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by

Kamal M. Adhikari and Michael C. Sullivan

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Web:	http://topology.auburn.edu/tp/
Mail:	Topology Proceedings Department of Mathematics & Statistics Auburn University, Alabama 36849, USA
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FURTHER STUDY OF SIMPLE SMALE FLOWS USING FOUR BAND TEMPLATES

KAMAL M. ADHIKARI AND MICHAEL C. SULLIVAN

Abstract. In this paper, we discuss how to realize a nonsingular Smale flow with a four band template on a 3-sphere. This extends the work done by Michael C. Sullivan on Lorenz Smale flows and by Bin Yu on realizing Lorenz like Smale flows on 3-manifolds, and continues the work of Elizabeth L. Haynes and Sullivan on realizing simple Smale flows with a different four band template on a 3-sphere.

1. Introduction

A nonsingular Smale flow on a 3-manifold M is a structurally stable flow with a 1-dimensional chain recurrent set. A chain recurrent set consists of a finite number of disjoint basic sets which are compact and transitive. A basic set may be an attractor, a repeller, or a saddle set. We study the realizations of a nonsingular Smale flow when the saddle set is modeled by a four band template and this extends the work done in [13]. A template is a compact branched 2-manifold with boundary which has a smooth semiflow and is built locally from two types of charts, joining and splitting. The most popular template is a Lorenz template which was introduced by R. F. Williams [20] to study the Lorenz attractor. Joan S. Birman and Williams [2] proved the template theorem which says that in Smale flow, the chaotic saddle set can be represented by a template and any knot type of the periodic orbits can be studied within a template.

In the past, much work has been done to realize Smale flows using templates. Michal C. Sullivan studied a special type of nonsingular Smale

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