Internship proposal

Recalibration of auditory representation for self-generated sound

Superviser: Takayuki Ito, Nozomi Endo
Contact: takayuki.ito@gipsa-lab.grenoble-inp.fr
Location: GIPSA-lab / Grenoble-Alps University.

Background: Auditory-motor interaction is important in speech and musical performance. In both, the movement is precisely controlled to generate a target sound and the modulation of auditory inputs critically affects to the motor performance (Guenther et al., 1998; Zatorre et al., 2007). Recent study showed that loudness perception can be modulated in self-generated sound, but not in externally-produced sound (Endo et al., 2019), suggesting that auditory representation of self-generated sound can be shaped or calibrated through auditory-motor experience through their interaction.

Purpose: The long-term goal of current project is to **explore the mechanism of auditory-motor interaction for auditory perception of self-generated sound.** In this internship, we will examine whether the loudness perception of self-generated sound can be modulated through auditory-motor adaptation.

Method: Loudness discrimination test by self-generated sound will be carried out as auditory task. The stimulus sounds will be produced by finger tapping movement with the robotic device (Geomagic: Phantom 1.0) as shown in Fig. 1. The robot will produce virtual environment of several stiffness condition, which will be controlled through Matlab. We will record the participant's responses and electroencephalography, and will analyze the data using Matlab and R.

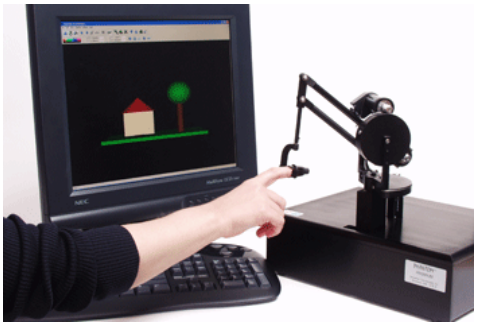

Figure 1

Outputs: The results will shed very interesting light on the cognitive processing in the human brain. The student will learn an original and sophisticated technique associated with the use of the Phantom system. The internship will combine psychophysical experiments and use of various software for piloting the actuator, driving the experiment and analyzing the results with statistical tools. This experiment, if successful, could drive towards further studies and possible developments for audio-motor interaction and learning.

Endo N, Ito T, Mochida T, Ijiri T, Nakazawa K (2019) Influence of amplitude regarding finger force on loudness discrimination acuity of self-generated sound. In: International Conference On Perception And Action, pp Poster. Groningen, Netherlands.

Guenther FH, Hampson M, Johnson D (1998) A theoretical investigation of reference frames for the planning of speech movements. Psychol Rev 105:611–633.

Zatorre RJ, Chen JL, Penhune VB (2007) When the brain plays music: auditory-motor interactions in music perception and production. Nat Rev Neurosci 8:547–558.