## **Contents**

2 Some Basic Concepts on Complex Networks and Games .	
2.1 Complex Networks	
2.1.1 Examples of Real Networks	
2.1.2 Definitions	
2.1.3 Some Network Models	
2.1.4 Processes on Networks	
2.2 Games	
2.2.1 Classical Game Theory	
2.2.2 Evolutionary Game Theory	
2.2.3 Evolution of Cooperation	
References	
The Dricener's Dilemme on Static Compley Naturalis	
3.1 The Model	
<ul> <li>3.1 The Model</li></ul>	
3.1 The Model	
3.1 The Model	
3.1 The Model	orks
3.1 The Model	orks
3.1 The Model	orks

xii Contents

4		Games on Static Complex Networks	77
	4.1	Average Level of Cooperation, and Fractions of Pure	70
		Strategists and Fluctuating Individuals	79
	4.2	Number of Clusters of Cooperators and Defectors	81
	4.3	Distribution of the Cooperation Among the Degrees	0.0
		of Connectivity	82
	4.4	Conclusions	83
	Refere	ences	85
5		risoner's Dilemma Game on Random	
	Scale-	Free Networks	87
	5.1	Numerical Simulations on Random Scale-Free Networks	88
	5.2	The Degree-Based Mean Field Approximation	91
	5.3	Targeted Cooperation	93
	5.4	Dependence with the Exponent of the Power-Law Distributions	
		for the Mean Field Approximation	95
	5.5	Comparison Between Simulations and Mean-Field	
		Approximation for the Targeted Cooperation	
		Initial Conditions	96
	5.6	Conclusions	98
	Refere	ences	99
,	an r	A. D. D. C. and an C. d. Euro Metarrolla	
6		Prisoner's Dilemma Game on Scale-Free Networks	101
		Limited Number of Interactions	101
	6.1	The Model	102
	6.2	Average Level of Cooperation	103
	6.3	Imposing a More Tight Connectivity Restriction	110
	6.4	Conclusions	
	Refere	ences	111
Pa	rt II	<b>Evolutionary Dynamics on Growing Complex Networks</b>	
7	Comp	olex Networks from Evolutionary Preferential Attachment	117
	7.1	The Model	118
	7.2	Degree Distribution and Average Level of Cooperation	119
	7.3	Degree Distribution Among Cooperators	121
	7.4	Clustering Coefficient and Degree-Degree Correlations	123
		7.4.1 Clustering Coefficient	124
		7.4.2 Degree–Degree Correlations	125
	7.5	Dynamics on Static Networks Constructed	
		Using the EPA Model	126
		7.5.1 Stopping Growth and Letting the Evolutionary	
		Dynamics Evolve	127

Contents

		7.5.2 Effects of Randomizations on	
		the Evolutionary Dynamics	127
		7.5.3 EPA Networks as Substrates for	
		Evolutionary Dynamics	128
	7.6	Time Evolution of the $P_c(k)$ After Network Growth	130
	7.7	Microscopic Roots of Cooperation After Network Growth	131
	7.8	Other $\tau_D/\tau_T$ Time Relations	133
	7.9	Conclusions	136
	Refe	rences	137
8	Com	plex Networks from Other Dynamic-Dependent	
	Atta	chment Rules	139
	8.1	The Model	140
		8.1.1 A Simplification of the Model	141
	8.2	Degree Distribution	143
	8.3	Average Level of Cooperation as a Function	
		of the Parameters of the System	145
	8.4	Average Level of Cooperation After the Growth	
		has Finished	146
	8.5	Probability of Fixation	147
	8.6	Level of Cooperation After Re-Initializing the Strategies	148
	8.7	Conclusions	150
	Refe	rences	151
9	Sum	mary	153
Al	out t	ne Author	157