

Smell-Based Memory Recollection and Communication Support

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Abstract. Many victims of The Great East Japan Earthquake lost many precious mementos. Such losses can result in more time being required to recover emotionally and mentally.

This paper proposes an effective reminder management system using smell. The system focuses on fond memory recollection. Preliminary experiments using a device that produces smell showed that it was effective to help recall fond memories by smell. This system encourages us to remember fond memories using smell, record the smells into a system and communicate with people who have similar experience.

Keywords: Fond memory, recollection, communication, smell

1 Introduction

Memory and mementoes are accumulated every day. Digital cameras and cell phones equipped with a camera function are now widely used, with people being able to easily record their individual experiences in everyday life using cameras and an unprecedented number of pictures being stored. In response to this trend Nojima[1] has emphasized the importance of administration of mementoes and proposed a type of memory engineering for use in organizing and administering rapidly increasing mementoes. Memory engineering aims to create an engineering support framework for the efficient and effective administration, storage, and utilization of vast numbers of mementoes, especially pictures and videos.

The Great East Japan Earthquake resulted in the victims of the disasters having lost precious mementoes through the tsunami, fire, and collapse of their houses. The mementoes referred to here can include those involving precious family members, the houses where they were born and raised in, places they used to play as a child, familiar surroundings such as neighbors and friends, as well as diaries, pictures, albums, and videos used to record all of them. The common belief is that victims of disasters losing those mementoes can result in more time being required for them to recover mentally because they feel a sense of loss of the time they spent in their lives, which they had stored in the form of mementoes, resulting from having lost the mementoes and can therefore be afraid that they will no longer be able to recollect the memories on which their identity is based [2]. People do not only look to the future but also live in the now based on trust in themselves which is consistent throughout

their life, from birth right through to the present. The reason why elderly victims of disasters take longer to recover mentally than younger people can be easily understood to be that the former have had longer lives, with the resulting loss for the former therefore being bigger than with the latter. In many cases people losing continuity in their lives due to disasters or accidents can give rise to fear and make them incapable of starting a new life. Starting a new life requires a solid foundation of their identity, in which going back over (recalling) past enjoyable episodes in their lives is both necessary and important [3]. In the case of the Great East Japan Earthquake the importance of the mementoes has been publicly recognized and many “memory search squads” were organized from volunteer groups [4]. The groups are involved in the volunteer activities of searching for photo albums and commemorative objects from the debris in areas with heavy tsunami damage. Activities involving pictures that evoke memories being searched for and then returned to their owners have also been spreading in the afflicted areas. Many of the disaster victims state that, “I feel I can push myself just a little harder if I can receive the picture I cherish, even if it is just one picture”, thus implying that the mementoes are of significant meaning to the victims of the disasters.

This study involves the establishment of a concept for a system for use in recollecting memories and thus supporting the victims of disasters that have lost mementoes through supporting that recollection using an alternative trigger to any lost mementoes. The target situation of this study is the opposite of conventional memory engineering and requires a quite different approach. The concept of the system involves pictures of common sightseeing spots, maps, old popular music, the smell of food etc, and other types of stimulation being used to promote the recollection of memories. The system also utilizes humming as an unconscious activity in everyday life to promote the recollection of any music related memories. The system then records the content of the recollections, thus supporting communication with others with similar experiences. This paper proposes a system that focuses on supporting memories being recollecting via use of the sense of smell.

2 Related Studies

Nakatani[3] proposed a framework for use in supporting the reconstruction of the memories of the victims of disasters. The framework provided triggers for use in recalling memories, including information on the time, place, event, names of individuals, etc., and feelings [4]. The triggers used in that recollection play a significant role in recalling memories, with a strong link being necessary between the triggers and the memories.

Memory engineering often utilizes pictures as a major trigger in recalling memories [5]. Pictures can visually evoke an image and thus are quite effective in memory recollection and communication support. However, the method would be ineffective in this study as it is highly likely that the victims of the disasters covered have typically lost all their pictures. In addition, if the victims of disasters have not recovered from the shock, recalled memories from pictures can result in adverse effects.

Music was also studied as a trigger in place of pictures [6]. Music, for example popular music, can often be common to everybody and hence easily shared with others. Music is also often closely related to memories and people can often easily recall a memory merely by listening to and humming tunes. The system proposed in [6] identifies a hummed tune and provides the name of the hummed song and its singer, together with the related data, such as the related memories of her/his own and the other users to the tune stored in the memory database, similar tunes of the same classification, and tunes of the same period. Based on these data, the system promotes memory recollection of the period and recommends other tunes which are favored by other users who love the hummed tune, as new triggers. However, the content of memory related to music can significantly vary, in some cases depending on the individual, thereby making the sharing of memories somewhat difficult.

