Title: Sparse decomposition of dynamical system

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Abstract:

We propose a procedure that decouples a dynamical system into smaller subsystems.

We define and motivate the necessary underlying sparse structure and connect it to a purely discrete object - the sparsity graph - allowing us to identify subsystems easily. Our main result is that many objects from dynamical systems (such as the region of attraction, invariant sets, attractors, (un)stable manifolds, Lyapunov functions,...) decompose according to the subsystems. This can be widely applied to computational methods for those objects and allows to lower the dimension of the system, provided the system has a certain sparse structure.