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Listening enhancement for mobile phones: how to improve intelligibility in a noisy environment

Mobile telephony is often conducted in the presence of strong acoustical background noise such as traffic or babble noise. In this situation, the near-end listener perceives a mixture of the clean far-end (downlink) speech and the acoustical background noise from the near-end and thus experiences an increased listening effort and a possibly reduced speech intelligibility.

While the acoustical background noise signal cannot be influenced, the received clean far-end speech signal can be manipulated by signal processing techniques for reducing the listening effort and for improving the speech intelligibility. We call this approach near-end listening enhancement.

A reasonable objective optimization criterion is to maximize the Speech Intelligibility Index (SII). The optimization has to take into account constraints arising from the underlying psychoacoustical model of perception and from the limitations of small loudspeakers. The optimization approach and the solutions will be presented.

Alternative time-domain and frequency-domain implementation structures with uniform and non-uniform spectral resolution will be discussed. The experimental setup using a dummy head will be described. Audio examples will be demonstrated.

Furthermore, the applicability in digital hearing aids, car radios, and in-car communication systems will be addressed.