StressMincer: Enhancement of Catharsis Effect by Visualization of Words and Destruction with Haptic Feedback

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Figure 1: StressMincer (a: Shredding, b: Burning by flamethrower, c: Flushing with toilet water)

ABSTRACT

We are constantly exposed to mental stress in our daily lives, especially under the COVID-19 pandemic. To cope with this issue, we developed StressMincer, an interactive system that combines two stress-relieving factors: expression of negative emotion and destruction. The users obtain catharsis effect by putting negative emotions into words, and a force feedback mechanism enables users to destroy these words by their actions. Three different destructive experiences were developed; shredding, burning by flamethrower, and flushing with toilet water.

CCS CONCEPTS

• **Human-centered computing → Human computer interaction(HCI)**; **Interaction devices**; **HCI design and evaluation methods**.

KEYWORDS

Stress, Cathartic Effect, Voice Recognition, Tactile Interface, VR/AR, Mental Health

1 INTRODUCTION

We are daily under mental stress. There are three main types of stressors: calamities, drastic changes in our lives, and daily troubles [4]. In recent years, global warming and other factors have caused climate change, and disasters have been observed in many countries around the world. In addition, behavioral restrictions due to the spread of COVID-19 have drastically changed our lives, and more and more people are suffering from tremendous stress [6]. Furthermore, techno-stress caused by fatigue and troubles due to the use of social networking services (SNS) has become another issue [8]. Various methods have been proposed to manage the stress [7][5][2], such as occupational stretching and exercise, but most of them lacks entertainment aspect. ANGER ROOM [3] is an example of entertainment-based stress reduction service, in which people break things. However, visiting such facilities under COVID-19 situation is difficult, and cleaning up the debris from the destroyed objects is costly and might give another stress.

Our idea is to develop stress reduction system by using AR/VR technology; AR/VR technology does not require the actual destruction of objects, while providing a highly immersive experience of destroying objects through visual and haptic feedback. Moreover, AR/VR technology makes it possible to create experiences that are difficult in reality, such as burning objects or crushing with waterflow.

We also focused on the catharsis effect [1], which can relieve pain by putting negative emotions into concrete words such as dissatisfaction. In our approach, the negative words shouted by the user are captured by microphone and visualized as 3D models in a virtual space, and they are destroyed by the user.

2 STRESS MINCER

StressMincer is an interactive system that combines two stress-relieving factors, visualization of negative words and destructive action to the visualized words (Figure1).

The system has a haptic feedback mechanism on the side to increase the immersion of the destructive action. A simple and compact 1-D rotation mechanism is adopted for haptic feedback, which can be embedded into back side of the visual display, and achieves high-quality haptic presentation.

2.1 Hardware

The system overview is shown in Figure2. We adopted a naked-eye stereoscopic display (ELF-SR1, Sony) to provide users with visually immersive content. Head mounted displays (HMDs) were not adopted for ease of use.

The haptic display part employs a simple mechanism using a DC motor, and its compact design enables it to fit into the back side of the visual display. The motor is PD-controlled by a microcontroller (ESP32 Devkit-C, Espressif), which communicates with a PC via USB. An acrylic case covering the entire display was fabricated, and the motor was fixed to the back side of the display.

Three control buttons are equipped on top of the display to help users easily carry out a series of experiences on their own. These buttons have the functions to start voice recognition and to select an application. Input by the buttons is processed through the microcontroller.
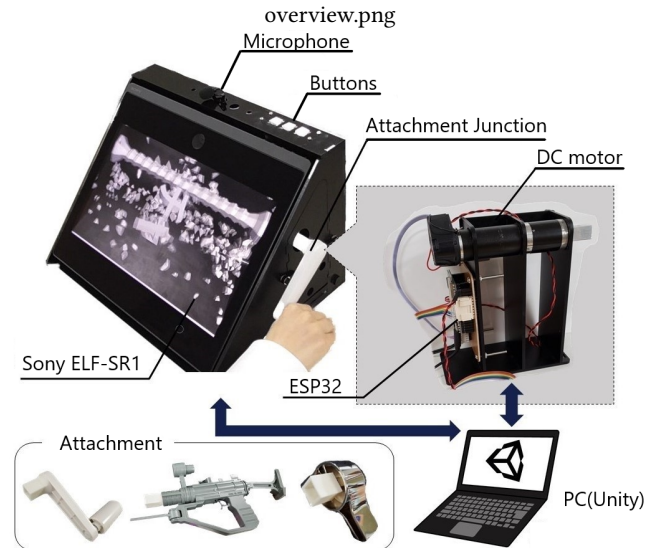

Figure 2: System Overview

2.2 Software

StressMincer uses Unity for visual effects and communication with the microcontroller. It uses Windows Speech, which is a standard feature of Windows, to recognize the user's voice. The text information converted by the speech recognition is converted to a 3D model by the unity asset function.

3 APPLICATIONS

We created three applications (Figure1). Each application uses a special attachment printed with 3D printer that is connected to the motor. *i) Shredding:* This application uses a handle-type attachment to shred the object. When the user rotates the handle, it presents a periodic vibration and resistant force to realize the sense of shredding. *ii) Burning by flamethrower:* A flamethrower attachment is used to turn the object into charcoal. When the user pulls the trigger, the vibration caused by the jet of flame is presented. *iii) Flushing with toilet water:* Using a lever-type attachment, the object is broken down and flushed with water. When the user pulls the lever, a resistant force is presented.

4 PRELIMINARY ASSESSMENT

StressMincer was displayed at the exhibition, and we asked the participants for feedback. Overall, they found the system to be fun, interesting, and pleasurable. However, most participants hesitated to shout negative words in a public place. The environment was crowded, which may have affected the experience. In order to properly evaluate the stress-relieving effect of the combination of visualization of words and destructive actions, it is necessary to set up a private room. As for the experience of destroying a word, there were many comments that the force feedback was surprising and enjoyable, but there was still room to improve the quality of the haptic reproduction. In fact, since our programmed haptic feedback does not reflect the sensed information such as velocity, we need

to incorporate them to improve the feedback quality. Among the applications, the shredder was the most popular, which is probably because the user's destructive action, the haptic feedback, and the image of the moment of destruction were all synchronized.

5 CONCLUSION

To ease our mental stress in an entertaining manner, we developed an interactive system that combines two stress-relieving factors: verbalization of negative feeling and vandalism. We also developed three applications and obtained feedback from the users, and found that StressMincer was both entertaining and interesting. Although we did not investigate the degree of stress reduction in this system in detail, we believe that the experience through StressMincer was enjoyable and contributed to stress relief, although there were some difficulties in the process of promoting the cathartic effect. In the future, we plan to optimize the force feedback and conduct psychological experiments.

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