



Sudan University of Science and Technology



College of Graduate Studies

Interference management for Device to Device communication Underlying Cellular Networks Using DRC And FFR

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إدارة تداخل الإتصال من جهاز الى جهاز المخصصة للشبكات الخلوية باستخدام إدارة
التردد وتحديد المسافة المعيارية

PreparedBy:

Haifa AbuObaida Abu AL Hassan Saeed.

Supervisor:

Dr. Rashid A. Saeed.

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى:

﴿يَرْفَعُ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ
دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ﴾

صدق الله العظيم

سورة المجادلة

{الآية 11}

Dedication

This dedication To our parents and families, who love and

Support us.

*To all the teachers at Sudan University who taught us throughout our college
career.*

To all our friends and colleagues.

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In the first and before all we thank ALLAH for every things we are reaching and going to it in our life. As always, the completion of any project would not be possible without the support.

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Abstract

D2D communication aims to improve the spectral efficiency and increases the overall system capacity. In the proposed scheme, sharing the uplink channel of a cellular system is analyzed in single cell and multi cell.

In single cell, the model investigated how to properly choose a CUE for the D2D link, by using Distance constrained Resource sharing Criteria (DRC) for the base station to select the best resource of a CUE to reuse it for a D2D link.

L_{\min} is a pre-selected distance constraint to control the interference from the selected CUE to the D2D UE1 to be interference in the stable level $L \geq L_{\min}$, ($L_{\min}=150.437$), to adjust the power transmitted from CUE, using OFPC, Open loop power control is capability of the UE transmitter to set its uplink transmit power to a specified value suitable for receiver.

In multi cell, used fractional frequency reuse in D2D Communication, assumed cluster consist of three cell, studied the distance of location for D2D pair from the center of the cell edge of inner region, to cell edge of total cell with out FFR.

Assumed the D2D pair in inner region in first cell the D2D pair faces interference from inner region from other cells which it has same frequency. Calculated the distance from tow center and from D2D pair, and calculate the SINR

The simulation results show that the proposed scheme can enhance the value of SINR and optimal system capacity on the promise of ensuring the cellular communication quality.

المستخلص

هذه الاطروحة تقدم جزء معيناً من تقنيات الجيل الرابع وهو نظام الاتصالات المباشرة (من جهاز الى جهاز) من غير تدخل اساسي للابراج الهوائية. ويتم دمج هذا النظام مع الاتصالات الخليوية.

نظام الاتصالات المباشرة يزيد من مساحه التغطية وزياده السعة لكل المستخدمين كما انه يساعد على الاستغلال الامثل للطيف المرئي وذلك باعاده استخدام القناة.

اعاده استخدام القناة يتم تنفيذه باستخدام نفس القنوات ضمن المنطقه المسماه بالخلايا والمحدده بالمواقع المختلفه في منطقته خدمه الشبكه الخليويه، هذا البحث لا يخصص قنوات معينه لنظام الاتصال المباشر، وانما نقوم باعادة استخدام قنوات اللاتصالات الخليوية وذلك لزياده كفاءة النظام.

في هذا البحث نناقش كيفيه التقليل من التداخل بين مستخدمي نظام الاتصال المباشر ومستخدمي نظام الاتصال الخليوي .

للاستغلال الامثل للنطاق الترددي في الخليه الواحده؛ يتم اعاده قناه النظام الخليوي وذلك بحساب المسافة المثلى بين مستخدم النظام الخليوي ومستخدم النظام المباشر لكي لا يحدث التداخل ولقد وجدت في هذا النموذج المقترح تقريبا 150.437 كذلك تم التحكم في كمية القدرة الواصلة للمستقبل بمعادله معينه وحساب SINR، أما في عدة خلايا فقد تم تقسيم النطاق الترددي في الثلاث خلايا وتم تقسيم النطاق الترددي للخليه الواحدة لقسمين الجزء الخارجي للخليه والجزء الداخلي لها؛ كذلك افترض أن النطاق الترددي نفسه للجزء الداخلي للثلاث خلايا مخصص لنظام الاتصال المباشر وبذلك يقل التداخل بدرجة عالية وتم حساب SINR والسعه وذلك لضمان جودة وكفاءة النظام.

