Kyoto Dynamics Days 5

Trellis and related topics

January 26 - 27, 2005

Department of Mathematics, Kyoto University
Large Meeting Room in Math. Department Bldg.

Program

January 26

2:00-3:30 Pieter Collins (CWI & Kyoto Univ.)
Lectures on Homoclinic Dynamics and Trellises (1)
Introduction to Nielsen-Thurston Theory

Abstract: In the first talk, I will review the theory of surface homeomorphisms developed primary by J. Nielsen and W. Thurston. I will first give an overview of the Lefschetz fixed-point index and the Nielsen fixed-point theory. I will then give Thurston's classification of isotopy classes of surface homeomorphisms. I will next discuss the dynamical properties of pseudo-Anosov diffeomorphisms and the Thurston minimal representative. Finally, I will outline Bestiva and Handel's algorithm for the computing train-tracks for pseudo-Anosov isotopy classes.

The results reviewed here is important for the development of a theory for homoclinic dynamics of surface diffeomorphisms. The theory for periodic dynamics gives a scheme to follow in developing a theory for homoclinic dynamics. Some of the results, especially those on fixed-point theory are directly useful, and most of the others can be adapted from the periodic case to the homoclinic case.

4:00-5:00 Atsuro Sannami (Kitami Institute of Technology)
Coding on the Henon map

Abstract: In this talk, I will review the coding problem of the H\'enon map on ${\bf R}^2$. I will present 4 topics about coding. They are Generating partition, Pruning front, Symbolic extension and Discontinuity of coding.

6:00- Dinner

January 27

9:30-10:30 Pieter Collins (CWI & Kyoto Univ.)
Lectures on Homoclinic Dynamics and Trellises (2)
Homoclinic Orbits, Tangles and Trellises

Abstract: In the second talk, I will give the main elements of the theory of homoclinic orbits, tangles, and trellises. I will first give the definition of a trellis, some useful terminology for describing their structure, and some important examples including the horseshoe trellises. I will then describe the operation of pruning a trellis, and use this to compute minimal extensions of a trellis, and how to relate a collection of homoclinic or heteroclinic orbits to a trellis type. I will next show how to use trelles to compute the forcing relation for homoclinic braid types, focussing on the forcing relation for homoclinic orbits of the Smale horseshoe map. Finally, I will define the graph representative of a trellis type, and state its main properties.

11:00-12:00 Zin Arai (Kyoto University)
On hyperbolic plateaus of Henon maps

Abstract: In this talk, we propose a method to verify the hyperbolicity of discrete dynamical systems. We apply the method to Henon map and obtain a computer assisted proof of the existence of hyperbolic plateaus in the parameter space.

Lunch break

2:00-3:00 Yutaka Ishii (Kyushu University)
Computing the maximal entropy locus of the Henon family

Abstract: In this talk I will present an algorithm which verifies if a given Henon map on R^2 does not have maximal entropy. This uses some ideas from complex dynamics and pluripotential theory.

3:30-5:00 Pieter Collins (CWI) (CWI & Kyoto Univ.)
Lectures on Homoclinic Dynamics and Trellises (3)
Entropy and Computation

Abstract: In the third and final talk, I will discuss the computation of the graph representative, and the optimality of the entropy bounds obtained. I will first give an algorithm (based o the Bestvina-Handel algorithm) to compute the graph representative, and some examples of the computation for horseshoe trellises. I will then sketch the proof of the main shadowing results for the graph representative, and the proof of the optimality of the entropy bound obtained. This completes the core results of the trellis theory. I will also briefly discuss the existence of simple ``universal trellises'' which force all knots and links. Finally, I shall outline some open areas of research, focusing on the rigorous numerical computation of braid types and trellis types, and on bifurcations and chaotic attractors in diffeomorphisms.