Gabriel Baud-Bovy

Extended Abstact

The objective of haptic interaction design is to develop haptic and virtual reality technologies that allow the designers to showcase their ideas more quickly. Haptic interaction must be built in such system because vision is a poor substitute to touch in this context. The open issues are many. For example, what role should the haptic device plays in such a system? Should it be used as an input device that allows the designer to transform the mockup or as a rendering device that takes the shape of the product? Is it possible to read the mind of the designer? What signals are available and how to interpret them? What are the limitations of existing technologies or how to solve them?

In the first part of this talk, I will present some thoughts on the possible contributions of Psychology to haptic interaction design. I will give some pointers toward some research fields and methods that might be relevant in this context. An important distinction must be made between research on high-level theoretical constructs such as creativity or aesthetics and research on more low-level characteristics of our sensory systems. While knowledge about creativity processes or about the characteristics that objects must have to be aesthetically pleasing is in theory more relevant to guide the development of such systems, it is far from clear whether research in these domains, as conducted in the laboratories and published in journals, can be applied easily. In contrast, knowledge of characteristics of the sensory systems can be used as guidelines in a more straightforward manner. For example, measuring the spatial acuity of touch provides information that is immediately useful to design a tactile display.

In the second part of my talk, I'll briefly present the results of some research on haptic perception:

- *Transparency.* Unlike other sensory systems, the processing of an external force is not a pure information-processing problem because the body massive. Sensing an external force in these conditions is challenging because the force produced by the body to compensate gravity or to move the body stimulates the same group of sensors as the external force. In other words, to interpret the signals that originate from the sensors in the muscles, the central nervous system must untangle the part that is caused by the external force from the part that is caused by the body itself. This is particularly challenging during the perception of weak forces (Baud-Bovy & Gatti, 2010). In a sense, this problem is similar to the one of rendering a force precisely with a haptic interface (Parietti et al., 2011; Bocca & Baud-Bovy, 2009). However, in this case, the mechanical properties of the plant (e.g., friction, inertia, etc.) carry their imprint on the rendered rather than on the perceived force.

- *Perceptual stability.* The visual world appears to us as stable despite the constant eye movements. Similarly, in everyday life we interact with objects without having the impression that their dimension or weight changes. In one study, we tackled the issue of whether moving an object in different manner leads to specific misperceptions of the physical masses (Baud-Bovy & Scochia, 2009). In other study, we measured the minimum transient change of length of a bimanually hand-held bar that could be detected at rest and during motion (Baud-Bovy et al., 2010).

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