

Elektrotechnik-Elektronik-Informationstechnik

EEI KOLLOQUIUM

Blind Beamforming based on Independent Component Extraction: Static and Moving Source-Of-Interest

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Freitag, 12.11.2021, 14⁰⁰ Uhr

Raum H6, Cauerstr. 7-9

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The goal of Blind Source Separation (BSS) is to separate a mixture of signals observed by sensors using minimum knowledge about the source signals and the mixing system. The most popular approach has been Independent Component Analysis (ICA) where the source signals are retrieved based on the assumption that they are statistically independent. The mixing model assumed in ICA is linear, therefore, also the de-mixing system is linear and it corresponds to a set of beamformers whose outputs yield the separated signals.

In this talk, we will focus on the problem of extraction of one source-of-interest, referred to as Blind Source Extraction (BSE). BSE is actually a subproblem of BSS where only one particular signal should be retrieved from the mixture. Independent Component Extraction (ICE) is the BSE variant of ICA, which aims at finding such a source that is independent from the other signals in the observed mixture. In ICE, an intuitive parametrization of the mixing system is used where there are two parameter vectors related to the source-of-interest: the mixing and the separating vector. We will show how and why the separating vector sought through ICE can be interpreted as a blind minimum power distortionless response beamformer (MPDR), when the target source is static. As a recent extension, we will also introduce a modified mixing model for ICE, which is semi-time-variant and is suitable for blind extraction of a moving source. We will show that the separating vector, in this model, can be interpreted as a blind linearly constrained minimum power beamformer (LCMP) steered towards the area of the source occurrence during its movement.

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