Internship proposal

Contribution of orofacial somatosensory inputs to 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 sentences in noise was improved by visual stimulation concerning rhythmic information related to the presented sentences (Aubanel et al., 2017). 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 sentences embedded in 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 Prrat for speech sound analysis and R for statistical analysis.

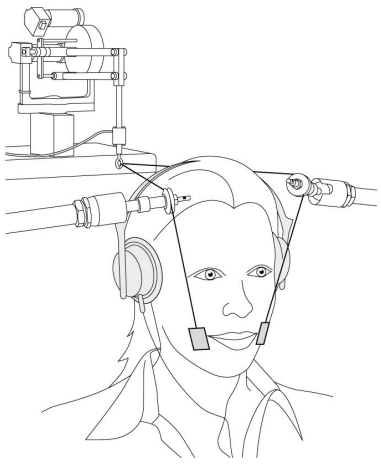

Figure 1

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 robotic system. The internship will combine psychophysical experiments and use of various software for piloting the robot, 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 supported by the multi-laboratory project (Comm4Child) funded by EU Horizon 2020.

Reference:

Aubanel V, Masters C, Kim J, Davis C (2017) Contribution of visual rhythmic information to speech perception in noise. In: 14th International Conference on Auditory-Visual Speech Processing (AVSP 2017). Stockholm, Sweden.

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

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