Mixing Glue Spray and Cold Spray for Realizing “Popping” Sensation

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Abstract. Carbonated water or gas-filled candy provides a tingling or popping sensation in the mouth, creating a refreshing experience. If this type of tactile sensation can be presented to other parts of the body, it may provide a novel tactile experience. We found that mixing glue spray and cold spray can produce a strong "popping" sensation on the finger pad. In this study, a device to change the mixing rate was introduced and a subjective evaluation of the sensation was performed.

Keywords: haptics, chemical haptics, popping sensation

1 Introduction

Carbonated water or candy with compressed gas are favored by people because they provide the sensation of popping bubbles in the mouth, thereby creating a refreshing experience. Although this sensation is limited to the food textural domain, we considered that it is possible to provide a new experience by expanding this sensation to the tactile domain. Ultrasound and electric stimulation are used to present tactile sensations as a method for presenting sparkling sensations [1] [2]. However, both these methods require special electronic devices.

We found that a mixture of glue spray and cold spray produced a sensation of popping bubbles on the skin. This stimulation is not caused by a chemical substance such as sanshool [3] but by a mechanical stimulus, which is confirmed by the fact that it occurs even when wearing a thin rubber glove. This method is non-powered and combines commercially available sprays, making it readily available and easy to implement. In this study, a device that can change the rate of spray ejection was developed and a subjective study of sensation was conducted.

2 Device

The device consists of a microcontroller (ESP32-devKitC WROOM-32, Espressif Systems Pte. Ltd.), servo motor (MG996R, TowerPro), acrylic plate, and aluminum frame (Fig. 1 a). To control the mixing ratio of the cold spray (fumakiller) and glue spray (3M),

a servo motor was controlled by a microcontroller. In this device, an acrylic plate was placed vertically, and the motor was controlled to spray it onto the acrylic plate (Fig. 1 b). The acrylic plate was then tilted, and a finger was pressed against it to experience popping sensation (Fig. 1 c).

We investigated whether the popping sensation changed with the rate of glue and cold spray. We also compared the intensity of the sensation with that of existing substances that provide the popping sensation, such as carbonated water and gas-filled candy. The mixture produced a stronger popping sensation than the spray alone, with the intensity of the popping sensation being comparable to that of the gas-filled candy. In addition, the participants reported that the quality of the sensation differed between the candy and proposed methods. These differences in sensory qualities should be thoroughly examined in the future.

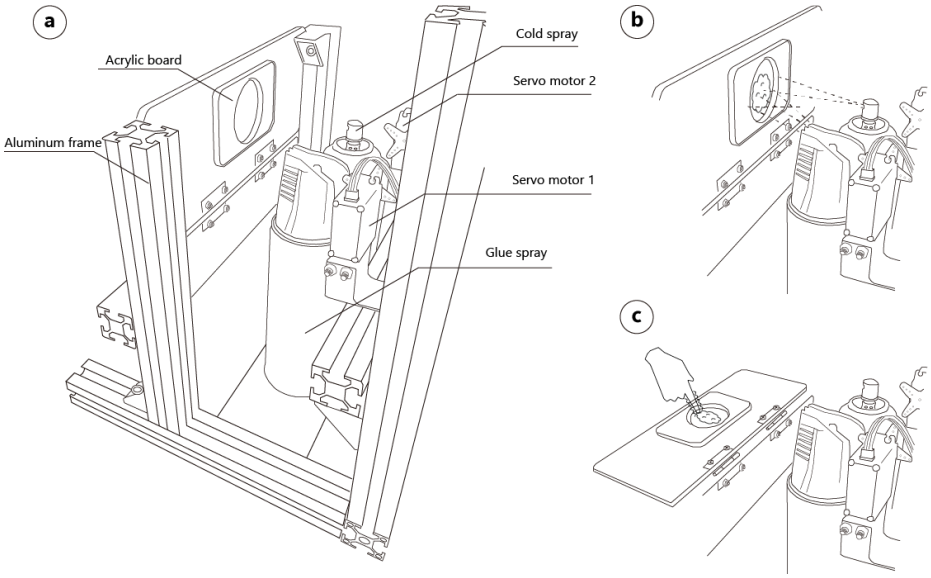

Fig. 1 Presentation device:
a. Device configuration, b. Presentation method, c. Scene of presentation

References

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