In addition to the triggers mentioned above smell was also studied as a trigger of memories. Smell can be easily connected to a specific memory and it is said that the sense of smell is the most effective with long-term memories, in particular. In this study images and text were used as triggers in addition to smells in supporting the communication of memories. However, the objects that users recalled from a smell were not very consistent with the images and text presented by the system in relation to that smell, and hence, the system did not prove to be very effective.

3 Overview of the System

This study concerns the establishment of support for memories being recollected and communicated with a focus on the close relationship between a smell and long-term memory. People often recognize a smell, particularly when food related, and recall an experience as a memory after smelling the same smell. This study therefore focused on food related smells. We believe that a system for use in making a smell which are familiar to the users can effectively promote memories being recollected.

This study utilized an Aromageur developed by Mirapro Corporation [7] to produce the smells (Figure 1). The equipment can control the smell, including its strength or weakness, by blending up to six types of essential oils and flavors in specific proportions. The equipment can also easily be used to blend original smells. Furthermore, the blend used can then be saved as electronic data, and hence can be invoked and reproduced anytime.

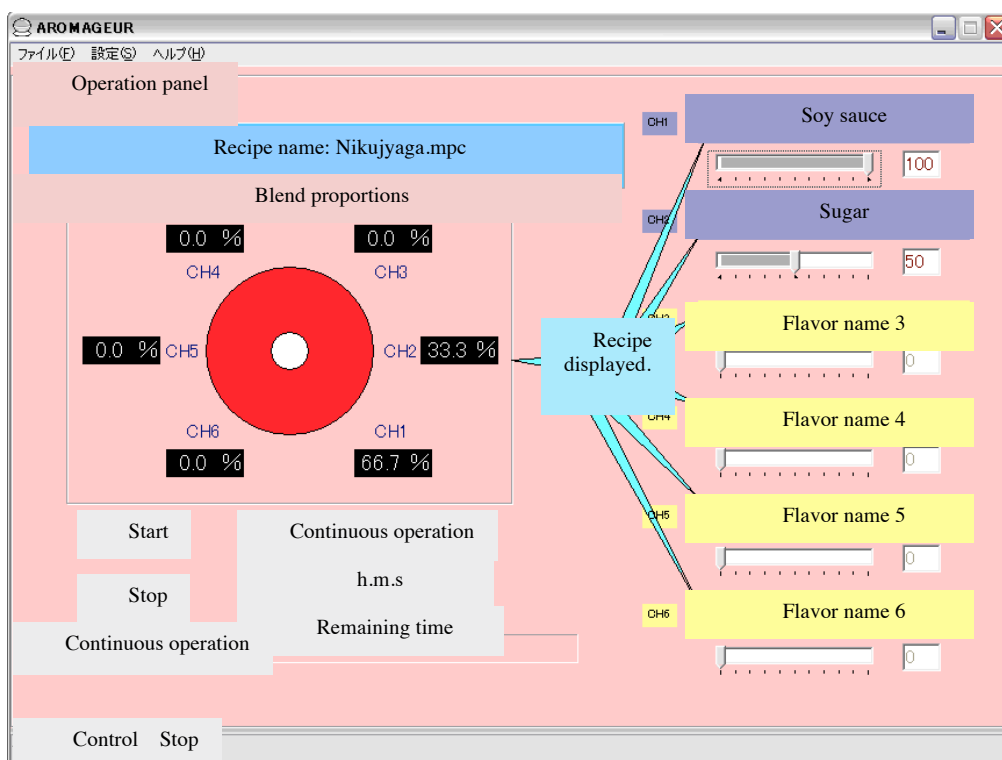
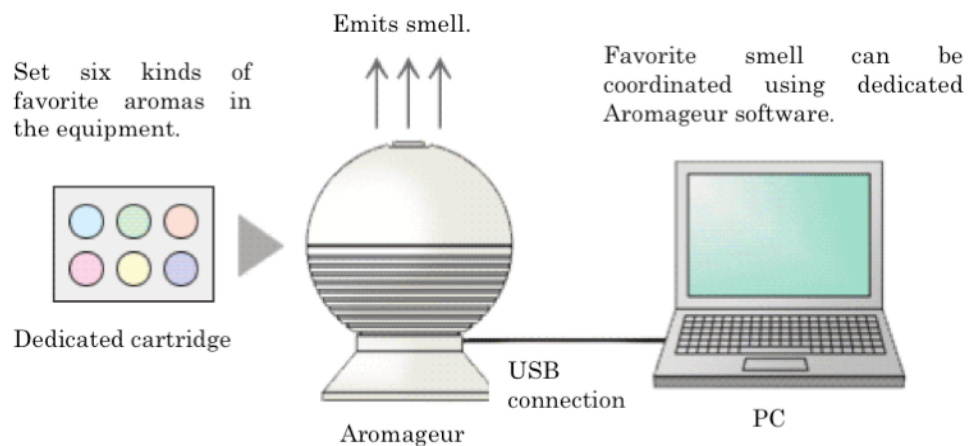


Figure 1. Experimental setup and its user interface

3.1 Recommending a smell that suits the preference of users

The expectation was that releasing a smell that suits the user from the system would effectively promote the recollection of memories and support communication. Morphological analysis was used to analyze the preference of users. The morphological analysis used in the system extracts nouns from the text and identifies any words concerning food from among them. The system then extracts any words that are particularly popular as well as those that can be closely linked to the memories of users.

