# Haptic-Emoticon: A Framework for Creating and Sharing Haptic Contents

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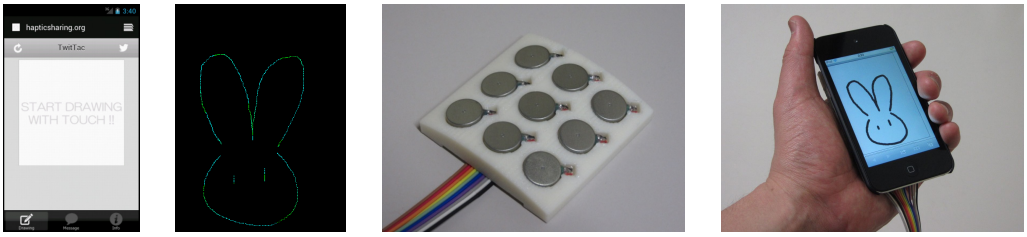


**Figure 1.** (from left to right) Haptic-Emoticon creating web application, Haptic-Emoticon trajectory with color graduation (timestamps), a 3x3 vibrotactile physical rendering display, Haptic-Emoticon haptic and visual rendering.

## 1. Introduction

Haptics is a complex sensation with pressure, temperature, vibration, and so on. Therefore developing an interface for creating or designing haptic contents is an attractive challenge. One solution is reduction and simplification of the haptic information. For example, Minamizawa et al. have simplified it as a temporal signal (sound) in *TECHTILE toolkit* [1]. We have inspired from handwriting motion on a skin. Our solution is a reduction to spatiotemporal information and we employ a spatiotemporal stroking trajectory on a 2D surface for a haptic content.

According to our fundamental concept, in this demonstration, we present Haptic-Emoticon system which is a platform for creating, sharing, and rendering haptic contents for emotionally enhancing and decorating text messages. Emoticons (e.g. " :-) ", " :-( ", "😨", "😰" etc.)) are used in text messages to represent writers' feelings and moods over various text-based communication tools (e-mails, short message services, comments on social networking services, etc.). Since our reduction simplifies haptic information into 2D spatiotemporal trajectories, we can create the haptic contents as we draw some line pictures. By utilizing RGB color data on pixels as timestamps, we can store and share the haptic contents as an image file. This enables the haptic contents (spatiotemporal trajectories) being embedded into text messages like emoticons. We call them "Haptic-Emoticon" and exhibit its creating, sharing, and rendering system.

## 2. Haptic-Emoticon Technical Approach

Our Haptic-Emoticon system includes a creating interface, an encoding algorithm and its sharing strategy, and a physical rendering device. The whole system is developed under a concept that it should be available as many people as possible. Therefore, our system utilizes some conventional devices and networking services.

Users can create (design) the Haptic-Emoticon with common GUI devices with pointing input interfaces (e.g. touchscreens, mouse, etc.) because it is just a spatiotemporal stroking trajectory. The Haptic-Emoticon creating system is developed as a platform-independent web application. A user creates a Haptic-Emoticon by drawing a stroking trajectory on a touchscreen.

The Haptic-Emoticon is graphically encoded in a conventional image format (Portable Network Graphics, PNG). The spatial information of the Haptic-Emoticon is recorded as its trajectory on an image, while the timestamps along the trajectory is stored as RGB color data of each pixel on it. In other words, the trajectory's color changes gradationally.

Since Haptic-Emoticon is stored with the PNG format, it is easily distributed and shared with text messages over various internet protocol (IP) communication services such as e-mails, short message services (SMS), comments on social networking services (SNS), etc. Our first prototype supports Twitter (http://www.twitter.com) so that the Haptic-Emoticon images are posted with short text messages.

The Haptic-Emoticon is physically rendered on a skin surface by using a custom 3x3 vibrotactile device. Haptic displays with 2D vibrator arrays have a long history (e.g. [2]). Similar to prior works, we applied a rendering algorithm based on the haptic apparent motion and the phantom sensation. We fabricated our prototype by using some affordable components such as nine vibration motors (FM23, Tokyo Parts), a microcontroller (Arduino Mega) with a basic motor driver circuit. The Haptic-Emoticon is rendered haptically on a palm and visually on a screen simultaneously.

## 3. Features and Future Works

We proposed a novel haptic contents creating and sharing platform based on a 2D spatiotemporal reduction of haptic information. We exhibit the Haptic-Emoticon system based on our concept. While the system is not suitable to render any real haptic sensation, users can create and share their original Haptic-Emoticon and express their personal emotions as if drawing pictures.

According to our basic idea that the system should be available for as many people as possible, we should employ a built-in vibrator in a smartphone, for example, and this is one of our future works. Since the creation and encoding of the Haptic-Emoticon are quite simple, we are planning to combine it with various artworks and entertainment contents (music, movies, paintings, poems, etc.) for exploring possibilities of emotional expression of haptic contents.

## Acknowledgement

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## References

[1] Minamizawa, K., Kakehi, Y., Nakatani, M., Mihara, S., and Tachi, S., "TECHTILE toolkit: a prototyping tool for designing haptic media," in *SIGGRAPH 2012 Emerging Technologies*.

[2] Israr, A., Poupyrev, I., "Control space of apparent haptic motion," in Proc. of *IEEE World Haptics Conference (WHC) 2011*, pp.457-462, 2011.


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