Self-Defining Memory Cues: Creative Expression and Emotional Meaning

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Abstract
This paper explores how people generate cues for capturing personal meaningful daily events, which can be used for later recall. Such understanding can be explored to inform the design and development of personal informatics systems, aimed to support reflection and increased self-awareness. We describe a diary study with six participants and discuss initial findings showing the qualities of daily meaningful events, the value of different types of cues and their distinct contents for supporting episodic recall.

Author Keywords
Self-generated cues; meaningful daily events; doodling; episodic memory recall; creativity; emotions.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
HCI community has started engaging with issues of reflection on personal experience [14][15]. The field of personal informatics [7][10][11][12][17] is particularly positioned to tackle the challenge of capturing and representing experience for later reflection, awareness and behaviour change.

Instrumental objects

*"I spent the entire morning covered in glue thanks to reception children. I don't think I have ever been covered in so much glue in my life. It was chaotic***"** [P1]

"This was my first phonics lesson and that was our guide book for the year" [P1]

"Just the generic practice that we have every Wednesday afternoon […] it was interesting but nothing amazing happened. I thought it was artistic at the time" [P6]

However, before one can reflect on personal experience is important that that experience is richly recalled. This paper proposed to intersect two distinct areas of research: personal informatics and memory technologies to address the challenge of supporting episodic recall of meaningful daily events.

The aim of this work is to look beyond automatically generated memory cues and explore the value of manually self-defined cues, with the goal of developing novel and more effective types of cues. We defined self-defining memory cues, digital cues manually created either by capturing readily available content embodying the essence of an event, or by creating and capturing such content when not readily available.

Related Work

The Value of Recall in Personal Informatics

The main goal of Personal Informatics is to support people's self-tracking, self-awareness and self-management, and its main research question is how can we transform this overwhelming incoming body data into self-knowledge. Current research has focused on how such data can be summarized and visualized to enable the reflection on meaningful personal events [7][10][11][12][17][20].

A key challenge is identifying meaningful daily events worth reflecting on, and more importantly, how can they be retrieved. While lifelogging technologies support total recall, recent scholarly interest has suggested that selection at the moment of encoding is much needed [18]. As increased engagement in the encoding process supports recall [21], in this paper we aim to explore the manually generated cues for daily memorable events rather than automatically generated ones.

Memory Cues for Episodic Recall

Most of the HCI research on episodic memories has focused on memory aids for supporting retrieval [6], with an emphasis on visual cues such as photographs and videos [19]. A wealth of studies have shown SenseCam's benefits for supporting recall of episodic memories [5], both as remembering and knowing about the past [19]. Lee and Dey found that SenseCam photos should be recognizable or personally significant and that they capture four distinct types of cues: people, objects, places and actions [9]. Kalnikaite et al.'s findings showed that visual cues promote better recall, whereas locational information supports inferences about patterns of behavior [8].

Other types of cues have been investigated with respect to aiding memory recall: audio cues, such as ambient sound recordings or spoken word diary entries [2]; geo-locational cues [8]; digital media, such as calendars and email [4][10]; and most recently biofeedback cues, such as heart rate monitors and galvanic skin response sensors [17].

Most of the previous work has focused on automatically generated memory cues. We know little about how people manually generate cues for their memorable daily events. This research gap is important to address as may shed light into developing different, more effective types of cues both in terms of format and content.

Method

The aim of this study is to explore how people generate cues for capturing personal meaningful daily events, which can be used for later recall. Such understanding can be explored to inform the design and development of personal informatics systems, aimed to support increased self-awareness, reflection and behaviour change. The study addresses the following research questions:

- What are *meaningful daily events* that people decide to capture cues for? Which *qualities* set meaningful events apart from the mundane events?

Objects as Activity Outcomes

"[What was the most memorable event from Sunday?] Probably when I was washing my motorcycle […] in the afternoon. You could see that it was a bit damp that day. It had rained previously but not at that point" [P6]

"I had a very boring day where I was just cleaning the house for large proportion but towards the end I saw there was a new game released on Xbox Live for free so I downloaded it. That was probably

- What *format* people prefer for self-defining cues in order to later prompt recall of meaningful daily events? Is there a preference for recording photos, sketches, sound or voice-based cues?
- What *content* of daily events gets captured by self-defining cues? Is there a preference for place, time, people, emotions, thoughts?

