emgr – **EM**pirical **GR**amian Framework (Version: 5.99)
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In control and system theory the system Gramian matrices of linear input-output systems have wide-spread use, for example in: model reduction, decentralized control, optimal placement, sensitivity analysis or parameter identification. Empirical Gramian matrices correspond to the (linear) system Gramians, but extend to parametric and nonlinear systems due to their data-driven computation. The empirical Gramian framework is an open-source Matlab toolbox, enabling the computation of the following empirical system Gramians:

Empirical Gramians:
- Empirical Controllability Gramian
- Empirical Observability Gramian
- Empirical Cross Gramian
- Empirical Linear Cross Gramian (fast variant for linear systems)
- Empirical Sensitivity Gramian (controllability of state and parameters)
- Empirical Identifiability Gramian (observability of state and parameters)
- Empirical Joint Gramian (observability of parameters and minimality of state)

Features:
- Interfaces for: Custom solvers, inner product kernels & distributed memory
- Non-Symmetric option for all cross Gramians
- Compatible with OCTAVE, MATLAB and PYTHON
- Vectorized and parallelizable
- Functional design
- Open-source licensed
- Single file with less than 600 lines of code

More info: https://gramian.de
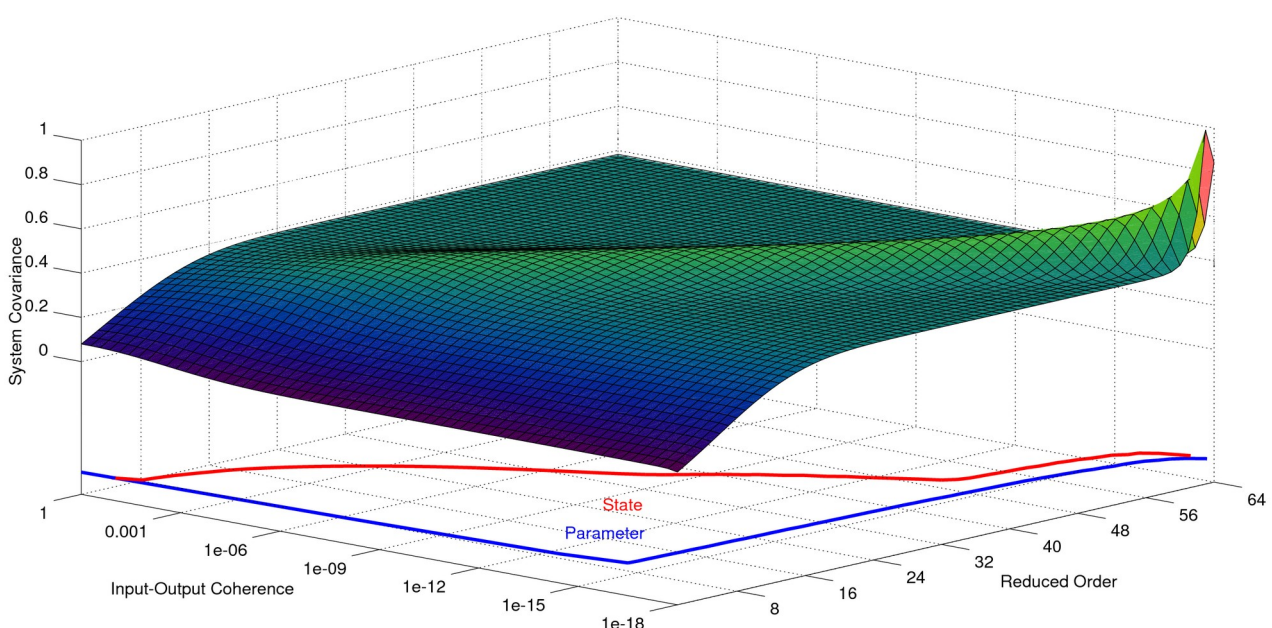
Combined state and parameter reducibility for a nonlinear transport problem with local velocity parametrization.