

Contents

1 Introduction	1
1.1 Property of Spectrums	3
1.1.1 Transmission Range and Spectrum Reusability	3
1.1.2 Interference Graph	4
1.2 Traditional Auction Mechanisms	5
1.2.1 Secondary Auction	5
1.2.2 Vickrey-Clarke-Groves Auction	5
1.2.3 McAfee Auction	6
1.3 Economic Properties	6
1.3.1 Truthfulness	6
1.3.2 Individual Rationality	7
1.3.3 Budget Balance	7
2 Static Homogeneous Spectrum Auction	9
2.1 Homogeneous Spectrum Forward Auction	9
2.1.1 A Naive Truthful Auction Mechanism	9
2.1.2 Auction Mechanism Based on Greedy Algorithm	10
2.1.3 Proofs of Economic Properties	12
2.2 Homogeneous Spectrum Double Auction	13
2.2.1 Auction Mechanism Design	13
2.2.2 Proofs of Economic Properties	14
3 Static Heterogeneous Spectrum Auction	17
3.1 Modeling Heterogeneous Spectrum Double Auction	18
3.2 Challenges of Heterogeneous Spectrum Auction Design	19
3.2.1 Spatial Heterogeneity	19
3.2.2 Frequency Heterogeneity	20
3.2.3 Market Manipulation	21
3.3 Single Item Heterogeneous Spectrum Auction	21
3.3.1 Auction Mechanism Design	22
3.3.2 Illustrative Example	25
3.3.3 Proofs of Economic Properties	25

3.4	Multiple Item Heterogeneous Spectrum Auction	28
3.4.1	Auction Mechanism Design	29
3.4.2	Illustrative Example	30
3.4.3	Proofs of Economic Properties	32
3.4.4	Spectrum Continuity	34
4	Dynamic Spectrum Auction	37
4.1	Modeling Online Spectrum Auction	38
4.2	Interference Discount	40
4.2.1	Comparison of Interference Degree	41
4.2.2	Reusability Efficiency of Interfering Neighbors	42
4.2.3	Interference Discount	43
4.3	Auction Mechanism Design	44
4.3.1	Pre-auction Candidate Screening	44
4.3.2	Main Auction Algorithm	46
4.4	Proofs of Economic Properties	46
5	Future Research Directions	51
5.1	Collusion in Spectrum Auction	51
5.2	Simultaneous Multiple Round Auction	52
5.2.1	Optimal Spectrum Allocation	53
5.2.2	Free Riding Problem	54
	References	55

Dynamic Spectrum Auction in Wireless Communication

Chen, Y.; Zhang, Q.

2015, IX, 58 p. 14 illus., Softcover

ISBN: 978-3-319-14029-2