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Solution Processing of Graphene Derivative for Electronic Applications

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ABSTRACT

By exploiting the sparse and low rank properties of structural dynamic responses data, datadriven approaches are developed to efficiently address the output-only structural identification and damage detection problems, as well the data compression and data cleansing problems. First, the most popular blind source separation (BSS) technique, independent component analysis (ICA), which is able to extract sparse components, is combined with classic timefrequency representations (short-time-Fourier-transform (STFT) and wavelet transform (WT)) to develop new methods for modal identification and damage detection. Second, the system identification problem is solved using the complexity pursuit learning rule, which can identify a wide range of structures with highly-damped modes, closely-spaced modes, or complex modes even in the presence of non-stationary excitation. Third, the spirit of the sparsity property of modal responses, the sparse component analysis (SCA) modal identification method is presented; this algorithm handles the underdetermined problem (with an underlying sparse representation recovered by minimization) where limited sensors may be available compared to the active modes of the structure. Fourth, the low rank/sparse methods for data compression and denoising (cleansing) are presented. All the aforementioned research topics are presented briefly to highlight the versatility of sparsity and low rank algorithms for tackling a class of structural identification and structural health monitoring problems, while the seminar will get into to greater depth only on the SCA algorithm and low-rank/sparse algorithm for denoising to present the core concepts. The seminar will conclude with a brief presentation of lowrank/sparse algorithm to dynamic imaging for damage detection.

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