
Creating a spectral gap through inverse spectral theory

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Abstract

A means of simplifying the analysis of dynamical systems is given by center manifold theory, which – under certain conditions, such as the existence of a spectral gap – allows to reduce the dimension of the problem. Especially in the context of partial differential equations, which can be viewed as infinite-dimensional dynamical systems, such a reduction is of particular interest, but often inhibited due to the absence of a spectral gap. We explain how center manifold theory can be applied to non-autonomous problems in which, at first sight, such an endeavor seems hopeless, but a reduction becomes possible after solving an inverse spectral problem. In other words, we demonstrate that the infinitely many parameters inherent in non-autonomous coefficients can be used to overcome challenges that are out of reach in the autonomous case. We illustrate the successful use of this strategy along a range of problems whose common theme is the search of time-periodic solutions in the setting of dispersive equations with spatially periodic coefficients. This is joint work with C.E. Wayne.

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