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Nonautonomous attractors and bifurcation structures on nonautonomous families of flat topped tent maps

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Abstract If a dynamic process is generated by a one-dimensional map, then insertion of a flat segment on the map will often lead to a stable periodic orbit. This mechanism has been widely used in the control of chaos on one-dimensional dynamical systems in areas as diverse as cardiac dynamics, telecommunications or electronic circuits.

Parameters in real world situations very often are not constant with time. In that cases, the evolutionary equations have to depend explicitly on time, through time-dependent parameters or external inputs. Then the classical theory of autonomous dynamical systems is no longer applicable and we get into the field of nonautonomous dynamical systems. When we get into the general nonautonomous context, usual notions from autonomous discrete dynamics, like invariant sets, attractivity and repulsivity must be reinterpreted and reformulated. This is the core of nonautonomous bifurcation theory, that has been developed in recent years by various authors.

In this work we will consider families of nonautonomous dynamical systems $x_{k+1} = f_{\lambda_k}(x_k)$, generated by a one-parameter family of flat-topped

tent maps $f_\lambda(x)$. This situation is highly relevant for the applications, in order to mimic control or regulation strategies through the sequence λ_k.

We will discuss the concept of attractor in this context and study the dependence on their existence, and corresponding bifurcation structures, under the properties of the sequences λ_k.

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