From Lifelog to Diary: a Timeline View For Memory Reminiscence

Lijuan Zhou, Yang Cheng*, Cathal Gurrin, Zhengwei Qiu
School of Computing, Dublin City University, International School, Beijing University of Posts and Telecommunications*
Collins Avenue, Glasnevin, Dublin 9, Dublin, Ireland
mzhou@computing.dcu.ie

ABSTRACT

As digital recording sensors and lifelogging devices become more prevalent, the suitability of lifelogging tools to act as a reminiscence supporting tool has become an important research challenge. This paper aims to describe a first-generation memory reminiscence tool that utilises lifelogging sensors to record a digital diary of user activities and presents it as a narrative description of user activities. The automatically recognised daily activities are shown chronologically in the timeline view.

Categories and Subject Descriptors

H.4 [**Information Systems Applications**]: Miscellaneous

Keywords

Human Computer Interaction; Memory Reminiscence; Lifelog; Digital Diary

1. INTRODUCTION

Traditional dairy recording is typically text based, either through writing in a notebook or, more recently, maintaining an online blog. Naturally there is an overhead in maintaining a diary, which may be offputting for many. Therefore, keeping a lifelog with the help of mobile lifelogging devices such as a SenseCam or a smartphone is more convenient and liable and is becoming an acceptable choice for people who choose to lifelog. However, simply generating a diary automatically using sensors on a mobile device produces a semantic gap, in which it is difficult for people to interpret raw data into a human readable language. Narratives for lifelogs can be generated in a few ways. For example, asking people to write down the event/activity description for a sequence of events generated as part of a lifelog, or alternatively, it is possible to build up a library of narrative sentences with specific time, event content, people and other relevant information automatically. Our own experience has suggested that the lowest user overhead approach has the most potential to be gainfully used, hence this automatic generation method is the subject of this research.

The approaches to gathering and utilising lifelogs can be viewed as three types: comic/cartoon style diary which avoids the further concern of personal privacy[2]; lifelog retrieval

systems, that are mainly visual-based[1] and users can either retrieve one specific image or recall a ranked list of relevant events; and finally lifelog event browsers [3], which present visual images in a calendar view and include functionalities such as group sharing and editing. There has also been consideration of the processes of maintaining daily digital dairies in the work of Lee et.al. who proposed to use a media process to generate human visual dairy based on SenseCam data data[5] and Doherty et. al. who presented a framework of constructing and augmenting human dairy through lifelog data[3].

However, there is little research that explores natual language represetation of lifelogging activities, using a combination of text based narratives and images. This work aims at transforming the raw sensor data collected by lifelogging devices into a narrative (story) form so people can read lifelogs in a timeline diary view.

2. DIARIES AND REMINISCENCE

Diaries keeping track of everyday life would reflect real-life activities of individuals over a prolonged period, including person activities and levels of social engagement. Consulting such a personal diary is a good method of keeping track of daily life or supporting retrospection over past experiences and internal memories. Visual lifelogs provide a direct visual trigger to past experience through assistive devices which capture daily lifelog moments and attempt to provide reminders at future appropriate times. However, people are not yet used to rich visual lifelogs (potentially thousands of images daily). Through reading the automatically created narrative diary, not only could you find out the past success and mistakes and potentially gain new insights in a conventional text-based manner, but the emotional variations and the activity influence on physical and mental health are also available for consultation. The lowest barrier-to-lifelogging device is a smartphone [4], and thereby it is possible to generate an automatic digital diary by either carrying a smartphone or wearing one (camera facing out) on a lanyard around the neck. It is our consideration that such a digital diary could be proposed as a practical tool for self-care mental health[6].

3. ACTIVITY RECOGNITION

Lifelog data is usually a media-rich sensed archive of life experience of an individual, and it could include image sequences (from wearable cameras), GPS, accelerometer data, color change and environment temperature, and so on. In this paper, we are focusing on using the accelerometer for
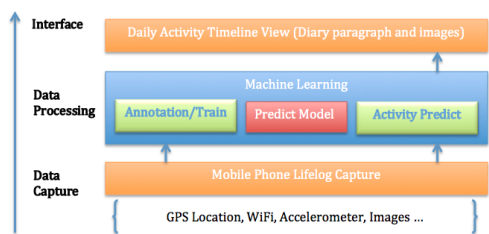
Figure 1: The Structure of the Timeline View

Figure 2: Screenshot of the Timelife View of Lifelog Events

activity recognition. Based on priot work, we identify 15 human life activities: Preparing food, Socializing, On the phone, Relaxing, Taking Care of my Children, Eating, Housework, Exercising, Pray/worship/meditate, Working, Watching TV, Commuting, Computer/Internet/Email, Shopping and Napping. The features extracted from accelerometer data for annotation and prediction is based on the mean value of three dimensional accelerometer data within dynamic time windows and the standard deviation values. In addition, the covariance value of any two dimensions is also included. So in total, we generate 9 dimensional features for each activity annotation and recognition. Using this approach, we are able to translate the computer-readable data into semantically meaningful data for narrative generation.

