

Chapter 5

Odor Reproduction with Movie and Its Application to Teleolfaction

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ABSTRACT

The authors of this chapter study the odor reproduction system synchronously with a movie. The system is made up of an odor sensing system and an olfactory display. The fruit flavors were recorded with movies using a digital video camera and the odor sensing system. The results of the sensory tests showed that the odor information recorded using the proposed method is appropriate for the smell regeneration associated with the movie. Next, the authors propose a tele-olfaction system synchronous with visual information. The olfactory display system was placed remotely from the odor sensing system, and both of them were connected via Internet. In addition to the olfactory system, a Web camera captures image around the sniffing point and that image appears at the computer display connected to the olfactory display at remote site. Moreover, the mobile stage with its sniffing point and the Web camera remotely controlled by a user was introduced so that he/she could interactively approach a smelling object. The questionnaire survey at the exhibition revealed that a user can enjoy smell synchronous with movie in real time even if he/she stays at the remote site.

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INTRODUCTION

A human perceives sensory information through senses such as vision, audition, olfaction, gustation and tactile and force impression. To enhance the quality of life, various equipment types have widely been used for recording and reproducing the visual and auditory information in daily living. Televisions, music players, digital cameras, digital video cameras and Web cameras are such common electronic devices.

Although the reproduction techniques thus far have been limited to the visual and auditory information, it would be expected to expand the reproduction techniques to other sensory information. For example, the tactile information has been used in virtual reality (Burdea and Ciffet, 2003). The olfactory information has been another target for the recording and reproduction (Barfield & Danas, 1996; Davide, Holmberg, & Lundstrom, 2001; Tominaga et al., 2001). It has been reported that the olfactory information drastically enhances the sense of presence in the virtual environments (Gobbetti & Scateni, 1998; Dinh, Walker, Song, Kobayashi, & Hodges, 1999).

Electronic-nose technology (Pearce, 1997) attracts attention in respect of realizing the recording of olfactory information (Gobbetti & Scateni, 1998; Davide, Holmberg, & Lundstrom, 2001). In the electronic nose, odors are recognized based on the sensor-response pattern of an odor sensor array composed of multiple sensors with partially overlapping specificities. This technology has been utilized for recording odor compositions with signal processing based on control theory (Nakamoto, Nakahira, Hiramatsu, & Moriizumi, 2001; Yamanaka, Matsumoto, & Nakamoto, 2003). Although typical electronic-nose systems have been developed for detecting odors in a closed chamber to minimize disturbances, this odor recorder has the capability of recording odors in the atmosphere (Yamanaka, Yoshikawa, & Nakamoto, 2004). Odor recording in the atmosphere is a challenging task due to the large fluctuation in odor concentration caused by turbulent airflows (Yamanaka, Ishida, Nakamoto, & Moriizumi, 1998).

It was reported that binary odor compositions of apple flavors were recorded using this system in the atmosphere (Yamanaka, Yoshikawa, & Nakamoto, 2004). It was however difficult to achieve a high accuracy of mixture quantification for the rapid change in an odor composed of more than two components. For the practical application of olfactory reproduction to a movie production, the reproduction of a wide variety of odors would be desirable rather than the reproduction of a mixture with precise composition. Therefore, the recording of odors in the atmosphere based on pattern classification is presented in this chapter to realize the reproduction of a wide variety of odors.

In order to display the odors recorded with the electronic-nose system, an electronic device to present the olfactory stimulus is required. Recently, several studies

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