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Non-exponential reverberation and its effect on sound perception

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Any acoustic signal extinguishes progressively due to multiple reflections from the walls and different objects in the room. The effect is called reverberation. The reverberation time may affect significantly the intelligibility of speech and music [1]. Numerical and electronic sound synthesis allows one to model the reverberation by the convolution of the signal with the appropriate impulse response function. It will be shown that a certain discreteness of the impulse response enhances the intelligibility but the envelope is also important. The effect of exponential envelopes will be compared with that of stretched exponential ones [2] and power-law type. It is known that the non-exponential decays may result either from a multiscale nature of the phenomenon [3] or from a non-linear behaviour [4]. Examples of the effect of all these variants of reverberation on the speech and music intelligibility will be provided.

References

- [1]. M. Valente, H.-D. Holly, R. J. Ross J. (2008), <i>Audiology: practice management</i>, Thieme, NY, pp. 425–426.
- [2] R. Metzler, J. Klafter , <i>Journal of Non-Crystalline Solids</i> 305 (2002) 81.
- [2] see e.g. M. N. Berberan-Santos, E. N. Bodunov, B. Valeur, <i>Chemical Physics</i> 315 (2005), 171.
- [3] P. Zieliński, <i>Physica B: Condensed Matter</i> 316 (2002) 603.

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