Sample
The fieldwork consisted of a diary study with six participants. We employed a convenience sample and recruited from authors' university and social groups. Participants are all students: three in their final year of Computer Science degrees, two from the Engineering Department and one studying teacher training. All participants are smart phone users and familiar with the Android operating system. Participants' age ranged from 21 to 25, with 5 being male and 1 female. None of the participants had any prior experience with personal informatics or life-logging systems.

Procedure
A five day diary study was performed, which involved three stages. In the initial stage, participants were individually introduced to the study, equipment and signed the consent form. To aid the capturing of events participants were provided with Android smart phones where the following applications were preinstalled:

- *Android* Camera, for image and video capture.
- *Picasso* - a drawing application for sketch and diagram entry.
- *Smart Voice Recorder* for voice and sound entry.
- *AIRS* [11] - Life-logging application for location tracking, mood entry and heart rate monitoring.

In the second stage, participants were asked to capture cues for their daily meaningful events. We instructed them to take photo, record video, audio and voice narration, or draw doodle. A timer application was used to provide reminder notifications for describing the most important event that has happened to them in the previous 2 hours. Interviews were scheduled for each end of day when the cues were shared and discussed to explore the selection and construction of cues, as well as their effectiveness for prompting the recall of the events.
The third and final stage took place at the end of the five days and consisted in a final interview when the cues were explored in terms of their effectiveness for delayed recall. Participants were also given the opportunity to provide additional feedback and return the equipment.

We employed a thematic analysis which offers a flexible approach to data exploration. It allows the identification of major themes which are further described.

Findings

Daily Memorable Events
Half of participants found it difficult to identify daily memorable events. Those who did have mentioned work achievements, completion of household chores, weekend fun activities, and hobbies. While three participants identified no memorable events, each of the others identified between three and five such events occurring over the duration of the diary study.

Example of memorable events include teacher training such as sequencing activity with reception children; planning and delivering of the first phonics class [P1]; driving and spending the weekend at a friend for hiking and Sunday lunch [P5]; successful completion of literature review for a module's coursework, washing one's motorcycle, treating oneself with a new downloaded after a day of cleaning the house, or playing the drums in a weekly group [P6].

Similarly to memorable events, mundane events also include work tasks, routine chore activities or fun, relaxing ones. For example such events include watching TV, commuting, studying, shopping, eating or drinking with friends. However, in contrast with

Context

"Saturday I went hiking in the Brecon with XX and we camped. It was fun. On the right hand side is where we pitched the tent the night before" [P5]

"The most memorable moment was eating lunch but I didn't want to take a picture whilst we were eating. That's cleaning up" [P5]

Generated cues: emotions

"My first phonics lesson went very well. I was really happy […] This is my thumbs up. I would have liked to video some of our phonics teach but I wasn't able to do that" [P1]

memorable events which are experienced with intense positive affect [16], the least memorable ones are characterized as having heightened negative arousal or low positive arousal. Even positive events such as achievements or relaxing activities do not appear to be celebrated as the memorable events are.

Our findings indicate that the hallmark of daily memorable events is positive affect, the richness of the felt experience, vivid recall of the event, and awareness of the significance of the event. What appears to matter is the personal meaning that people assign to them, rather than the events themselves. In contrast, less memorable events tend to be inferred based on routine activities and are described through fewer details and lacking rich personal notes. There is no awareness of the significance of the event, and less memorable events lack the potential to be represented through cues. As a result, such events are captured by fewer cues. In contrast, people able to identify memorable events are also able to provide detailed rationale for the selection or construction of cues for prompting their recall.

Cues Format

The self-defining cues consisted of photos (79%), doodles (18%), videos (2%) and audio cues (1%). It is probably less surprising that photos feature highly as cues as they are the easiest and most accessible to record. Photos also provide a wealth of content from context, people, activities and expressed emotions, readily available to be captured.

A surprising finding however is the prevalence of doodles as second preferred cue format. In contrast to photos, the doodles' content needs to be created. This involves a creative component which most people enjoyed. Doodles are particularly interesting as they are mostly preferred for capturing event's emotional meaning. They are also used for abstract qualities of the experience which are difficult to capture through readily available cues.

A second surprising finding was the limited use of audio cues. Previous work has shown that sonic souvenirs are more creative and better suited to express mundane events than photos [2]. Yet, we found few accounts of audio cues, and exclusively voice records rather than contextual sound. Despite their evocative power, the capturing of contextual sound appears problematic in settings where social norms prevent it.

