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”EDRIVE#3 - Resynchronization of tonal acoustic field in multi-pass non-stationary microphone array measurements”

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The geometrical limitations of microphone arrays as well as the unavailability of multiple channel data acquisition systems or their incurred costs fundamentally challenge the sound source identification in acoustic imaging. This can be solved by sequentially scanning the object of study with a moving array with or without fixed references and requires the sound field to be stationary. In rotating machines, the generated vibroacoustic phenomena during a run up or coast down are non-stationary, and conventional resynchronization techniques cannot be directly implemented. To solve this problem, this study proposes a novel approach called Angular Speed Resynchronization (ASR). The orders from several sequential measurements are first extracted using time domain order tracking techniques, then synchronized into a single data set over which order based beamforming (OBBF) is performed. OBBF is an acoustic imaging technique that aids in the identification of non-stationary tonal sources. Given that the radiated sound field is determined for a given angular speed, the complex envelops in the data set are realigned with respect to speed as if they were obtained from the same measurement with a full array. The proposed method is evaluated using an experimental data set collected from an electric motor. The approach demonstrates the capability of OBBF to accommodate with non-synchronous measurements.

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