Grocal Prize

Title: HANOSE
Team Name: JIM
Member: Muhammad Al ATIQI, Koji KOYAMA, Saiful Hadi MASRAN

Memory preservation is an important part of human life. Most recorded memories are in the form of pictures, audio, or a combination of both, as in videos. These preservation techniques are dependent on two types of sensors: auditory and visual. However, they are not the only sensors that can preserve human memory: olfactory sensors can also contribute to enriching human memory when describing a certain event or situation. Studies show that certain smells can evoke human memories and nostalgia [1]. To enrich the technology of human memory preservation, we introduce HANOSE, a portable device system to detect and recreate smells.

The HANOSE system consists of the smell detector itself and a smartphone application to transfer data to the cloud. The smell probe in the detector is a series of receptor membranes fabricated on Micro Electro Mechanical System Oscillator. When a flavor molecule attaches itself to the receptor membrane, the oscillation changes. The detected signal is transferred to a smell synthesizer using an internet connection. However, the issue with the smell detector is the tradeoff relationship between sensitivity and temperature independence, which could be solved by using diamond, which has ultra-high sonic speed and is temperature independent [2]. The digitized scent generated from the smell detector will either be stored in the cloud or sent to the smell synthesizer device. This device consists of three main parts: the artificial intelligence electronic computer unit (AI ECU), the cartridge unit, and the diffuser unit. The AI ECU recalls the digitized scent and regenerates the smell. The cartridge contains chemicals, either natural oils or synthetic fragrances, which are activated by either heat or air pressure when signals are sent by the AI ECU. Finally, the diffuser diffuses and broadcasts the smell. One of the main challenges is to develop a safe, consumable cartridge.

HANOSE can be used for different applications. The data from the HANOSE system are uploaded to the cloud coupled with user information such as gender, age, country, and smell preference. When the data becomes large enough, it can be widely used not only for the HANOSE system, but also for a wide variety of businesses, such as travel agents, online cooking lessons, advertising, and entertainment. During the COVID-19 pandemic, HANOSE can enrich remote interaction with loved ones by sharing familiar odors from home, beyond the usual audiovisual virtual interaction. Currently, there are some concerns about ensuring whether the product is safe and secure to use. First and foremost, the materials used should be nontoxic. Second, an extra-security protocol must be implemented to prevent problems such as odor bombing.
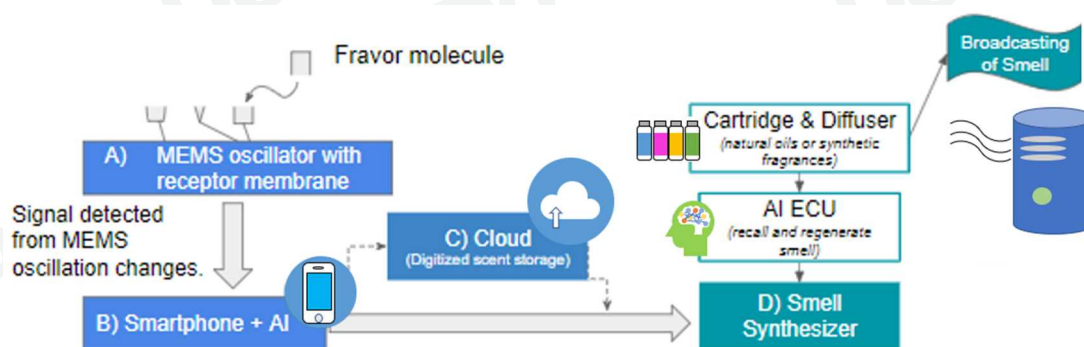

Fig. HANOSE system overview (Figure by JIM Team)

Reference:
[1] Reid, C.A., Green, J.D., Wildschut, T. and Sedikides, C., 2015. *Scent-evoked nostalgia.* Memory, 23(2), pp.157-166.
[2] Shitaka, S., Nakahata, H., Fujii, S., Oyo Buturi 71(3) (2002) pp. 327 (in Japanese).

Title: Helmet Time Capsule
Team Name: Sushi
Member: Chanakarn Thamsiriprideeporn, Laura Martinez, Nguyen Bao Ngoc, Mukit Sarkar

In many countries, motorbikes are the primary means of transportation. A helmet is, therefore, an indispensable protection accessory for most citizens. Considering its significance, the team decided to enhance the helmet's value by incorporating the ability to augment memories through the human's available senses.

The Helmet Time Capsule functions not only as a helmet, but also as a high-tech time capsule. The device utilizes augmented reality for image/video playback, voice and face synthesis for a true-to-life face-to-face interaction experience, and digital olfaction technology for smell simulation. It is also equipped with an advanced glove that is able to mimic human touch. The helmet user could actively recall any precious memories, such as a great cooking experience with the smell of the actual food, or a family outdoor activity coupled with 3D simulation of the place that it occurred in. Additionally, the wearer is protected from head injuries while using the device, even when not driving.

Title: Creating Empathy through a New Historical Debate
Team Name: FOX
Member: Atsushi SAITO, Kana TOMITA, Alexis SÁNCHEZ SALAZAR

The most important legacy that victims of historical tragedies can pass on to new generations is their testimonies. These testimonies are important for preventing the re-occurrence of similar tragedies and as valuable life lessons in general. The AI testimony provides the experience of a face-to-face conversation, which leaves a positive impression on participants. Although this technology seems to be an effective way to preserve our historical memories and has already been implemented, we cannot interact with it unless we visit a museum.

We propose an extension of this method, in which not just the testimonies of the victims, but also those of the perpetrators are included.   The contrast between the two can provide better insights into what caused such tragedies to occur. By properly guiding the debate generated between the two parties, this can be used to provide closure to historical tragedies, creating more empathy. The interaction can also be broadcasted online to larger audiences.