As shown in Fig. 1, the lifelog data is analysed by a generated predictive module. We utilize machine learning based method for activity recognition, for later narrative generation. The activity recognition part is done automatically through machine learning with user annotated data, which means that every item of the sensor data will be classified into one kind of activity that is defined in the narrative database. Usually, the number of activities is limited, which is the same as in the automatic activity recognition process.

4. NARRATIVE & TIMELINE GENERATION

Narrative generation is the process of constructing a narrative description of an event or activity, with a view to effectively using story as a communications medium. While there have been previous approaches to narrative generation, many based on statistical and template-based approaches, the approach planned in this research is novel in that accessing the writings of the lifelogging individual. It is proposed that the narrative generated could be more lifelike, in that it could replicate some of the writing style of the individual. Additionally, simulated writing style could better reflect the lifelog owner's activity and mood variation. Getting a more accurate diary is the goal of this research.

A statistical approach is proposed to generate a specific writing style for the narrative. The process emphasises a sentence construction approach that includes: tense, voice, adjective and conjunction. In our experiment, past tense is the main tense used by the diary. The percentage of the usage of active and passive voice in the training data for simulating similar writing style can be decided by the user. It is more difficult for computer to recognize the expressed meaning as well as combined mood under different contexts as the adjective vocabulary would be huge.

Figure 2 shows the system of the timeline view for memory reminiscence that we propose could be helpful for supporting reminiscence. With the calender on the left side, the system
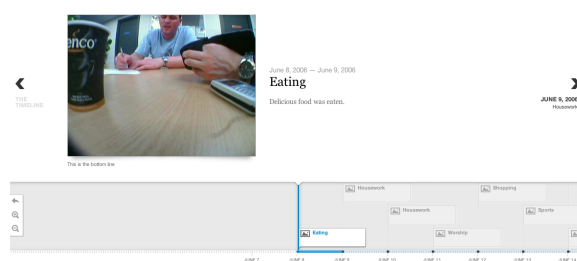
users can select a specific date to view the lifelog events for that day. The lifelog picture is the keyframe of an event in that day, when the user click it, it can play the event content to show the whole event. Also, all days with lifelog recording are marked on the timeline, if the user clicks on any time point, it will show the events of the day. And the user can click *last* and *next* button to view another event.

5. CONCLUSIONS

In this paper, we present a timeline based lifelog viewing system for memory reminiscence with automatically generated narratives. In the future, we will implement this timeline-based narrative diary browsing system and will conduct further user evaluation.

6. ACKNOWLEDGEMENT

7. REFERENCES

[1] K. Aizawa, D. Tancharoen, S. Kawasaki, and T. Yamasaki. Efficient retrieval of life log based on context and content. In *Proceedings of the the 1st ACM workshop on Continuous archival and retrieval of personal experiences*, pages 22–31. ACM, 2004.

[2] S.-B. Cho, K.-J. Kim, K. S. Hwang, and I.-J. Song. Anidiary: Daily cartoon-style diary exploits bayesian networks. *Pervasive Computing, IEEE*, 6(3):66–75, 2007.

[3] A. Doherty, C. Moulin, and A. Smeaton. Automatically assisting human memory: A sensecam browser. *Memory*, 19(7):785–795, 2011.

[4] C. Gurrin, Z. Qiu, M. Hughes, N. Caprani, A. R. Doherty, S. E. Hodges, and A. F. Smeaton. The smartphone as a platform for wearable cameras in health research. *American journal of preventive medicine*, 44(3):308–313, 2013.

[5] H. Lee, A. F. Smeaton, N. E. OâĂŹConnor, G. Jones, M. Blighe, D. Byrne, A. Doherty, and C. Gurrin. Constructing a sensecam visual diary as a media process. *Multimedia Systems*, 14(6):341–349, 2008.

[6] P. Self-maintenance. Assessment of older people: self-maintaining and instrumental activities of daily living. 1969.