

應用於高車速正交分頻多工系統新型通道 估計方法之設計與模擬

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摘 要

在多路徑衰減通道高移動速度的正交分頻多工系統，通道估計是非常重要的課題。為因應高資料速率傳輸的需求，不損失太多頻帶使用效率的通道估計方法是緊要的，特別是在快速變動的通道下。我們提出半盲式的通道估計方法，其中包含基於多路徑干擾消除的初始通道估計子，及適應性牛頓法追蹤緊接著的通道變化。值得一提的是，在通道追蹤過程中，只需要稀疏的領航訊號。此外，沒有限制初始領航訊號的結構及追蹤用稀疏領航訊號的位置，所以此通道估計方法亦可推廣至一般的正交分頻多工系統。此論文中，初始通道估計子是利用 IEEE 802.16 正交分頻多工模式下定義的初始領航符元模擬，而牛頓法通道追蹤則模擬在 120 km/hr 及 240 km/hr 的高車速下。從模擬結果知道，此半盲式通道估計子在錯誤率上有很好的表現。總之，此通道估計方法不僅達到高頻帶使用效率且有不錯的估計準確度。

Design and Simulation of A New Channel Estimation Method for High Mobility OFDM Systems

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Abstract

Channel estimation is an important issue for high mobility OFDM systems in multipath fading channels. In demand of high data transmission rate, a channel estimation method without loss of too much bandwidth efficiency is critical, especially in fast fading channels. We propose a semi-blind channel estimation method which consists of an MPIC-based initial channel estimator, followed by an adaptive Newton tracker to track channel variations in the subsequent OFDM symbols. It is worth to mention that only sparse pilots are needed to track channel impulse responses. Moreover, there are no restrictions on the preamble structure in the initial channel estimator and no restrictions on the locations of the sparse pilots in the tracking stages as well. Thus, the semi-blind channel estimation method can be generally applied to OFDM systems. In this thesis, the initial channel estimator is simulated with the preamble defined in IEEE 802.16 OFDM mode, and the adaptive Newton tracker is verified in high mobility channels (120 km/hr and 240 km/hr). From the simulation results, we can find that the semi-blind channel estimation method performs very well in terms of bit error rate. In conclusion, the semi-blind channel estimation method can achieve both bandwidth efficiency and estimation accuracy.

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Content

中文摘要	i
English Abstract	ii
誌謝	iii
Content	iv
List of Tables	vi
List of Figures	vii
Acronym	x
Chapter 1 Introduction	1
1.1 History of OFDM.....	1
1.2 Paper Surveys on OFDM Channel Estimators.....	2
1.3 Motivation of This Thesis.....	3
1.4 Organization of This Thesis.....	4
Chapter 2 Introduction of DFT-based OFDM Systems and Related Conventional Channel Estimation Techniques	5
2.1 DFT-Based OFDM System.....	5
2.1.1 OFDM modulator.....	5
2.1.2 Cyclic Prefix (CP).....	6
2.1.3 OFDM Demodulator.....	7
2.1.4 Advantages and Disadvantages of OFDM Systems.....	9
2.2 Characteristics of Multipath Fading Channels.....	10
2.3 Some Conventional Channel Estimators on OFDM Systems.....	12

2.3.1 Least Square (LS) Channel Estimator.....	13
2.3.2 Linear Minimal Mean Square Error (MMSE) Channel Estimator...	14
2.3.3 DFT-based 1-Dimension Channel Estimator.....	15
2.3.4 Channel Estimator Based on Time Domain Correlation.....	17
2.3.5 Decision Feedback or Decision Directed Channel Estimator.....	19
Chapter 3 Semi-blind Channel Estimator with Sparse Pilots on	
High Mobility OFDM Systems	21
3.1 System Description.....	21
3.1.1 OFDM Packet Format.....	22
3.2 Initial Channel Estimation Based on Multipath Interference Cancellation...	23
3.3 An Adaptive Newton Method to Track Channel Responses.....	25
3.3.1 Channel Estimator Model.....	25
3.3.2 Problem Formulation.....	26
3.3.3 Adaptive Newton Methods.....	27
3.3.4 Combination of Pilots and Decision Data Direction.....	29
3.4 Computation complexity issues.....	32
3.5 Mean Square Errors of Channel Estimators.....	36
Chapter 4 Simulation Results and Discussions	38
4.1 Introduction of a preamble defined in IEEE 802.16 OFDM mode.....	38
4.2 Initial Channel Estimation with the Preamble.....	41
4.3 Adaptive Newton Tracking.....	42
4.4 Simulation Environment.....	45
Chapter 5 Conclusions and Future Works	57
Appendix	58
Bibliographies	60

List of Tables

3.1 Complexity of operation in the MPIC-based initial channel estimator.....	33
3.2 Complexity of MPIC-based initial channel estimator.....	34
3.3 Complexity of operation in the adaptive Newton tracking.....	35
3.4 Complexity of the adaptive Newton tracking.....	36
4.1 Frequency description of IEEE 802.16 OFDM mode.....	40
4.1 Simulation parameters.....	45



