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# VIBRATION SENSORS PLACEMENT OPTIMIZATION

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In this paper, we present a polynomial-time algorithm for finding locally optimal solution of a combinatorial (non-convex and NP-hard) problem of placing $p$ vibration sensors at $n$ possible locations. The algorithm is based on a series of convex relaxations of the problem, where each relaxation minimizes both performance criteria (e.q. measurement error) and a sparsity-inducing term. In contrast to the existing approaches [1], we define the sparsity-inducing term as a convex combination of both sparsity-inducing norms [2] and general (non sparsity-inducing) norms. This allows us to introduce structure into the resulting sparsity pattern, thus taking into the account additional relationships between the sensors locations.

To illustrate the efficiency of the proposed approach, numerical implementation of the algorithm is used to solve a problem of positioning directional vibration sensors (accelerometers) in structural dynamics measurements. By grouping possible sensors locations via appropriate combination of norms, we are able to simultaneously minimize the number of sensors and optimize sensors spatial directions.

As a conclusion, we discuss the connection of our research with algorithms that play significant role in signal and image processing, as well as machine learning [3], thus bridging the gap between the research areas and providing the insights into possible future research.

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