TABLE OF CONTENTS

Contents	Page
الآية.....	ii
Dedication.....	iii
Acknowledgement.....	iv
Abstract.....	v
المستخلص.....	vi
Table of contents.....	vii
List of figure.....	ix
List of table.....	x
List of abbreviations.....	xi
CHAPTER ONE:INTRODUCTION	
1.1 Preface.....	2
1.2 Problem statement.....	3
1.3 Aim and Objective.....	3
1.4 Methodology.....	4
1.5 Proposed solution.....	4
1.6 Thesis out lines.....	5
CHAPTER TOW:LITERATURE REVIEW	
2.1 Background.....	7
2.2 Architecture Of Device to Device Communication.....	8
2.2.1 Background in LTE-A Network.....	8
2.2.2 D2D Communication Scenarios.....	10
2.3 D2D Scheme procedure.....	13
2.4 Classification of D2D Communication.....	14

2.5	Challenges Of D2D Communication underlying Cellular Network.....	15
2.6	Channel Measurements.....	20
2.7	Related work.....	22

CHAPTER THREE: METHDOLOGY

3.1	Introduction.....	26
3.2	Interference Scenarios.....	27
3.2.1	Intracell Versus Intercell Interference.....	27
3.2.2	Uplink Versus Downlink Interference.....	27
3.2.3	Network Scenario of One D2D Candidate Versus Multiple D2Candidates.....	28
3.3	Interference Generated by D2D Communication.....	29
3.4	Power Control.....	32
3.5	Fractional Frequency Reuse.....	33
3.6	System Model.....	34
3.6.1	First: for single cell.....	34
3.6.2	Second: for multi cell.....	38

CHAPTER FOUR:RESULTS AND DISCUSSION

4.1	Descriptive analysis.....	41
4.2	Mathematical model.....	42
4.3	Simulation setup.....	42
4.4	Simulation Results.....	43

CHAPTER FIVE:CONCLUSION AND RECOMMENDATION

5.1	Conclusion.....	52
5.2	Recommendations.....	53
	References.....	54
	Appendix.....	59

LIST OF FIGURES

FIGUR E NO.	TITLE	PAGE
2.1	Architecture of LTE-A Network	9
2.2	Architecture of D2D communication	10
2.3	D2D discovery procedure	14
2.4	Classification of D2D communication	15
2.5	D2D communication modes	18
2.6	Channel exchange procedure	20
3.1	Intracell Versus Intercell Interference	27
3.2	Uplink Versus Downlink Interference	28
3.3	D2D Candidate Versus Multiple D2D Candidates	29
3.4	System model of the D2D communication	30
3.5	Block diagram of steps involved in setting uplink power using open loop power control	32
3.6	Fractional frequency reuse	34
3.7	System model of D2D underlying a cellular Network	35
3.8	Flow chart for single cell	37
3.9	Flow chart for multi cell	39
4.1	Distribution of users in cell	44
4.2	Signal to interference noise ratio versus distance between user and D2DRX	44
4.3	Relation between distance and power	45
4.4	power and distance normalized versus users in cell	46
4.5	power transmit per user versus SINR	46
4.6	Fractional Frequency Reuse	48
4.7	Users in Cell versus channel assignment	48
4.8	Radius of cell versus SINR	49
4.9	Capacity versus SINR	50

LIST OF TABLES

TABLE NO	TITLE	PAGE
3.1	Interference in downlink and uplink period	31
4.1	Simulation parameter for single cell	43
4.2	Simulation parameter for multi cell	47

LIST OF ABBREVIATIONS

AWGN	Additive White Gaussian Noise
BS	Base Station
BF	Beam forming
BSR	Buffer Status Report
CUE	Cellular user equipment
C2D	Cellular to Device
CN	Core Network
CQI	Channel Quality Indicator
D2D	Device to Device
DUE	Device user equipment
D_R	Device to Device receiver
D_T	Device to Device transmitter
DM-RS	Demodulation Reference symbols
DL	Down link
DPF	Direct Provisioning Function
D2C	Device to Cellular
eNBs	Evolved Node B
E-UTRAN	Evolved Universal Terrestrial Radio Access Network
EPC	Evolved Packet Core
FFR	Fractional Frequency Reuse
5G	The Fifth Generation of Mobile Telecommunications Technology
3GPP	The 3rd Generation Partnership Project
HSS	Home Subscriber Server
IC	Interference Cancelation
LTE	Long Term Evaluation
LTE-A	Long Term Evaluation - Advanced
LA	Location Area
MATLAB	Mathematical Laboratory
MME	Mobility Management Entity
MS	Mobile Station
MAC	Media Access Interval
NEW	Network entity
OFDM	Orthogonal Frequency Division Multiplexing
PLMN	Public land mobile network
Prose	Proximity service
PDLCCH	Physical Down link Control Channel
PUSCCH	Physical Uplink Share Channel

PDF	Probability Density Function
PPP	Poisson point process
QOS	Quality Of Service
RB	Resource Block
RSRP	Reference Symbol Received Power
SINR	Signal to noise plus interference ratio
SR	scheduling request
SRS	Sounding Reference Signal
TTI	Transmission time interval
UE	User equipment
UMTS	Universal Mobile Telecommunication System
UL	Uplink