

# Persistence of normally hyperbolic invariant manifolds: a proof using the Perron method

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We will formulate a version of the theorem on persistence of normally hyperbolic invariant manifolds (NHIM's). NHIM's are generalizations of hyperbolic fixed points for ODE's (and maps); the fixed point is generalized to a whole invariant manifold which satisfies similar hyperbolicity conditions. Our version includes Hölder continuity of the highest derivatives and is stated in a Banach space context.

Using a simple example, we show that the smoothness result obtained is optimal and governed by the gap condition. This last fact makes proving this persistence of NHIM's theorem technically involved.

Then we give an overview of the proof using the Perron method, where we try to focus on the ideas necessary due to the gap condition.