

الاستهلال

يقول الله سبحانه وتعالى :



صدق الله العظيم

الآية 114 من سورة طه

DEDICATION

We Dedicate This Work to Our Families for Their Endless Love, Support
and Encouragement

Thanks for Always Being There For Us

ACKNOWLEDGEMENT

All praises and thanks for Almighty God, the driven force of this universe, the source of all knowledge and wisdom endowed mankind, who made this possible and blessed us a potential and ability to contribute a drop of material to the existing ocean of knowledge.

We would like to express our gratitude to our supervisor **Dr.Fath Elrahman Ismael khalifa**who strongly supported us from the very beginning and provided us with valuable advice. Great thanks for him for the endless support and encouragement. Without his guidance and encouragement, we would not be able to do this.

The successful completion of this research depends largely on the encouragement and guidelines of many others. We would like also to take this opportunity to express our gratitude to our friends and to the people who have been instrumental and gave us help, support, and well wishes.

ABSTRACT

The Long Term Evolution (LTE) project was initiated in 2004 motivated by the need to reduce the cost per bit, and the flexible use of new and existing frequency bands. LTE-Advanced is the project name of the evolved version of LTE that is being developed by 3GPP.

LTE-Advanced supports several technologies to enhance the overall performance, it supports Heterogeneous network (HET-NET) which consist of mix of different size cells within the same coverage area. HET-NET further improves the capacity and coverage but it has many drawbacks such as high interference.

This research discusses issues related to enhance the overall performance of users in the heterogeneous network deployment. Users in small cells such as pico or femto are exposed to relatively high interference due to the variations in the power levels for different cell sizes. Further, more effort is needed to improve the ability to utilize the available resources in different cell levels.

The key techniques used in this research are the sectorization using three sectors (which is used to mitigate the interference) and a cooperation transmission strategy (which is used to apply the cooperation technique). The investigation of the effectiveness of the above mentioned schemes is done by using simulation written in MATLAB. In which, the use of sectorization using three sectors resulted in improvement in the bit rate by 10% - 14%. In addition, the deployment of the cooperation technique increases the bit rate up to 67%. Therefore, the throughput increases by 50% because of the use of the sectorization using three sectors. Also, the deployment of the cooperation technique leads to a large increment in throughput up to 66%.

Due to the above recorded enhancement in the performance parameters recommendations are made in assessing and Applying multi cell cooperation for LTE-Advanced Heterogeneous network that are to be a key technology to enhance the performance of users in small cells which is benefit to the operators to attract more users and generate more profits.

المستخلص

التطور بعيد المدى أو مايسمى بالجيل الرابع للاتصالات بدأ في العام 2004 والتي كان الغرض منه تقديم خدمات أفضل للمشاركين بتكلفة أقل وبكفاءة جيدة وبعرض نطاق الموجود يتم الاستفادة منه استفادة قصوى ، التطور بعيد المدى المحسن هو اسم المشروع المعتمد الذي طور من قبل مشروع شراكة الجيل الثالث.

من مميزات التطور البعيد المدى المحسن دعمه لعدة أنواع من التقنيات لتحسين كفاءة وجودة النظام. من هذه التقنيات تقنية الشبكات المتجانسة وهي الشبكات التي تكون بها محطات ارسال مختلفة الأحجام داخل تغطية محطة كبرى ، الغرض من هذه التقنية زيادة مناطق التغطية وسعة النظام ، لكن هذه التقنية بها مشكلة تداخل الاشارات بشكل كبير .

هذا البحث يناقش كيفية زيادة وتحسين الخدمات للمستخدمين عن طريق تطبيق الشبكات المتجانسة والعمل بها ، مستخدمى الشبكة الذين يستخدمون محطة الارسال والاستقبال ذات المدى القصير يعانون من تداخل الاشارات بسبب اختلاف القدرة بين محطات الارسال والاستقبال ذات النطاقات المختلفة ، وإضافة إلى ذلك هنالك حوجة للاستفادة القصوى من الموارد الموجودة بالشبكة لخدمة المشتركين .

تم استخدام تقنيات مختلفة للوصول لأهداف البحث, من تلك التقنيات تقليل التداخل بين الاشارات (بتقسيم الخلية الى قطاعات) وبالتالي تقليل التداخل, وأيضا تقنية استراتيجية التشارك والتعاون بين المحطات للاستغلال الأمثل للموارد المتاحة في الشبكة لرفع مستوى الخدمة وجودتها ، تم استخدام برنامج الماتلاب كتطبيق لعمل التقنيات السابقة ومقارنة الاختلاف قبل وبعد التحسن في أدائية النظام ، عند استخدام التقنية الأولى تقنية الغاء التداخل بين المحطات (تقسيم الخلية الى قطاعات) تم تحسين الإشارة وكفاءة الخدمة بنسبة تتراوح بين 10 – 14 % لمعدل ارسال البيانات ، ولرفع الكفاءة أكثر تم استخدام التقنية الثانية تقنية التعاون والتشارك بين المحطات لتصل النسبة إلى 67 % . أيضا معدل ارسال المعلومات في حالة التقنية الأولى تحسن بمقدار حوالي 50 % ونجد أنه بعد عمل تقنية التشارك والتعاون بين المحطات تصل إلى 66 % مما يحسن الخدمة بشكل جيد .

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LIST OF SYMBOLS

P_t	Transmitted Power
P_r	Received Power
d	Distance From The Base Station
N	Number Of The Other Base Stations
N_o	Noise (Total Noise)
t	Attenuation Factor
L	Path loss
$\frac{s}{i}$	Signal To Interference Ratio
Th	Throughput
Bw	Bandwidth
mf	Modulation Factor
BR	Bit Rate
Se	Spectral Efficiency
De	Delay
dt	Data
Dt_r	Data Rate
U_{BW}	Used Bandwidth
$BW-U$	Bandwidth Utilization
$A-BW$	Available Bandwidth
Acc_{th}	Accumulated Throughput

inst_th_i	Instantaneous Throughput At Frame i
inst_th_{i-1}	Instantaneous Throughput At Frame $i-1$

ABBREVIATIONS

1G	First Generation
2G	Second Generation
3G	Third Generation
3GPP	Third Generation Partnership Project
4G	Fourth Generation
bps	Bit Per Second
CoMP	Coordination Multipoint
CQI	Channel Quality Identifier
DL	Downlink
DSL	Digital Subscriber Line
eNB	E-Node Base Station
FDD	Frequency Division Duplexing
HET-NET	Heterogeneous Network
ICIC	Inter Cell Interference Cancellation
ITU	International Telecommunication Union
Kbps	Kilo Bit Per Second
LTE	Long Term Evolution
Mbps	Mega Bit Per Second
MIMO	Multi Input Multi Output
OFDM	Orthogonal Frequency Division Multiplexing

OFDMA	Orthogonal Frequency Division Multiple Access
PAPR	Peak To Average Power Ratio
PRB	Physical Resource Block
RRH	Remote radio head
SC-FDMA	Single-Carrier Frequency Division Multiple Access
SIC	Successive Interference Cancellation
SIR	Signal To Interference Ratio
TDD	Time Division Duplexing
UE	User Equipment
UL	Uplink
Wi-Fi	Wireless Fidelity
WiMAX	The Worldwide Interoperability For Microwave Access