Frequency-Domain-extracted Proper Orthogonal Decomposition (FDxPOD) code and Sample Dataset

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Summary of Code and Dataset

This MATLAB® code is for the computation of the flow field data processing called "Frequency-Domain-extracted Proper Orthogonal Decomposition," or "FDxPOD" proposed by the authors. A sample dataset to use "FDxPOD.m" program is also provided in this repository. This dataset contains flow field data obtained using Particle Image Velocimetry (PIV). technique. This data was obtained at the small low-turbulence wind tunnel at the Institute of Fluid Science, Tohoku University. The flow field at the trailing edge of a NACA0012 airfoil was measured, and the vorticity distribution was computed. The experimental details are given in Ref1. Readers can also use the Pressure-Sensitive Paint (PSP) data provided in Ref2.

FDxPOD.m: a main program of FDxPOD written in MATLAB®. This program uses the following sub-programs. To use this program, the sub-programs and dataset must be placed in the same path.

DGspsensor.m: a sub-program of Optimal sensor placement (Ref3), which is used in "FDxPOD.m.".

grlasso.m: a sub-program of group lasso, which is used in "FDxPOD.m."

gr_admm.m: a sub-program of the Alternating Direction Method of Multipliers (ADMM) for group lasso, which is used in "grlasso.m."

shrinkage.m: a sub-program to compute the shrinkage in ADMM, which is used in "gr_admm.m."

X*n*.mat (n = 1, 2, 3): a sample dataset for "FDxPOD.m." The matrix "Xn(i, j)" (n = 1, 2, 3) is a matrix of vorticity distribution data. Here, i is a spatial index, and j is a temporal index.

Xave.mat: The matrix "Xave(i)" represents the time-averaged data of Xn(i, j) (n = 1, 2, 3). The matrix "adress" indicates the mask placement (0: masked, 1: non-masked).

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References

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