Summary: In this article William Kalies and Robert Vandervorst describe Conley theory. Conley theory studies the dichotomy between gradient-like and non-gradient-like (recurrent) behavior of dynamical systems. It is a topological theory and one is compelled to ask the question whether this theory is computable. Numerical simulation has proved to be a common technique for analyzing dynamics, but does not give a complete picture of global behavior. By discretizing a dynamical system in time and space one can build a combinatorial dynamical system which carries dynamical information of the original system within a given resolution. The novelty of computational Conley theory is the combination of algebra, topology and combinatorics which produces computable tools that can be used to prove rigorous statements about global dynamic behavior.

MSC:

37B30 Index theory for dynamical systems, Morse-Conley indices
37B35 Gradient-like behavior; isolated (locally maximal) invariant sets; attractors, repellers for topological dynamical systems

Keywords:

Conley theory; recurrent behavior; topological theory