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The Set of Periods for a Class of Crazy Maps

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The crazy maps are a class of continuous maps from $\Sigma_N \times \mathbb{S}^1$, where Σ_N is the product space of the bi-infinite sequences on N symbols and $\mathbb{S}^1$ is the unit circle, into itself. Moreover, each of these maps has N orientation-preserving circle homeomorphisms associated with it. In this paper we study the set of periods in the case $N = 2$ and where the associated maps are rotations.

1. INTRODUCTION

In 1974 Afraimovich and Shilnikov [1] described the semi-hyperbolic invariant set generated by a bifurcation of several homoclinic surfaces of a saddle-node cycle. The invariant set in the last bifurcation is homeomorphic to the product space $\Sigma_N \times \mathbb{S}^1$, where $\Sigma_N = \{0, 1, \ldots, N-1\}^{\mathbb{Z}}$ is the space of all bi-infinite sequences

$$\underline{a} = \{\ldots a_{-n} \ldots a_{-1}.a_0 a_1 \ldots a_n \ldots\}$$

of symbols $0, 1, \ldots, N-1$ (we note that in this paper we shall use the same notation as in [2]). The dynamics on the invariant set above after some rescaling, gives rise to *crazy dynamics*. It is described as follows.

Let $\underline{a} = \{\ldots a_{-1}.a_0 a_1 \ldots\} \in \Sigma_N$. Then $\sigma : \Sigma_N \to \Sigma_N$, *the shift map*, is given by

$$\sigma(\underline{a}) = \{\ldots a_{-1} a_0.a_1 a_2 \ldots\}.$$

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