

What do people want from their lifelogs?

Yi Chen

Centre for Digital Video Processing
School of Computing
Dublin City University, Dublin 9, Ireland
ychen@computing.dcu.ie

Gareth J. F. Jones

Centre for Digital Video Processing
School of Computing
Dublin City University, Dublin 9, Ireland
gjones@computing.dcu.ie

ABSTRACT

The practice of lifelogging potentially consists of automatically capturing and storing a digital record of every piece of information that a person (lifelogger) encounters in their daily experiences. Lifelogging has become an increasingly popular area of research in recent years. Most current lifelogging research focuses on techniques for data capture or processing. Current applications of lifelogging technology are usually driven by new technology inventions, creative ideas of researchers, or the special needs of a particular user group, e.g. individuals with memory impairment. To the best of our knowledge, little work has explored potential lifelogs applications from the perspective of the desires of the general public. One of the difficulties of carrying out such a study is the balancing of the information given to the subject regarding lifelog technology to enable them to generate realistic ideas without limiting or directing their imaginations by providing too much specific information. We report a study in which we take a progressive approach where we introduce lifelogging in three stages, and collect the ideas and opinions of a volunteer group of general public participants on techniques for lifelog capture, and applications and functionality.

General Terms

Design, Experimentation, Human Factors

Keywords

Lifelog, applications, questionnaire, methods

1. INTRODUCTION

Lifelogging is a special case of a personal information space. A lifelog aims to capture certain aspects of a person's life, this can include not only the information that a person encounters or is interested in, but also what he or she is doing or experiencing. Some of the popular current lifelog capture techniques include automatic taking of photos using wearable cameras (e.g. Microsoft SenseCam [7]), videos (e.g.[6]), audio, and physical track logs from sensors such as GPS, accelerometers, and biometric devices such as heart rate monitor. Studies of lifelogging have often focused on advanced technologies for the efficient capture of as many aspects of a person's life as possible, while other researchers have looked at how to aggregate and interpret the massive volumes of captured data, e.g. segmenting a stream of images into groups of events [3], finding images to represent a period of time where hundreds of images or frames of video are available, or detecting activities using sensor data [13].

While researchers have devoted considerable effort to making data available to people, they have not given much attention to studying the uses for which potential lifelog users would actually want one. Currently, the most popular application of lifelog techniques is to use the streams of pervasively captured photos

from the first person perspective to support mentally impaired people, specifically for people who have severe mnemonic problems. Despite the interest in capturing data, little study has been made of applying this technology to support the daily life of the general population. Notable exceptions include some studies have looked at re-telling life stories [2, 4, 5], and summarizing life patterns to help human well-being (e.g. [9]). This study looks at how the wider population might use lifelog applications, the conclusions of this study are intended to guide the development of new lifelog technologies.

2. RELATED WORK

There have been many exciting proposals of what lifelogs technologies might offer. Examples include transmitting professional knowledge [1], and supporting the data owner's memory ([8, 14, 15]). Sellen and Whittaker [16] summarized five functions that lifelogs could potentially support, referred to as the 5 'R's: *recollecting* (recalling a specific piece of information or an experience), *reminiscing* (reliving past experiences for emotional or sentimental reasons), *remembering intentions* (remember to do, e.g. remembering to show up for appointments), *reflecting* (a more abstract representation of personal data to facilitate reflection on, and reviewing of, past experience) and *retrieving*, that is, to retrieve a previously encountered digital item or information, such as documents, email, or Web pages. The first three functions are different forms of support to memory, the retrieval function corresponds to what Spärck Jones called "deposit", that is, storing currently less important stuff for potentially use. Other applications she suggested (as concluded by [10]) include: *Super me* - as a pool of facts to amplify one's memory), supporting one's memory; *Persona* - story telling using one's lifelogs data, *Assembly* - similar to reflection, but the data (an extracted version of a particular aspect of a person) is presented to others, examples include a doctor's medical record of a person; and *Collective* - different individuals sharing their lifelog records in social networks.

