A method for "composing" tactile sense and its application for Human Agent Interaction

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Abstract: Tactile sense is irreducible for human begin, however it is not easy to examine or design tactile sense. Because we have not yet developed a suitable method for describing the tactile sense, so we propose a method based on musical scoring, which we refer to as the "tactile score."
On designing tactile sense, one of the important issues is how to design "comfortable; tactile sense, however it is still our challenge. In order to consider it, we have been interested in massaging; it gives us comfortable stimulus and has been used in various areas such as medicine, cosmetics, education and so on. We have been collaborate with cosmeticians who gives massages and based on their experience in beauty salons, we have developed the method for describing massaging, "tactile score"; and we have analyzed massages that show high beauty effects by using the tactile score and found that there are basic techniques of massages and also the rules of composing techniques exist. Tactile score have been developed for massaging, we also show that this method can be applied various areas, in order to create comfortable tactile sense.

1 Introduction

Tactile sense has been of interest to psychology, psychophysics, cognitive science and so on; and recently it also has been of interest to engineering and design. In engineering, tactile sense has been investigated related to the virtual reality or robotics, where main subject is how to regenerate tactile sense mechanically (Oxford 2010). In the product design or manufacturing, tactile sense is an important factor; for example in the product design of electronic equipments such as a smart phone or iPad, tactile sense is a key factor of designing (for example Takeo 2004). For example, massage has been a state of art technique of tactile sense for long time; since a massage affects our mental and physiology, it has been used in broad area and its effects have been investigated in rehabilitation medicine, psychiatry, the art of cosmetic treatments and so on, and it has been shown that a massage improves functional recovery in rehabilitation, brings realization and improves the condition of skin. And also tactile sense has been used in education, training of self-awareness and so on.

2. Tactile Score

We have been interested in massaging, because massaging is common in daily life and it exists in-between a person who massages and to be massaged, where it can be regarded as the person to be massaged also gives massage, hence massage is like "clap" by hands, it is produced by left hand and right hand and it can not to be generated by one hand. Hence we have developed the notation for describing the tactile sense of massage with refereeing to the music score.
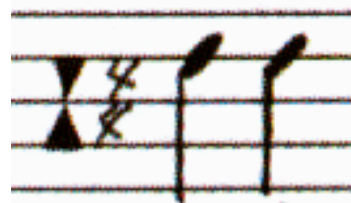

Figure 3: The "staff notation" of tactile score.

In order to compose the tactile score, we apply a musical score to encode the tactile sense of massage, where the pressure intensity is expressed as a staff (Figure 3). We set the line sandwiched in between two upside-down triangles as the basic pressure and then move it up and down to create a pressure variation, for example, in describing the pressure to touch something important. The whole note represents rhythm of massaging, so it includes a movement of a stroke.

Next we number the areas of the palm to describe the size of the dimension (Figure 4 (left)), in addition, we encode the spatial position and the movement of the stroke like a curve, line, dot, and each size of them like small, medium, and large as tactile steps like sol-fa of a musical score on a face. (Figure 4 (right)).
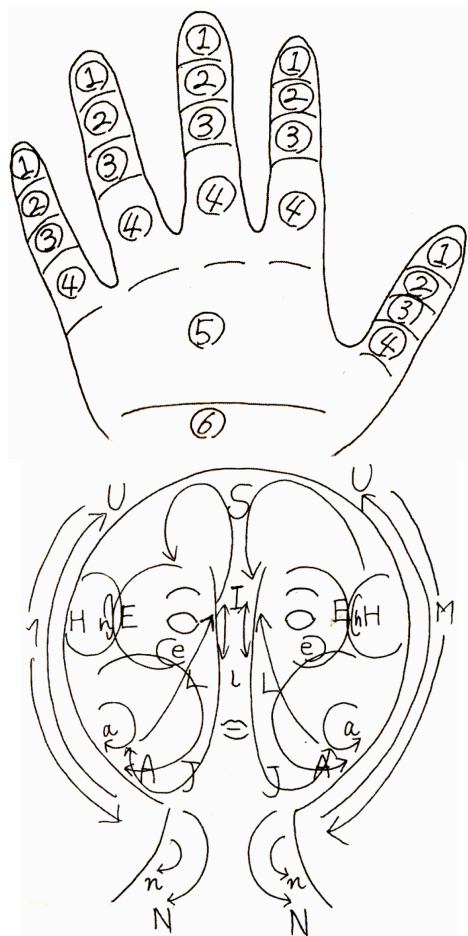
Figure 4 (left) Various areas of a palm using in massaging (numbered as 1 to 6), (right) basic strokes of massaging; spatial positions and movements of strokes on a face; there are three types of strokes as curves, lines, and dots and each stroke has three types of length or size as small, medium, and large.

And also we give number to the areas of a hand using in massaging (Figure 4 (left)) and give symbols to basic strokes in a face, each basic stroke has three lengths or sizes as short/small, medium, long/large; these strokes give different quality of tactile, we call such quality of tactile as the tactile step like "sol-fa" of a musical score.

Language of Tactile Sense

Tactile perception conveys different messages from speech language. When one is patted on the shoulder once, he/she might think it is an accidental bump, yet when patted twice, it has a meaning and he/she interprets it as someone has called him/her. Also, mothers gently tap babies at a steady rhythm when they caress their babies. The steady rhythm evokes the sense of security in babies.

In other words, counts and rhythm are important in tactile perception. We suppose the basic "count" of massage is the circular stroke from the base point. Just like when one is patted on the shoulder, a single stroke could not be distinguished from a mere rubbing and it required more than double strokes to be recognized as massage. This set of double or more strokes was considered as the basic element. Counts were alphabets of massage, basic elements were words, and the combination of words corresponded to massage. We has conjectured the existence of principle in tactile sense such as massaging and we are able to investigate the "grammar" of tactile sense by using tactile score and development of the language of tactile sense will be able to apply in broad area such as scientific communication, education, engineering and so on.

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