The flow of use will now be explained. The system utilizes Twitter [8] through which it collects the tweets of users, automatically extracts keywords for use in the morphological analysis, and the produce smells related to the keywords thus extracted. In this step an image related to the keyword is also shown. If the user does recollect a memory the system then asks the user to tweet the recipe of the smell and details on the memory evoked. The system then saves the details of the memory and related smell. The tweets can additionally draw the interest of other users, thus initiating conversations, which thereby supports communication.

3.2 Sharing memories via use of smell and images

The system assumes usage mainly during mealtimes and at people's homes. For example, people often take pictures and tweet via Twitter when eating sweets or fruit. If they could tweet not only the image but also the smell, then other users would be able to receive visual and sensory stimuli that could trigger memories recollected. The situation exists where the same image of food has different smells and conversely almost the same smell different images of food, with that small difference then being capable of promoting active conversation among several users. We therefore believe that grouping tweets according to the smell of food could be used to promote active communication among users.

4 Implementation of the System

4.1 Configuration of the System

The system provides support for memory recollection, administration, and communication via utilization of the functions mentioned above. Implementation of the system used Objective-C for iPhone applications and php for the Google App Engine. The system was created to be used with portable devices in ensuring easy use of the system in everyday life. An outline of the system is as described below (Figure 2).

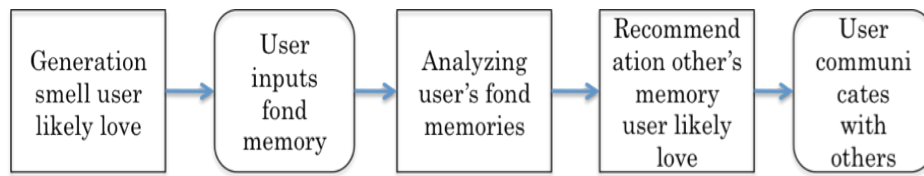


Figure 2. Outline of the experiment

The main functions of this system include:

- (1) Administration of memories
- (2) Producing a smell, and
- (3) Administration of users.

Memories are saved as tweets, pictures, and smell blends.

A group for the same food is created and users can view the memories of other users in thus initiating communication.

The initial smells covered by the system were of fruit.

The basic information from users is collected from Twitter. The preferences of each user are automatically analyzed by the system and updated in the memory database.

A typical example of use is as described below.

The user first logs on to the system via their Twitter account. The system then obtains past tweets of the user and analyzes them, the results of which are then used to produce a smell. If the user recalls something they then tweet the details to the system, with the smell needing to be tweeted as well. The user can browse both their own and other users' tweets via the system.

In addition, the user includes a picture and smell with a tweet when they eat something. Other users can then view the tweet, use it to recall something, and then tweet the details with a picture and smell. This then initiates communication within a group of users that have tweeted on similar food. We believe that other users will then join the tweet concerning the pictures and smell, thus making the conversation more active.

4.2 Preliminary experiment

A preliminary experiment took place in which a blend of the smell of that children's favorite, curry and rice, was produced using Aromageur to verify whether it would result in any memory being recollected. Four male university students were involved in the experiment.

The following were confirmed via the experiment:

- (1) The smell of food was properly blended.
- (2) This then resulted in the target recalling a memory related to the food.

- (3) However, many of the experimental targets stated that the smell produced from the Aromageur was “stronger” than that of the actual food itself, which is probably due to the former having no visual focus and thus the impression from the sensation of the smell being stronger.
- (4) The smell remained within the space for about 30 minutes, thereby making it difficult to blend several kinds of smells in the same experiment. Further efforts will need to take place in implementing more experiments on the recollection of memories via use of smell.

Another preliminary experiment took place with communication concerning food. Fifteen university students were involved in the experiment.

The following were confirmed via the experiment.

- (1) The topic of food was very good trigger to recall fond memories.
- (2) Communication concerning food encourages recollecting fond memories.
- (3) However, it could be easier to recall food from fond memories than fond memories from food.

5 Conclusion

Experiments took place on supporting the recollection of memories via use of the abovementioned system. Preliminary experiments found an important relationship between smell and fond memories. We intend to continue to verify whether smells can effectively promote memories being recollected and memory communication thus supported based on the results.

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