Petrelli et.al. [11,12] conducted a series of experiments, investigating the types of physical object that people desire to keep as mementos and how they are going to use them. They found that the objects people choose to store are usually what could reflect experiences about oneself, about certain people, events or places, and things reflecting contemporary features, so that they can compare them with things they encounter in the future. The participants' reasons for keeping these items include: recording aspects of one's life, reminiscing (e.g. for nostalgia or for fun), comparing today and the future, and preservation (because they are valuable or embedded with great personal meaning). While interesting, the results from these studies are not directly applicable to electronic lifelogs due to the difference between objects in the physical world that electronic items. For example, electronic items can be duplicated many times, so are less likely to be valuable because of their unique existence. Also,

storage space in the physical world cannot be compared with that for electronic items. Thus, we decided to explore people's opinions of lifelog technologies directly from a wide population.

3. METHOD

To better understand the potential applications of lifelog technologies from the perspective of potential users, we conducted an online survey hosted on `sojump.com`, a website which enables users to create advanced online questionnaires and also provides a paid survey service, that is, users (questionnaire creator) can pay their participants through a credit system. At the time the survey was conducted, the website had approximately two million subscribers, who were informed via email when new paid surveys for which they were qualified to participate became available.

3.1 Participants

We solicited for questionnaire participants through `sojump.com`'s paid-survey service and social networks such as *Facebook* and *weibo.com*. The questionnaire did not define any criteria for participants. This means that the age and gender of the participants are both conveniently sampled. Since the participants were subscribers of the website, we could generally assume that they have considerable knowledge and skill in daily computer tasks, e.g. using the Internet. Also, since `sojum.com` is a Chinese website, almost all participants employed via the website's paid survey service will be Chinese speakers. The questionnaire was anonymous and the participants invited via the website's paid survey service were paid at rates depending on the number of questions answered and the question difficulty.

A total of 414 subjects completed the questionnaire, with 182 males, and 232 females, ages ranging from 15-50, with 73.8% in the age range of 20-30. Among the subjects, the majority (408) were from the website's paid-survey service, with only six subjects recruited from other sources.

3.2 Questionnaire

The questionnaire was presented in both Chinese and English. It aimed to explore the type of lifelog data people want to be captured and stored, lifelog applications that they would like and the characteristics of the participants themselves, to explore the factors that influence their opinions. As discussed earlier, it is difficult to ask people to answer questions based on their imagination for technologies that do not currently exist or they may not have heard of previously. It is also difficult to balance information that participants require to generate realistic ideas and opinions, and the possibility that the information given to them could direct, and therefore restrict, their imagination. The questions in our questionnaire thus gradually explained the idea of lifelogging without giving too much information to the participant at each point and thus restricting their imagination. The questionnaire was structured in three parts:

1) Introducing lifelog relating to past experience

Firstly, we listed some types of currently popular lifelogging elements, and asked participants if they **have ever wished** that they had recorded and/or stored any of these in the **past ten years**. We tried to cover most categories of lifelog data, but not to put more weight on any of them, so as to avoid biasing users' imaginations. Choices listed for this question include: "photos of what you saw", "your footsteps (names of places that you've been to)", "what you ate every day", "your emotional status", "what

you saw/used/created on your computers" "records of your conversations", "some moments or episodes in your life". This question acted as a preliminary introduction to lifelogging without actually telling them what it is. We expected that participants could reflect on the sample scenario and that this would trigger more thoughts regarding other things they might wish to have captured. This was captured by an open-ended question. We then asked participants to tell us what they wished to do with the data if it were recorded and stored.

2) Introducing current lifelog capturing techniques and application to elicit more ideas

Once their initial thoughts were collected, we could tell the participants more about the possible types of data in lifelogs and ask for their opinions about capturing these types of data. Following a brief introduction to the concept of lifelogging, we asked the participants to rate their preferences for capturing and storing each type of data that is currently captured or discussed in the area of lifelogging on a 5 point rating scale (from 1="don't want to capture it at all", to 5="want to capture as many and as frequently as possible"). The methods listed included: "audio recording of whatever you could hear", "scripts of your conversations (given that the script could be very accurately translated from the people's voices)"; "photos captured from first person perspective (imagine a small camera mounted next to your eyes)", "video captured from first person perspective". Again, we provided a list of currently known or planned lifelog applications for them to rate (1="not useful at all" to 5="extremely useful"). Following this, there was an open-ended question for them to add more suggestions of applications that had not been included in any of the above questions or their previous description.

