SIGNAL PROCESSING AND PERFORMANCE EVALUATION FOR IN-CAR COMMUNICATION SYSTEMS

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Due to a large amount of background noise the communication within a car driving at moderate or even high speed is often difficult. This is especially true if one of the communication parters is the driver (or the codriver) and the other is one of the backseat passengers. As a result of the large background noise level the backseat passengers often lean towards the driver or codriver. Furthermore, all speakers increase their loudness. Even if both reactions enhance the quality of the *communication channel* it is rather exhausting and uncomfortable for the passengers.

The situation can be improved by using in-car communication systems. These systems record the speech of each passenger by means of a single microphone or with an array of microphones. The recorded signals of the currently speaking passengers are processed by the system and played via those loudspeakers which are located close to the non-active passengers. Comparable to public address systems, in-car communication systems operate within a closed electro-acoustic loop. Thus, signal processing is required to guarantee stable operation which means to avoid acoustic feedback such as howling or whistling.

In this contribution we describe the basic processing units of an in-car communication system. Those units contain mostly standard algorithms such as beamforming, echo cancellation, and loss control. However, these methods cannot be applied and controlled as in applications like hands-free telephones or preprocessing for speech recognition systems. Here, the problem is that the excitation signals and the distorting components are highly correlated – leading to convergence problems of adaptive algorithms such as NLMS or affine projection. Furthermore, in-car communication systems have very restrictive demands on the tolerable processing delay.

After formulation of the system demands and presenting the algorithmic components hints for evaluating the quality of such systems are given. Finally, the results of a real system are presented.

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