الآيـــة

قال تعالي :

﴿ الُوا سُ بْ حَ انَكَ لاَ عِ لْ مَ لَنَا إِلاَّ مَ ا عَ لَّمْتَنَا إِنَّكَ أَنْتَ الْعَ لِيمُ الْحَ كِيم (32) ﴾

(سورة البقرة)

﴿ نَ آمَ نُوا مِ نْكُمْ وَ الَّذِ ينَ أُوتُوا الْعِ لْمَ دَ رَ جَ اتٍ وَ اللَّهُ بِمَ ا تَعْمَ لُونَ خَ بِيرٌ (11) ﴾

(سورة المجادلة)

Dedication

Dedicated to

My parents

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There are a lot of people to whom i am grateful for their continuous encouragement, help and trust on me. In an auspicious moment, I came across to my thesis supervisor **Dr: Asharf Gasim Elsid Abdalla** whom I would like to express my heartiest gratitude for his keen guidance, sincere help and friendly manner which inspires me to do well in the thesis and makes it a reality.

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التّكَيّف الرابط لمحطة المحمول

للباحث : عبدالله عبدالعزيز عبدالله علي
مشرف البحث الدكتور:أشرف قسم السيد عبدالله

الملخص

يَعْتَبْر ويَعُدّ نظام الإتصالات (Wimax) من الأنظمة التى جذبتاِنْتِباه الباحثين والمطوريين ومقدمى الخدمة في مجتمع الإتصالات . وقد تمنَشَرَ كثير من الأوراق البحثية المتعلقة بتصميم شبكات الـ(Wimax) وقد أجرى الباحثون بحوث كثيرة لتطوير وتصميمُوارِزْمِيَّة لنظم التّكَيّف قناة أتصال وذلك لتعزيز إداء هذه الأنظمة مدفوعين بالرغبة في التنقل السلس (Seamless mobility) .

فُتِحَتْ ال -(Wimax – IEEE802.16e)باباً جديد لشبكات المحمول ذات السعات العريضة وأصبحت منافس قوى للأنظمة الموجودة حالياً مثل الجيل الثالث والرابع .

في هذاالدّراسَةِ تم أقتراح نظمُوارِزْمِيَّة بسيطةلتّكَيّف قناة أتصال لمحطة محمول مدعوم بنظام شبكات الـ(Wimax) دور قناة الإتصال مهم جداً لانه يتحكم في زيادة إداء الطبقة الفيزيائية (Physical Layer) بحيث يمتد التأثير الى الطبقات العليا .

الهَدَفِ الرئيسلخُوارِزْمِيَّة تكييف القناة هو أختيار العوامل المناسبة والمؤثرة لـ(Burst profile) كما تم إختيار الـ Forward Error Correction Block Error Rate) كمحددخُلوارِزْمِيَّة .خُلوارِزْمِيَّة تستخدم جدول ثابت لقيمة نسبة الإشارة الىنِسْبَة الضجيج الرمزى مع الأخذ فيالاعتِبارِ الترابط (Correlation) مع نظاممُتَعَدِّد المداخل والمخارج (MIMO) مع الضبطلدِّيناميكِيّ لقيمةنِسْبَة الاشارة الىنِسْبَة الضجيجحَسَب السرعة بدون النّظَر الى الجدول الثابت.

تَمَّ تَقْيِيم إداءخُلوارِزْمِيَّة باستخدام المقارنات والرسومات البيانية ونتيجة ذللكوَجَدَ أن الخُوارِزْمِيَّة أستطاعت ان تحافظ علىجُودَة الخدمة كما يمكن إعتبارها مرجع لإجراء مزيد من البحوث والدراسات في مجال تقنياتالتّكَيّف الرابط لمحطة المحمول .

Link Adaptation for Mobile Terminal

By: Abdallh Abdelaziz Abdallh Ali
Supervisor: Dr: Asharf Gasim Elsid Abdalla

ABSTRACT

WiMAX has attracted a lot of attention recently in the telecommunication community including researchers, product developers and service providers. Numerous papers have been published on various design issues of WiMAX networks. Researchers made a lot of researches to develop and evaluate different Link Adaptation algorithms for enhancing the performance of the WiMAX systems. Researchers motivated by the demand of seamless mobility. The IEEE 802.16e or mobile WiMAX opens a new door of possibility of mobile broadband. Hence, it is a strong competitor to the existing mobile communication systems (3G, and 4G).