The challenge of capturing cues during the memorable events opens up the opportunity for some participants to construct the cues after the event. Besides photos and audio records, videos are also used to post-annotate events. For example, people creatively generated videos to express their feelings after successful completion of challenging tasks. On few occasion, people were challenged by the demand of constructing the cues, so that a few memorable events remained uncaptured.

Cues Content

Our findings indicate that the content represented within the cues consists of objects (59%), spatio-temporal context (24%), emotional meaning (16%) and people (1%).

These content categories are interesting as they differ in two important aspects from previous cue taxonomies: events, spatio-temporal contexts, thoughts and emotions [17], and: people, objects, places and actions [9].

First, self-generated cues show the prevalence of objects and specific object types, and second, the also show limited emphasis on people. With respect to objects, most of the memorable events consist of human activities. When defining the cues, participants tend to identify key aspects which could stand for the entire activity. Such aspects include materials and *objects instrumental* for the completion of the activity, or *objects representing the result of the activity*. For example, P1 mentioned large amount of glue used during the activity with reception children, or a cooked

Generated cues: emotions

"I was really tired. Basically the day had worn me out, I have never felt so tired just from teaching ever" [P1]

Generated cues: abstract representations

"During our phonics lesson we went on treasure hunt of words in the outside area, and the children have to be able to recognise the words by how they are spelled. Such as cat. And we get the children to sound them out. Cat was the most popular and successful" [P1]

Absent cues

"I drove to Wales to see my friend XXX. [What was the most memorable event from that day?] Probably the drive but that won't be recorded in pictures" [P5]

banana cake. The objects figuring in cues are not only physical but also *digital*, capturing for example the successful completion of a piece of coursework or a downloaded game for P6.

Another surprising finding is the prevalence of emotional meaning within the self-defining cues. As shown in Table 1, such meaning is predominantly captured through doodle-based cues. People tend to draw their moods through abstract representations using color and shapes, or tend to write their emotions using drawn letters, i.e. bad, itchy, confused, tired [P3]. This is an interesting outcome, given that people were provided with mood entry application. The preference to use the doodles to express emotions suggests the value of creative and more agentic forms of participation in generating the cues.

	Object instru-mental	Object out-come	Con-text	People	Meaning/ emotion
Photos	49	8	29	1	3
Doodles	5				15
Video		1			1
Audio	1	1	1		1
Total	**55**	**10**	**30**	**1**	**20**

Table 1. Categories of cues' content across cues' formats

While people are often present in automatically logged cues such as SenseCam photos [4] [9], our outcomes suggest that people are less important in self-defined cues. We conjecture that the essence of an activity, even if social, is better captured through its materiality, i.e. objects and context. Our self-defined photo-based cues also differ from souvenir photos and their self presentation quality. In contrast, we found limited photo-based cues featuring selfies, suggesting that such cues are for exclusive private functional use [1][13].

The captured contexts consist of work settings, streets, outdoor places, houses or kitchen where people share social activities. About half of the context-based cues were recorded by P3 during his weekend trip. This suggests that for activities performed in familiar places, the objects-based cues are preferred, while for activities in new, unfamiliar places, the change of context becomes important and worth recording, confirming previous findings on locational information supports inferences about patterns of behavior [8].

Conclusions

Daily meaningful events that people identify and generate cues for are characterized by positive affect, and richness of the felt experience. In contrast to less meaningful events which are inferred based on routines, the meaningful ones are vividly remembered.

In terms of cue formats, people prefer visual representations, with photos featuring mostly the objects or contexts of activities, and doodles-based cues capturing feelings or abstract concepts key to the event. Doodles offer opportunity for creative expression and are particularly enjoyed. This suggests that digital support for self-defining cues should enable increased users' engagement and agency.

With respect to cue contents, self-generated cues show the prevalence of core objects such as those instrumental for the completion of activities, or those capturing the result of activities. Findings also indicate the limited value of people and self presentation in cueing recall of meaningful daily events. Tools to support the recall of daily events could explore the caption of activities and their objects in both visual and innovative non-visual form, i.e. through movement or touch.

We acknowledge the limitation of the preset capturing methods on participants' natural behavior. The limited sample size of this exploratory study also needs addressing in future work. An exciting research direction which we will focus on is investigating new tools to support the non-visual self-defining cues for the recall of daily events.

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