3) Introducing a tool

In the third step, we introduced a prototype software tool to show some possible ways of accessing lifelog data. The expectation in doing this is that this could give some tangible idea of what a lifelog system could bring to participants, so that we could further explore their needs, desires and system expectations for a lifelog accessing system. A snapshot of the prototype system interface was presented with detailed instructions for each function. Participants were required to tick the functions that they read and understood, before they proceeded to further questions.

4) Personal differences

We also collected information about the participants' lifestyle and personality at the end of the test to see if these correlate to any differences in the functions they want. Six features were collected: 1) gender, 2) age, 3) how much they liked their lives being recorded (e.g. "how often do you take photos"), 4) habits on deleting, organizing and sharing, 5) frequency of travel, and 6) self-evaluation of their own memory. Questions 3-6 were rated on 5-point rating scales.

4. RESULTS AND DISCUSSION

Among the 414 completed questionnaires, 402 were judged to be valid and reliable. We investigated the Spearman's rank correlation between the traits and habits of individuals and their preference for capturing techniques and lifelog applications. Little correlation was found between age or gender and the selection of favoured functions. Nor was any significant correlation found between the subject's self-rating of memory, frequency of travel, interest in life recording and sharing, or organization habits and their preference for capturing technologies.

4.1 What to capture?

4.1.1 Preferred types of recording

Wilcoxon tests were used to compare the differences between the user's preference ranking among the following pairs: 1) audio types vs. visual types, 2) sound vs. text representations of voice, 3) photo vs. video, 4) photos about oneself (with one's figure in it) and photos about what one saw (what is in front of the person, rather than the person him or herself). Significant advantage was found in visual vs. audio ($Z=-9.30$, $p<.001$), photos vs. videos ($z=-2.37$, $p=.018$), and script of conversations to audio recordings ($Z=-2.67$, $p=.008$), photos about oneself vs. photo of what one sees ($Z=-2.06$, $p=.035$). Some participants voted absolute "no" to recording of sound, one to scripts of conversations and videos, but all participants were willing to take photos.

Table 1. Ranking of capturing methods

Measure	Sound	Conversation	photos ¹	photo ²	video
Mode	3	3	4	5	4
Median	3	3	4	4	4
Mean	3.32	3.12	4.07	3.94	3.81
"Never" (%)	3.86	14.7	0	0	2.42
"As often as possible" (%)	16.2	17.3	36.5	36.0	32.5
SD	1.09	1.18	0.87	0.99	1.07

Note: photo¹ refers to "your photos, or photos about you", photo² refers to photos taken from first person perspective

Sound

Recording of conversations is somewhat controversial since it is often regarded as overly intrusive to privacy, and could for example act as evidence to help the wearer in a lawsuit. Some people also commented that they would like their loved ones' voices to have been recorded, so that they could hear these people when they were gone. Indeed, sound is a very emotional resource to assist reminiscing, although about one sixth of the participants were strongly against the recording of sound.

Wearable cameras

Regarding the opinion of wearing a small automatic photo taking camera, the majority (74.2%) of the participants showed positive attitudes ($M=3.94$, $SD=.99$), that they either "somewhat agree" or "strongly agree" that they would wear this camera and let it continuously and automatically take photos of what they saw. Regarding the situation that other people around them were using such a camera, 62.5% still said that they would be happy to wear such a camera themselves, and 43% of the participants said that they would be more aware of their own behaviour. Some people commented that they were afraid to have other people's privacy being captured on their cameras. Some participants commented that they would like to have control over what would be captured, e.g. "a convenient power button"... "I can turn it off when don't want it to record". One participant answered that he would not like the camera to be as small as to be unnoticeable, otherwise it would be impolite to the people being captured, and the wearer themselves would not know when they themselves were being captured.

