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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

AD-A215 319

DTIC
ECTE
1211989
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1b. RESTRICTIVE MARKINGS

3. DISTRIBUTION/AVAILABILITY OF REPORT
Approved for public release;
distribution unlimited.

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S)

AFOSR-TR-89-1306

6a. NAME OF PERFORMING ORGANIZATION

6b. OFFICE SYMBOL
(if applicable)

7a. NAME OF MONITORING ORGANIZATION

6c. ADDRESS (City, State, and ZIP Code)

University of North Carolina
440 W. Franklin St., Bldg 454H
Chapel Hill, NC 27514

7b. ADDRESS (City, State, and ZIP Code)

Air Force Office of Scientific Research
Building 410
Bolling AFB, DC 20332-64488a. NAME OF FUNDING/SPONSORING
ORGANIZATION8b. OFFICE SYMBOL
(if applicable)

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

AFOSR

NM

AFOSR-89-0200

8c. ADDRESS (City, State, and ZIP Code)

Building 410
Bolling AFB, DC 20332-6448

10. SOURCE OF FUNDING NUMBERS

PROGRAM
ELEMENT NO.PROJECT
NO.TASK
NO.WORK UNIT
ACCESSION NO.

61102F

2304

A4

11. TITLE (Include Security Classification)

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT

13b. TIME COVERED

14. DATE OF REPORT (Year, Month, Day)

15. PAGE COUNT

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

FIELD

GROUP

SUB-GROUP

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

We have developed a structure theory for real analytic diffeomorphisms of compact surfaces very similar to the well known structure theory of Axiom A diffeomorphisms. This theory has strong implications for the structure of systems with two degrees of freedom. We have shown that there is an at most countable collection of closed invariant sets $1, 2, \dots$ with the following properties: 1. Any closed invariant set of which has positive topological entropy is a subset of some i . 2. A large subset of i has a description as a symbolic space on a countable number of symbols. These results are currently being written up. In addition, we have found a relatively simple proof of our previously established result that there are residual subsets A of open sets of diffeomorphisms with the property that each element in A has infinitely many sinks. A slight modification of this proof will

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21. ABSTRACT SECURITY CLASSIFICATION

UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL

22b. TELEPHONE (Include Area Code)

22c. OFFICE SYMBOL

(202) 767-4559

NM

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89 13 1 048

appear in some notes of Palis and Takens on bifurcation theory presented at a Colloquium in Brazil in July, 1987. Another result states that many systems with two degrees of freedom have fractal basin boundaries with Hausdorff dimension two (i.e. maximal Hausdorff dimension). This leads to the frequent existence of what we call pseudo-attractors-- closed invariant sets with dense orbits whose basins have maximal dimension. Finally, we have made progress on a numerical procedure to estimate topological entropy in low dimensional smooth dynamical systems.

FINAL TECHNICAL REPORT for AFOSR-85-0200

During the tenure of this grant we have made significant progress on several problems.

We have developed a structure theory for real analytic diffeomorphisms of compact surfaces very similar to the well known structure theory of Axiom A diffeomorphisms. This theory has strong implications for the structure of systems with two degrees of freedom. We have shown that there is an at most countable collection of closed invariant sets $\Lambda_1, \Lambda_2, \dots$ with the following properties:

1. Any closed invariant set on which f has positive topological entropy is a subset of some Λ_i .
2. A large subset of Λ_i has a description as a symbolic space on a countable number of symbols.

These results are currently being written up.

In addition, we have found a relatively simple proof of our previously established result that there are residual subsets A of open sets of diffeomorphisms with the property that each element in A has infinitely many sinks. A slight modification of this proof will appear in some notes of Palis and Takens on bifurcation theory presented at a Colloquium in Brazil in July, 1987.

Another result states that many systems with two degrees of freedom have fractal basin boundaries with Hausdorff dimension two (i.e. maximal Hausdorff dimension). This leads to the frequent existence of what we call pseudo-attractors—closed invariant sets with dense orbits whose basins have maximal dimension.

Finally, we have made progress on a numerical procedure to estimate topological entropy in low dimensional smooth dynamical systems.

The following papers have resulted in part from the support under this grant.

1. *Continuity Properties of Entropy*, to appear in Annals of Math.
2. *Entropy and Volume*, to appear in Jour. of Ergodic Theory and Dynamical Systems.

3. *On the dimension of fractal basin boundaries*, in preparation.
4. *Computing Topological Entropy*, in preparation.

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Unannounced	☐
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