam, a ubiquitous camera system that can record not only the scene users are looking at but also themselves at that moment. This study also believes that it is important in order to remember their experiences to provide not only photographs they took but also other

information. In addition, they also provide to integrate visual and textual information. This study particular focuses on the location information of photographs. We wish to also adopt location information and provide users both temporal and location information to expand their memory.

7. Conclusion

This paper presented the PHOTMOSPHERE, which displays photographs and news in order to expand people's memories by connecting the "memory" of their experiences and activities and the "record" of past events. To investigate the presentation of news with photographs, we conducted an examination to observe how detailed participants' memories regarding photographs can be. We also conducted an experiment to observe how correctly participants remember when the presented news happened. On the basis of the results obtained, we conclude that connecting the three factors, namely, "memory," "record," and "time" is helpful in expanding memory. In the future, we wish to develop and reformulate the design of the PHOTMOSPHERE based on this finding and subsequently check the usefulness of this system.

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