

STUDENT PROJECT PROPOSAL: “Early reflection processing in cochlear implants”

Project type: **M.Sc. thesis** **B.Sc. thesis** **Special course**

Duration: **18 or 21 weeks** ECTS: **30 or 35**

Starting date from: **Flexible**

Project description:

Listening to speech in an environment with reverberation can be challenging for both the normal and impaired auditory system. However, it has been shown for both normal- and impaired-hearing listeners that it is the late reflections in reverberant environments that are responsible for degrading speech intelligibility, whereas early reflections actually aid speech intelligibility by increasing the effective signal-to-noise ratio (Bradley *et al.*, 2003; Arweiler *et al.*, 2011). Contrastingly, studies conducted with cochlear implant (CI) recipients have suggested that CI recipients have almost no tolerance for reverberation and that they are negatively impacted by both early and late reflections.

Recently however, Kressner *et al.* (2018) have re-evaluated the influence of reverberation on speech intelligibility in CI recipients using more authentic virtual auditory environments (i.e., a loudspeaker-based auralization system rather than non-individualized binaural room simulations). The results demonstrate that the detrimental effect of reverberation on speech intelligibility for CI recipients is much smaller than previously suggested, especially with short source-receiver distances. Furthermore, the results suggest that, in contrast to previous literature, early reflections may not actually be detrimental to CI recipients and, at least in some conditions, may actually aid speech intelligibility for CI recipients in a similar way as for normal-hearing and hearing-impaired listeners. However, the experimental setup did not facilitate explicit conclusions in this direction. Thus, the main objective of this project is to explicitly investigate early reflection processing in CI recipients by measuring the effect of early reflections on speech intelligibility in realistic virtual auditory environments.

References:

Bradley, J. S., Sato, H., & Picard, M. (2003). On the importance of early reflections for speech in rooms. *The Journal of the Acoustical Society of America*, 113(6), 3233-3244.

Arweiler, I., & Buchholz, J. M. (2011). The influence of spectral characteristics of early reflections on speech intelligibility. *The Journal of the Acoustical Society of America*, 130(2), 996-1005.

Kressner, A. A., Westermann, A. & Buchholz, J. M. (2018). The impact of reverberation on speech intelligibility in cochlear implant recipients. *The Journal of the Acoustical Society of America*.

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