Let your body move: electrical muscle stimuli as haptics

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MOTIVATION FOR THE TUTORIAL

Haptic feedback allows leveraging other faculties such as *proprioception* instead of using the visual sense, which is often overloaded with traditional UIs. However, most haptic technologies have been away from the current trend in Human-Computer Interaction (HCI) which is miniaturization (e.g., mobile, wearable). Therefore haptic techniques, such as force feedback, tend to stay inside labs. In fact, most haptic devices resist miniaturization because they require physical motors and mechanics which do not scale down easily.

Researchers have proposed miniaturizing and simplifying haptic devices by using electrical-muscle stimulation as to actuate the muscles directly, rather than actuating through mechanics. Electrical muscle stimulation (EMS) uses a small current to elicit action on the motor fibers/nerves, causing an involuntary contraction on the user's body.

This enables mobile haptic devices capable of driving realistic forces, such as Muscle-Propelled Force Feedback [1], which fits the back of a mobile phone or in a wearable device. Furthermore, this technology has been used to create a new eyes-free interactive channel for both input and output-proprioceptive interaction, at the size of a wearable bracelet [2]. Moreover, EMS has been used to extend the affordance of everyday object by actuating the user as to suggest the correct way to manipulate these objects [3]. Also EMS has been applied to: teach a new skill such as playing a musical instrument, feeling virtual objects, and navigation support [7]. For more realistic interaction different objects properties were simulated for interaction with a wearable system [4] and for supporting pointing tasks [6]. Furthermore EMS has been used in a pedestrian navigation scenario [5] to bypass cognitive interpretation and directly manipulate the human locomotion system.

THE TUTORIAL FOCUS

In this tutorial we present electrical-muscle stimulation in a hands-on experience. We provide a ready-to-use device and toolkit as depicted in Figure 1, which allows quick prototyping. The toolkit combines the benefits of haptics with mobility. Furthermore, we provide a mobile app to easily control the device remotely.

We expect that the synergies between different researchers will generate new interesting applications around electrical muscle stimulation in haptics. The one-day tutorial will provide a space for brainstorming ideas, developing prototypes, and showcasing them at the interactivity session; thus, exposing the work to the Haptics community. The participants will learn how to operate EMS devices and explore their creative potential.

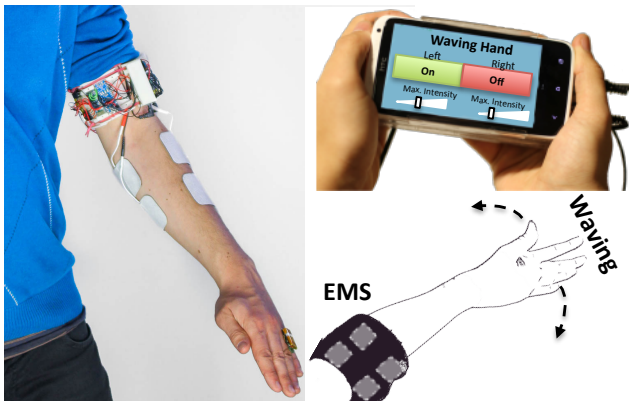

Figure 1: In this tutorial participants will instantiate their ideas in quick-prototypes using the ready-made and medically compliant kit Pose-IO.

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