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Determinant based Fast Greedy Optimization on Sparse Sensor Selection[1] YUJI SAITO, KEIGO YAMADA, Tohoku University, TAKU NONOMURA, Tohoku University, Presto, JST, KEISUKE ASAI, Tohoku University, DAISUKE TSUBAKINO, YASUO SASAKI, Nagoya University — The problem of optimally placing sensors to reduce calculation cost and reconstruction error arises naturally in scientific experiments. It is especially difficult to speedily select optimal sensors when the number of sensors is larger than POD modes. In this study, the authors have developed and proposed an extended determinant-based greedy algorithm based on a QR discrete empirical interpolation method (QDEIM) for the optimal sensor placement problem. The key point of this idea is that optimal sensors are obtained by the QDEIM method until the number of sensors is equal to POD modes. After that, new sensors are calculated by applying both of the determinant formula and matrix inversion lemma. We demonstrate the effectiveness of this algorithm on datasets related to climate science, and compare all calculation results; random sensors, convex approximation and a previously proposed QR algorithm in addition to the determinant-based greedy algorithm. We show that the calculation time of the proposed extended determinant-based greedy algorithm is faster than that of other methods with almost the same level of reconstruction error.

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