CONLEY INDEX THEORY

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ABSTRACT. Algebraic-topological tools have been widely used in dynamical systems in order to determine structural properties which remain invariant under small perturbations, as in Conley index theory.

The Conley index provides a topological description of the local dynamics around the Morse sets associated with a Morse decomposition of a given isolated invariant set. In order to describe the connections between the Morse sets, it was introduced an algebraic-topological tool called the connection matrix. Roughly speaking, a connection matrix for a Morse decomposition is a matrix that has as entries homomorphisms between the homology Conley indices of the Morse sets.

The aim of this course is to provide a brief introduction to Conley Index Theory, emphasizing the fundamental ideas of Conley's approach to study dynamical systems. We start with the basic definitions and facts of the Conley index, especially the ones concerning the basic properties of this index, then we proceed to the construction of connection matrices with a panoramic view of the applications: detect heteroclinic orbits.

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