

# Table of Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Stability of dynamical systems, bifurcations, and generic properties</b>	<b>7</b>
2.1	Some general notions	7
2.2	Autonomous systems of ODEs	9
2.3	Examples: Bifurcation depending on a parameter $\lambda \in \mathbb{R}$	15
2.4	Chaos in differential and difference equations. The concept of an attractor	22
2.5	Interaction, or the interplay between concentration or reaction and diffusion	36
2.6	Discrete and continuous systems. The Poincaré return map	41
2.7	Stability and bifurcations; generic properties	42
2.8	The Hopf bifurcation	46
2.9	Lotka-Volterra equations	48
2.10	Stable, unstable, and center manifolds	52
<b>3</b>	<b>Discrete invariants of dynamical systems</b>	<b>61</b>
3.1	The topology of graphs	61
3.2	Floer homology	62
3.3	Conley theory: examples and results	70
3.4	Cohomological Conley index	77
3.5	Homotopical invariants	80
3.6	Continuation properties of the Conley index	92
3.7	The discrete Conley index	93
<b>4</b>	<b>Entropy and topological aspects of dynamical systems</b>	<b>99</b>
4.1	The entropy of a process as an asymptotic quantity	99
4.2	Positive entropy and chaos	103
4.3	Symbolic dynamics	108
<b>5</b>	<b>Entropy and metric aspects of dynamical systems</b>	<b>111</b>
5.1	The metric approach to topological entropy	111
5.2	Complexity and intrinsic scales	114

<b>6</b>	<b>Entropy and measure theoretic aspects of dynamical systems</b>	119
6.1	Probability spaces and measure preserving maps	119
6.2	Ergodicity	121
6.3	Entropy and information	126
6.4	Invariant measures	138
6.5	Stochastic processes	142
6.6	Stochastic bifurcations	149
<b>7</b>	<b>Smooth dynamical systems</b>	153
7.1	Lyapunov exponents	153
7.2	Hyperbolicity	156
7.3	Information loss	165
<b>8</b>	<b>Cellular automata and Boolean networks as examples of discrete dynamical systems</b>	169
8.1	Cellular automata	169
8.2	Boolean networks	175
	<b>References</b>	181
	<b>Index</b>	185

Dynamical Systems

Examples of Complex Behaviour

Jost, J.

2005, VIII, 190 p. 65 illus., 15 illus. in color., Softcover

ISBN: 978-3-540-22908-7