It is expected that IEEE 802.16e will be the standard for future mobile WiMAX technology that could greatly increase the channel capacity without additional spectral resources. At this moment, mobile WiMAX or IEEE 802.16e is one of the hottest areas of research

In this thesis Link Adaptation (LA) algorithm was proposed for the mobile terminals which ware supported by (mobile) WiMAX network. The role of link adaptation (LA) was very important because it controls the physical layer throughput. Therefore, all the higher layers are affected by LA. The main function of LA algorithm was to select an appropriate burst profile, Forward Error Correction Block Error Rate (FBER) was chosen as constraint for the performance of LA. LA algorithm used a static threshold table of SNR per symbol and considers MIMO (Multiple Input Multiple Output)

channel correlation. SNR (Signal to Noise Ratio) was dynamically adjusted the before looking at the table based on mobility state.

The performances of the proposed LA algorithm were evaluated through numerical results used comparison and graphs. According to numerical results, the proposed LA algorithm was able to maintain a certain level quality of service (QoS) and it can be considered as reference for any further research in Link Adaptation field.

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List of Acronyms

3G	Third generation cellular
4G	Fourth generation cellular
AAS	Adaptive antenna system
ACK	Acknowledgement
AES	Advanced Encryption Standard
AMC	Adaptive modulation and coding
AP	Access point
ARQ	Automatic retransmission / repeat request
ATM	Asynchronous transfer mode
AWGN	Additive white Gaussian noise
BE	Best effort
BER	Bit error rate
BS	Base station
BPSK	Binary phase shift keying
BWA	broadband wireless access
CC	Convolutional coding
CID	Connection identifier
CP	Cyclic prefix
CQICH	Channel quality indicator channel
CTC	Convolutional turbo coding
DES	Data Encryption Standard
DFT	Discrete Fourier transform
DOCSIS	Data Over Cable Service Interface Specification
DL	Downlink
DSL	Digital subscriber line
DTLA	Dynamic threshold link adaptation
ErtPS	Extended real time polling service
FBER	FEC block error rate
FCH	Frame control header
FDD	Frequency division duplex
FEC	Forward error correction code
FFT	fast Fourier transform
FUSC	Fully used subchannelization
GSM	Global systems for mobile
HARQ	Hybrid ARQ
ICI	Inter Carrier Interference
IEEE	Institute of electrical and electronic engineers
IPP	Independent pilot pattern

ISI	inter symbol interference
ITU	International telecommunication union
LA	Link adaptation
LDPC	Low density parity check
LOS	Line of sight
LS	Least square
MAC	Medium access control (layer)
MAP	Medium access protocol
MCS	Modulation and coding scheme
MD	MIMO diversity
MIMO	Multiple input multiple output
ML	Maximum likelihood
MN	Mobile node
M-QAM	M-array QAM
MRC	Maximum ratio combining
MS	Mobile station
MT	Mobile terminal
NACK	Negative Acknowledgement
NEMO	Network mobility
NLOS	Non line of sight
OFDMA	Orthogonal frequency division multiple access
OFDM	Orthogonal frequency division multiplexing
PA	Power allocation
PDU	Protocol data unit
PER	packet error rate
PHY	Physical (layer)
PMF	Probability mass function
PUSC	Partially used subchannelization
QAM	Quadrature amplitude modulation
QoS	Quality of service
QPSK	Quaternary phase shift keying
RA	Resource allocation
RSSI	Received signal strength indicator
RTG	Receive transmit transition gap
rtPS	Real time polling service
SDU	Service data unit
SER	Symbol error rate
SF	Service flow
SINR	Signal interference to noise ratio

SISO	Single input single output
SM	Spatial multiplexing
SNR	Signal to noise ratio
STBC	Space time block code
TDD	Time division duplex
TTG	Transmit receive transition gap
UL	Uplink
WiBro	wireless broadband Internet technology
WiMAX	Wireless interoperability for microwave access or Worldwide inter operation for microwave access
WMAN	Wireless metropolitan area network
ZF	Zero Forcing