

An Information Process Model of Emotional Response to Haptic Input

Bertina Lee*
Systems Design Engineering,
University of Waterloo, Canada

Carolyn MacGregor+
Systems Design Engineering,
University of Waterloo, Canada

PROPOSAL

From a designer's perspective there is value in being able to predict and influence the nature of a user's emotional response and behaviour to a particular set of haptic input. With the goal of aiding designers in mind, a theoretical touch-emotion information processing model was constructed to encapsulate the interactions between perception of haptic stimuli, emotional response, and user behaviour (e.g. interaction time). The main pathways of interest were: emotional response that is a direct result of sensory perception of haptic stimuli (Perceptual Pathway); emotional response that is mediated through cognition, such as working memory, in conjunction with sensory perception (Cognitive Pathway); and behavioral response to haptic stimuli that is mediated through emotional response (Behavioral Pathway). Aspects of the model were then tested through a series of experiments. More specifically, experiments were designed to examine how changes in various touch factors (such as degree of haptic information available during exploration) impacted the user's emotional experience and behaviour.

To begin to validate the touch-emotion model, exploration of the main pathways guided the analysis of the experiments separately and collectively. Previous research suggests a predictable response trend for the texture parameter "roughness" with users tending to report more positive emotional response to "smooth" textures when compared to "rough" textures. For this reason, roughness was selected as a consistent variable to represent haptic stimuli across the experiments. As confirmation of texture as an emotional manipulator, experimental results found that emotional response valence became less positive as roughness increased ($N = 36$, $p < 0.005$). It is of interest that this effect occurred regardless of the level of haptic or visual information provided. These results will be discussed as they relate to the direct pathway from sensory to emotional response.

In considering the effects of cognition on emotional and behavioural response to haptic stimuli, participants were primed to think of the stimuli as a low-emotional commitment object (such as a mug) or as a higher emotional commitment object (such as a cell phone). The purpose of the priming was to force participants to evoke cognition by having to recall familiar objects, since presenting the actual object might elicit visceral response rather than cognitive mediation. Exploratory results suggest that cognitive reflection may mediate emotional response ($N = 27$, $p < 0.08$), without interacting with the main effect of roughness ($N = 27$, $p < 0.002$). In other words, perception of haptic stimuli, in this case "roughness", may supersede cognitive reflection to determine overall emotional response.

Time to interact with stimulus was analyzed in an effort to understand behavioural response in the context of emotional response to haptic stimuli. Based on behavioural research, it was hypothesized that time spent interacting with the stimuli would be a function of emotional valence, with more positive emotional response generating longer interaction time. Contrary to the hypothesis, increased interaction time was found to increase with magnitude of emotional response regardless of the positive or negative valence of the emotion ($N = 33$, $p < 0.002$).

Experimental results generally support the proposed touch-emotion information processing model. The use of the model as a tool for helping designers better understand the interaction between haptic stimuli and the emotional and behavioural response of the user is discussed.

[*lee_bertina@gmail.com](mailto:lee_bertina@gmail.com)

+carolyn.macgregor@uwaterloo.ca