List of Figures

2.1 OFDM modulator.....	6
2.2 Concept of inter-symbol interference (ISI).....	6
2.3 Complete OFDM symbol.....	7
2.4 Cyclic prefix extension OFDM system transmitter.....	7
2.5 OFDM system receiver.....	8
2.6 Equivalent channel model of OFDM systems.....	9
2.7 The multipath propagation model of Rayleigh fading channel.....	12
3.1 OFDM packet format.....	22
3.2 Flow chart of the proposed semi-blind channel estimation.....	22
3.3 Newton methods to track channel impulse responses.....	31
3.4 Newton methods based on decision data to track channel impulse responses...	32
4.1 Downlink and network entry preamble structure.....	38
4.2 Frequency description of IEEE 802.16 OFDM mode.....	40
4.3 Normalized cyclic-shift autocorrelation function of IEEE 802.16 OFDM Mode preamble.....	41
4.4 Initial channel MSE vs. delay spread of the inverse method, IDFT method and proposed MPIC method in a UMTS 6-path fading channel ($v=120\text{km/hr}$, $E_b / N_o=30\text{dB}$).....	46
4.5 Initial channel MSE vs. E_b / N_o of the phase I only estimator and the phase I& II (which is phase I followed by phase II) estimator with N_p as in (a) a two-path fading channel and (b) a UMTS 6-path fading channel ($v=120\text{km/hr}$).....	47
4.6 BER of the Newton methods vs. pilot direction weighting α with vehicle	

speed v and channel model as parameters ($E_b/N_o=30\text{dB}$, packet length $P=100$, 8 pilots, $\beta=2$, Newton iteration number=5, and initial channel responses are estimated by the proposed MPIC method)..... 48

4.7 Channel MSE after Newton tracking vs. E_b/N_o with Newton iteration number as parameters in (a) a two-path fading channel and (b) a UMTS 6-path fading channel (packet length $P=100$, 8 pilots, $\alpha=1$, $\beta=2$, $N_p = 2$ in (a), $N_p = 6$ in (b), and initial channel responses are estimated by the MPIC method, $v=120\text{km/hr}$)..... 49

4.8 BER of the Newton methods vs. E_b/N_o with Newton iteration number as parameters in (a) a two-path fading channel and (b) a UMTS 6-path fading channel (packet length $P=100$, 8 pilots, $\alpha=1$, $\beta=2$, $N_p = 2$ in (a) and $N_p = 6$ in (b), and initial channel responses are estimated by the MPIC methods, $v=120\text{km/hr}$)..... 50

4.9 Channel MSE after Newton tracking vs. E_b/N_o with N_p as parameters in (a) a two-path fading channel, $v=120\text{km/hr}$ or 240km/hr and (b) a UMTS 6-path fading channel, $v=120\text{km/hr}$ (packet length $P=100$, 8 pilots, $\alpha=1$, $\beta=2$, Newton iteration number=5, and initial channel responses are estimated by the MPIC method)..... 51

4.10 BER of the Newton methods vs. E_b/N_o of phase I. only initial channel estimator and phase I&II (which is phase I followed by phase II) initial channel estimator in a UMTS 6-path fading channel (packet length $P=100$, 8 pilots, $\alpha=1$, $\beta=2$, $N_p = 6$, Newton iteration number=5, $v=120\text{km/hr}$)..... 52

4.11 BER of the Newton methods vs. E_b/N_o in a UMTS 6paths fading channel

with N_p as parameters in (a) $v=120\text{km/hr}$ (b) $v=240\text{km/hr}$ (Packet length $P=100$, 8 pilots or no pilot, $\alpha=1$, $\beta=2$, Newton iteration number=5 and initial channel responses are estimated by the proposed MPIC method).....	53
4.12 BER of the Newton methods vs. E_b/N_o in two-path fading channel, with N_p and v as parameters (Packet length $P=100$, 8 pilots or no pilot, $\alpha=1$, $\beta=2$, Newton iteration number=5 and initial channels are estimated by the proposed MPIC method).....	54
4.13 BER of the Newton methods vs. packet length for $v=120\text{km/hr}$ in two-path fading channel and UMTS 6-path fading channel ($E_b/N_o = 30\text{dB}$, 8 pilots, $\alpha=1$, $\beta=2$, Newton iteration number=5 and initial channels are estimated by the proposed MPIC method).....	55
4.14 BER vs. E_b/N_o for ICI and ICI-free cases in a UMTS 6-path fading channel $v=120\text{km/hr}$ (Packet length $P=100$, 8 pilots, $\alpha=1$, $\beta=2$, $N_p=6$, Newton iteration number=5 and initial channel responses are estimated by the proposed MPIC method).....	56
4.15 BER vs. E_b/N_o of conventional decision directed methods with vehicle speed and packet length as parameters (iteration number=2).....	56

Acronym

AWGN	additive white Gaussian noise
BER	bit error rate
CP	cyclic prefix
DAB	digital audio broadcasting
DD	decision directed
DFT	discrete Fourier transform
DVB-T	digital video broadcasting terrestrial
IDFT/DFT	inverse discrete Fourier transform/discrete Fourier transform
ICI	inter-carrier interference
IEEE	institute of electrical and electronics engineers
IFFT/FFT	inverse fast Fourier transform/fast Fourier transform
ISI	inter-symbol interference
LAN	local area network
LOS	line of sight
LS	least square
MAN	metropolitan area network
MIC	multipath interference cancellation
MMSE	minimal mean square error
OFDM	orthogonal frequency division multiplexing
PA	pilot-aided
PAPR	peak to average power ratio

