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Phase spectral processing for improved time-domain soft microphone based noise estimation

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'Soft Microphones' (SM) constitute a cost-effective, yet quality alternative to the multiple microphones measurement, in applications related to noise mapping. SM offer a solution of great interest to real field applications, e.g., industrial plants. The SM approach, proposed in previous work of the authors, is based on the estimation of the noise signal and the calculation of noise levels over a set of points within the space of interest. To this end, a novel, frequency domain method was introduced and verified in a real field, textile plant experiment, with satisfactory results. However, in order to expand the use of SM from accurate noise mapping to a full Active Noise Control application, it is necessary to obtain accurate noise signal estimates in the time rather than the frequency domain. Further research into the deconvolution step of the proposed method reveals that discontinuities, appearing across the phase spectrum of the estimated signals, cause ambiguities that affect the deconvolution process. We propose here the use of the Hartley Transform phase spectrum, which conveys fewer discontinuities as compared to its Fourier Transform counterpart, while it allows for a discontinuities compensation scheme. Experimental results verify that phase spectrum preprocessing provides accurate time domain signal estimates.