Food texture augmentation by smartphone gripping in hand

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I. Introduction

The enhancement of eating and drinking experiences is critical for improving the quality of life (QoL) in various populations, including the elderly and individuals with medical conditions, dietary restrictions, or dysphagia. Past research has investigated methods to amplify sensory experiences related to food consumption, such as modifying food appearance with head-mounted displays (HMDs) [1], manipulating chewing sounds with bone-conduction earphones [2], and stimulating taste sensations using electrical stimuli [3].

These approaches often need bulky, specialized equipment, limiting convenience, portability, and applicability in settings like homes, restaurants, and outdoors. Furthermore, the cost of implementing these technologies can be prohibitive.

To address these limitations, we propose a texture augmentation method using only a smartphone, providing a more accessible, versatile solution for different locations. Our approach employs tactile-transfer, a technique creating the illusion of perceiving tactile sensations in various body parts. We aim to modify food textures by transferring the smartphone's firm sensation from hand to mouth.

II. Proposal Method

Figure 1 shows the proposed method and a prototype application. Users simultaneously grip the smartphone and chew, experiencing both the food texture and the hard tactile sensation in their hand. This combination is expected to create the perception of a harder food texture. Also, Smartphones are widely adopted. By designing a system that operates exclusively on smartphones, we anticipate reduced implementation costs. Additionally, since smartphones can display video, play sound, and produce vibrations, we expect increased scalability potential in this method.

III. Experiment and Result

To validate the proposed method, we conducted an experiment using a prototype app. The app altered the on-screen cookie's appearance by detecting gripping motion via a pressure sensor. On day one, participants consumed cookies as much as they want without the app; on day two, they consumed cookies with using the app. Taste and texture were evaluated using the VAS scale

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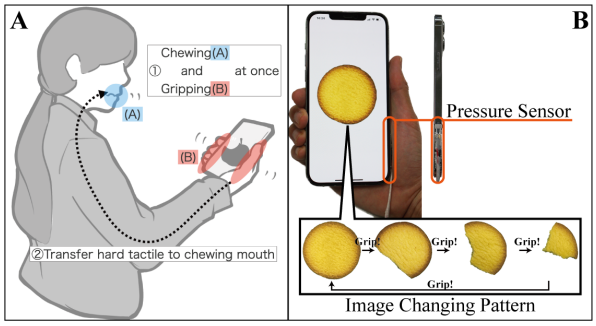

Fig. 1. A: Proposed Method, B: Prototype Application

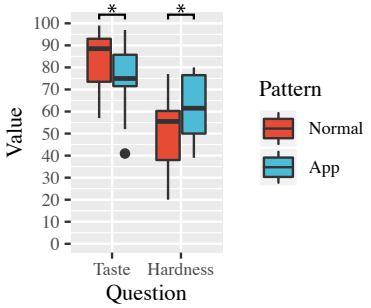

Fig. 2. Result of Experiment questionnaire

(0-100). The study included 10 participants (8 males, 2 females), mean age 23.5±0.62.

Figure 2 shows the results. Taste slightly decreased, and hardness increased. The Wilcoxon rank-sum test revealed significant differences in taste and texture (p-values 0.08 and 0.06), suggesting the method can affect texture. In future studies, we plan to include vibrations, images, and sounds to explore more complex texture modification.

References

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