

SPATIAL MANIPULATION OF MUSICAL SOUND: INFORMED SOURCE SEPARATION AND RESPATIALIZATION

Sylvain Marchand
University of Brest, France
sylvain.marchand@univ-brest.fr

ABSTRACT

"Active listening" enables the listener to interact with the sound while it is played, like composers of electroacoustic music. The main manipulation of the musical scene is (re)spatialization: moving sound sources in space. This is equivalent to source separation. Indeed, moving all the sources of the scene but one away from the listener separates that source. And moving separate sources then rendering from them the corresponding scene (spatial image) is easy. Allowing this spatial interaction / source separation from fixed musical pieces with a sufficient quality is a (too) challenging task for classic approaches, since it requires an analysis of the scene with inevitable (and often unacceptable) estimation errors. Thus we introduced the informed approach, which consists in inaudibly embedding some additional information. This information, which is coded with a minimal rate, aims at increasing the precision of the analysis / separation. Thus, the informed approach relies on both estimation and information theories. Since the initial presentation at VITA 2010, several informed source separation (ISS) methods were proposed. Among the best methods is the one based on spatial filtering (beamforming), with the spectral envelopes of the sources (perceptively coded) as additional information. More precisely, the proposed method is realized in an encoder-decoder framework. At the encoder, the spectral envelopes of the (known) original sources are extracted, their frequency resolution is adapted to the critical bands, and their magnitude is logarithmically quantized. These envelopes are then passed on to the decoder with the stereo mixture. At the decoder, the mixture signal is decomposed by time-frequency selective spatial filtering guided by a source activity index, derived from the spectral envelope values. The real-time manipulation of the source sources is then possible, from musical pieces initially fixed (possibly on some support like CDs), and with an unequaled (controllable) quality.