An algorithm for model-based denoising of input-output data

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It is well known that experimental measurements contain noise that corrupts the (usually deterministic) real quantities to be measured. For this reason, many denoising algorithms have been proposed and analyzed in the literature. In this work we focus on the case in which, given a physical dynamical system, its input/output variables are measured and these measurements are corrupted by a considerable amount of Gaussian noise, whose means and variances are supposed to be unknown. In this case, the noise not only corrupts each single piece of data but also the causal (input-output) relation between the data. The aim of this work is to use a deterministic model of the physical system, that we suppose described by linear differential equations, inside an iterative denoising algorithm, based on global optimization and smoothing, that allows also to estimate the means and covariances of the noise.

References

[1] M. Gatto, F. Marcuzzi, An algorithm for model-based denoising of input-output data, *Dolomites Research Notes on Approximation*, 12: 73–85, 2019.