Contents

1	Intr	Introduction		
	1.1	Interference Cancellation and Detection for Multiple Access		
		Channel with Perfect Feedback	1	
	1.2	Interference Cancellation and Detection for Multiple Access		
		Channel with Quantized Feedback	2	
	1.3	Interference Cancellation and Detection for X Channels	3	
	Refe	erences	4	
2	Inte	rference Cancellation and Detection for MAC		
	with	Two Users	7	
	2.1	Channel Model	7	
	2.2	Precoding Design	8	
	2.3	Decoding	15	
	2.4	Proof of Full Diversity	17	
	2.5	Extension to Two Users with More than		
		Two Transmit Antennas	19	
	2.6	Extension to More than 2 Receive Antennas	22	
	2.7	Simulation Results	28	
	2.8	Conclusions	29	
	Refe	erences	29	
3		rference Cancellation and Detection		
	for	More than Two Users	31	
	3.1	Interference Cancellation for Four Users Each		
		with Four Transmit Antennas	31	
	3.2	Decoding	38	
	3.3	Proof of Full Diversity	40	
	3.4	Extension to J Users with N Transmit Antennas		
		and One Receiver with M Receive Antennas	42	

xii Contents

		3.4.1 More Transmit Antennas, i.e., $N > J = M \dots \dots$	43
		3.4.2 More Receive Antennas, i.e., $M > J = N \dots$	43
		3.4.3 More Users, i.e., $J > M = N \dots$	46
	3.5	Simulation Results	49
	3.6	Conclusions	52
		erences	52
4	Inte	rference Cancellation for MAC Using Quantized Feedback	53
	4.1	Channel Model	53
	4.2	Interference Cancellation Precoding and Decoding	56
		4.2.1 Precoding	56
		4.2.2 Decoding	57
	4.3	Feedback Design and Diversity Analysis	60
		4.3.1 Feedback Design	60
		4.3.2 Diversity Analysis	61
	4.4	Coding Gain Analysis and Codebook Design	64
	4.5	Comparison of Our Scheme with Two Existing Schemes	67
	4.6	Extension to Any Number of Antennas	68
	4.7	Simulation Results	71
	4.8	Conclusions	73
	Refe	erences	73
5		rference-Free Transmission for X channels	75
	5.1	Channel Model	75
	5.2	Precoder Design	77
	5.3	Decoding	81
	5.4	Complete Precoding Scheme to Achieve Full Diversity	83
	5.5	Precoding Design for General N and M	87
		$5.5.1 M \ge 4 \dots \qquad \dots \qquad \dots$	87
		$5.5.2 M = 3 \dots \dots$	87
		5.5.3 <i>M</i> < 3	90
	5.6	Extension to J_t Transmitters Each with N Antennas	
		and J_r Receivers Each with M Antennas	90
		$5.6.1 J_t + 1 \leq M < J_t \cdot J_r \cdot \dots \cdot $	91
		$5.6.2 M \geq J_t \cdot J_r \dots \dots \dots \dots \dots \dots \dots \dots \dots $	92
	5.7	Simulation Results	94
	5.8	Conclusions	95
	Refe	erences	96