Internship proposal

Somatosensory influence on speech perception in noise

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Background:
Speech perception is an interactive process with multiple sensory modalities and probably some perceptuo-motor connections (Schwartz et al., 2012). Particularly seeing the talker's face helps better understanding of speech sounds in speech communication in noisy environment (Sumby and Pollack, 1954). This idea was further demonstrated by showing that the detection threshold of speech sound in noise was improved by visual stimulation concerning the moving face of the talker (Kim and Davis, 2004). In contrast to the focus of audio-visual interactions, recent findings of an orofacial somatosensory influence on the perception of speech sounds (Ito et al., 2009) suggest a potential role for the somatosensory system in speech processing. However, it is still unknown whether somatosensory inputs help to perceive speech sounds in noisy environment. Exploring possible influence of somatosensory inputs on speech perception in noise could provide new insights about the linkage between speech production and perception, and lead to potential interesting applications in speech learning.

Purpose:
The current project will **examine whether orofacial somatosensory inputs can aid the perception of speech sound in noise.**

Method:
1) A perception test concerning the detection threshold of speech perception in noise will be carried out.
2) In the test, the speech sound embedded in various levels of noise will be presented using Matlab with psychophysics toolbox.
3) A facial skin stretch perturbation will be applied as a main tool of somatosensory stimulation. The stimulation is generated using a robotic device (SenSable Technologies: Phantom 1.0) controlled with Matlab and custom-made control driver (Fig. 1).
4) The participant's responses will be analyzed using R for statistical analysis.

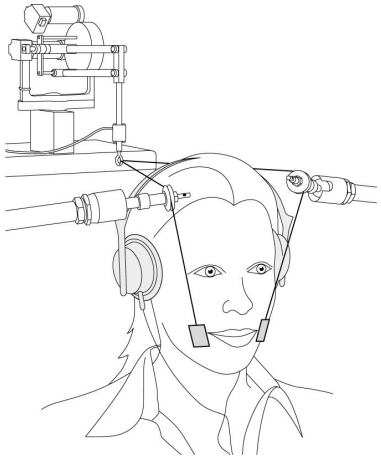

Figure 1

Outputs:
The results will shed very interesting light on the cognitive processing of speech 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 Phantom, driving the experiment and analyzing the results with statistical tools. This experiment, if successful, could drive towards further studies and possible developments for speech processing and speech learning. The project is part of a larger ERC Project “Speech Unit(e)s” funded by the European Community.

Reference:

Ito T, Tiede M, Ostry DJ (2009) Somatosensory function in speech perception. Proc Natl Acad Sci U S A 106:1245-1248.

Kim J, Davis C (2004) Investigating the audio–visual speech detection advantage. Speech Commun 44:19-30.

Schwartz JL, Basirat A, Menard L, Sato M (2012) The Perception-for-Action-Control Theory (PACT): A perceptuo-motor theory of speech perception. J Neurolinguistics 25:336-354.

Sumby WH, Pollack I (1954) Visual Contribution to Speech Intelligibility in Noise. J Acoust Soc Am 26:212-215.