4.1.2 Desired types of data

Among the provided options, most people wanted "photos of some moments in your life" (77.0%), footsteps (63.1%), about

half of them wanted to store all the visited or used information (files, images, webpages) on their computers (57.1%), emotional status (46.1%). Comparatively less people wished that they could have recorded conversations (28.6%), or what they ate each day (18.4%). We coded people's comments regarding any specific or additional things that they wanted to capture:

- *Thoughts*: including thoughts, ideas, plans and inspirations.
- *Moment in life*: Many people wanted to capture *cheerful, happy or funny, and touching* moments. Some people wished to record moments with certain people, e.g. loved ones, or certain types of events, e.g. "when I am playing football". One participant wanted to record every bit of daily life scenes.
- *Context*: including the weather, date and time, location, people around, and the name of the events if available.
- *Development or changes of certain aspects in one's life*: e.g. how the relationship developed between one and his partner, the change of one's own body, such as weight change and size.
- *Tasks done*: they said such records could make it easier to know what was left to be done later.
- *Others*: a list of books they read, people they met, "Facial expression and gestures", etc.

4.2 Applications of lifelogging data

4.2.1 Applications

Participants suggested applications including the following:

- 1) *Reminiscing*: Re-live the remote or recent past, e.g. "watch them with my wife when we're old", or review a recent holiday or interesting event. The purposes of reminiscing are usually casual and/or emotional, e.g. to re-enjoy a happy time, for fun, e.g., "laugh at my stupid stories in the past". Some subjects expected to let out their unhappy emotions through reviewing events that had happened.
- 2) *Memory backup*: Look up specific facts "in case I don't remember". It is similar to "recollection" or "super me"
- 3) *Telling and passing life stories*: Some people mentioned that they would like to lifelogs to make their autobiography or use them to assist in writing one, to leave them to their children or decedents as a memoriam or the story of our current generation.
- 4) *Re-use*: As for files, information and items encountered and used on the computer, the main application reported was to re-use it when needed, e.g. "I can look up information in it". This is similar to "deposit" or "retrieving"
- 5) *Evidences*: Several participants said that the photos and voice recorded could be used as evidence, e.g. in a court.
- 6) *Collection and Archiving*: Some people just want to save their favoured music, pictures, or every moment of their life without knowing exactly what they are going to do with the collection. Interestingly, three participants mentioned that they would like to use the images as wallpaper.
- 7) *Learning about unknown early age*: Many people mentioned that they would like to see what they were like in their early childhood, or how they grew up, e.g. "what was it like the moment I come into this world", "how I grew up and became like this". Many people also want to record how their children grow up.

- 8) *Well-being and better organization*: Many people want to see their life pattern, and compare their current lifestyle with that in the past. Some also want summaries of certain aspects of their life to help them review previous activities, e.g. “help me understand what I did and how I spent my time online”, “how I spend my money”, “how many calories I consumed today”. This type of application was mainly reported after introducing the prototype software. It seems that these suggestions were inspired by the functions of the prototype system, which shows one’s activities (both in the physical world and on computers) along a timeline. This suggests that user needs can be triggered by newly available technologies.

4.2.2 Suggested functions

After introducing the sample system, we collected the following user suggestions for lifelog systems.

1) *Sharing*: Several participants expressed their wish that the system could provide a function to upload some selected data from their lifelog to social networks. The types of things to be shared include photos, and also footage of what they have done, and their life patterns. Some people wanted to synchronize records of completed tasks with their online schedules.

2) *Show context data*: Some participants wanted context data to be presented along with their activities, including: date time, the location, people who were around. One participant even said “If the photos are taken during sightseeing or a holiday, I’d like to present the photos on the local map.”

3) *Privacy and Control*: Several participants expressed concerns of privacy issues. Some participants suggested “selective hiding of unwanted information”, or automatically inhibiting recording in some area such as the bathroom.

4) *Others* While most of participants said that they were very happy with the functions provided by the prototype system, a few participants wanted the interface to be as simple as possible.

