From human haptic perception modelling to system design for advanced human-machine interaction

Matteo Bianchi

(University of Pisa)

Human touch represents a marvelous sensory system, with a large variety of receptors and sensing elements. The interplay of these elements enables to shape the exploration and the interaction with the external world, and it also significantly contributes to human proprioception and perceptual organization of motion and space. It is hence clear that reproducing human tactile capabilities in artificial systems or haptic interfaces is an extremely challenging task: indeed, it is extremely hard for a haptic interface to fulfill both modality matching MM (i.e. an artificially delivered cue should be mediated by a stimulus sharing the same sensory modality as the one that would be naturally felt) and somatotopic matching SM (i.e. the stimulus should be experienced at the same location where it would be naturally experienced). The fulfillment of the latter requirement is not easy in tactile augmented reality, where the user's hands should be able to naturally touch the physical items, and at the same time, experience artificially superimposed tactile stimuli. In this talk, I will discuss an approach to achieve both MM and SM in wearable tactile systems for advanced human machine interaction, augmented reality, and tele-robotics. This approach moves from the neuroscientific investigation of human touch and its modelling using a language that can be easily implemented in an artificial body. At the same, it leverages upon the usage of fabrics for the interaction surface with the user's skin since it does not impair human touch-related sensory capabilities while touching physical items and maximizes device wearability. This combined approach opens interesting perspectives for tactile augmented reality applications.

References

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