

From Sharkovsky theorem to topological entropy for multivalued maps

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Abstract: Starting from the celebrated Sharkovsky cycle coexistence theorem, we will show that its application to differential equations leads to an “empty” theorem. In the lack of uniqueness, such an application is possible, provided we have to our disposal a multivalued version of the Sharkovsky theorem. In order to calculate topological entropy of given differential equations or inclusions, via the associated Poincaré translation operators along their trajectories, we need a new definition of topological entropy for multivalued maps. Its positive value can be achieved by means of the Bowen-Franks type theorem (based on the mentioned Sharkovsky-like extension) in terms of subharmonic periodic solutions whose periods differ from the power of two. On the other hand, despite a consistence with a single-valued case, there exist definitions of topological entropy equal to zero.