5. CONCLUSIONS

In this survey, we explored people’s opinions on lifelogs. The participants generally showed interests in lifelog technologies, although some of them also expressed concerns about privacy issues of the passive capture method. They tend to accept visual rather than sound capturing, though sound could be a very valuable resource for reminiscing or as evidence. Of course, many people wanted to have control of their data regardless of the capturing methods. The applications and functions they desire from their lifelogs include emotional purposes (reminiscing), task based purposes (recollecting or extracting specific information for re-use or evidence), to support well-being (e.g. learn about and compare current life pattern, exercises, personal finance, and get organized in work), or for sharing or transferring as memoriam of oneself (storytelling to other people, or learning about oneself in terms of what one has little memory of). A larger scale multi-cultural study may bring more interesting ideas, since culture may be a factor in determining people’s idea of lifelog applications.

6. REFERENCES

[1] Bush, V. As we may think. *The Atlantic Monthly*. 176(1): 101-108, July 1945.

[2] Byrne, D. and Jones, G. J. F. Towards computational autobiographical narratives through human digital memories.

In Proceeding of the 2nd ACM International Workshop on Story Representation, Mechanism and Context. ACM, 2008.

[3] Doherty, A. R. and Smeaton, A. F. Automatically segmenting lifelog data into events. *In Proceedings of WIAMIS 2008*. IEEE, 2008, 20-23.

[4] Harper, R., Randall, D., Smyth, N., Evans, C., Heledd, L. and Moore, R. The past is a different place: they do things differently there. *In Proceedings of the 7th ACM Conference on Designing Interactive Systems*. ACM, 2008, 271-280.

[5] Helmes, J., Hummels, C. and Sellen, A. The other brother: re-experiencing spontaneous moments from domestic life. *In Proceedings of the 3rd International Conference on Tangible and Embedded Interaction*. ACM, 2009, 233-240.

[6] Hirose, Y., Ikei, Y., Hirota, K. and Hirose, M. iFlashBack: a wearable electronic mnemonics to retain episodic memory visually real by video aided rehearsal. *In Proceedings of Anonymous Virtual Reality 2005*. IEEE, 2005, 273-276.

[7] Hodges, S., Williams, L., Berry, E., Izadi, S., Srinivasan, J., Butler, A., Smyth, G., Kapur, N. and Wood, K. SenseCam: A retrospective memory aid. *In Proceedings of UbiComp 2006: Ubiquitous Computing*, 2006, 177-193.

[8] Hoven, E. and Eggen, B. Informing augmented memory system design through autobiographical memory theory. *In Proceedings of Personal and Ubiquitous Computing*, 2008

[9] Kelly, P., Doherty, A., Berry, E., Hodges, S., Batterham, A. M. and Foster, C. Can we use digital life-log images to investigate active and sedentary travel behaviour? Results from a pilot study. *International Journal of Behavioral Nutrition and Physical Activity*, 8(1), 2011, 44.

[10] O’Hara, K., Morris, R., Shadbolt, N., Hitch, G. J., Hall, W. and Beagrie, N. Memories for life: a review of the science and technology. *Journal of the Royal Society Interface*, 3(8), 2006, 351.

[11] Petrelli, D., Van den Hoven, E. and Whittaker, S. Making history: intentional capture of future memories. *In Proceedings of the 27th International SIGCHI Conference on Human Factors in Computing Systems*. 2009

[12] Petrelli, D., Whittaker, S. and Brockmeier, J. AutoTopography: what can physical mementos tell us about digital memories? *In Proceeding of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing systems*. ACM, 2008, 53-62.

[13] Qiu, Z., Doherty, A. R., Gurrin, C. and Smeaton, A. F. Turning raw SenseCam accelerometer data into meaningful user activities. *In proceeding of SenseCam 2010*.

[14] Rhodes, B. J. The wearable remembrance agent: A system for augmented memory. *Personal and Ubiquitous Computing*, 1(4), 1997, 218-224.

[15] Sellen, A. J., Fogg, A., Aitken, M., Hodges, S., Rother, C. and Wood, K. Do life-logging technologies support memory for the past?: An experimental study using SenseCam. *In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. 2007, 81-90.

[16] Sellen, A. J. and Whittaker, S. Beyond total capture: a constructive critique of lifelogging. *Communications of the ACM*, 53, 5, 2010, 70-7.