



INTERFERENCE MITIGATION AND CAPACITY ENHANCEMENT IN VISIBLE LIGHT COMMUNICATION SYSTEMS

By

Hossien Badr Hossien Eldeeb

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirement for the Degree of

MASTER OF SCIENCE
in
Electronics and Communications Engineering

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Thesis Title:

Interference Mitigation and Capacity Enhancement in Visible Light Communication Systems

Key Words:

Visible light communication, Angle diversity, Co-channel interference, Multi-user interference, Resource allocation

Summary:

The continuous increase in the number of mobile applications encourages the replacement of the existing limited spectrum indoor RF wireless connections with high-speed ones. Visible light communication (VLC) technology is considered an attractive key, which opens the doors for high data rate indoor wireless applications needed in daily life. It has the advantages of energy efficiency, inherent security, the lower effect on human healthy and unregulated bandwidth. This technology relies on light emitting diodes (LEDs) which can achieve both illumination and data transmission. This is due to their unique advantages such as the long lifetime, low cost, high data rate and lower power consumption compared to other artificial light sources. However, VLC channel faces several challenges that limit its performance in high-speed transmissions. One of these challenges is signal interference. Particularly, two types of signal interference arise in the downlink VLC channel, which are co-channel interference (CCI) due to several adjacent transmitters operating at same optical frequency and inter-symbol interferences (ISI) due to multipath reflections from the same transmitter. Another challenge is how to establish an efficient uplink VLC channel, while achieving the envisioned Light-Fidelity (Li-Fi) communication systems. In this thesis, the two limitations are addressed and resolved while enhancing the overall performance of VLC networks.

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Table of Contents

ACKNOWLEDGMENTS	I
TABLE OF CONTENTS.....	II
LIST OF TABLES.....	IV
LIST OF FIGURES.....	V
NOMENCLATURE.....	VIII
ABBREVIATIONS.....	XII
ABSTRACT	XV
CHAPTER 1 : INTRODUCTION.....	1
1.1. INTRODUCTION	1
1.2. HISTORY OF VLC	2
1.3. THE USE OF LEDS.....	2
1.4. VLC CHALLENGES	3
1.4.1. VLC advantages	3
1.4.2. VLC applications.....	3
1.4.3. VLC limitations.....	4
1.4.4. Motivations.....	6
1.5. OBJECTIVES	7
1.6. THESIS STRUCTURE	8
CHAPTER 2 : VLC CHANNEL MODEL	9
2.1. INTRODUCTION	9
2.1.1. Optical transmitter model	9
2.1.2. Optical receiver model.....	10
2.1.3. Room channel model.....	10
2.2. SIMULATIONS AND NUMERICAL RESULTS	14
2.3. CONCLUSION	18
CHAPTER 3 : ANGULAR DIVERSITY RECEIVER (ADR)	19
3.1. INTRODUCTION	19
3.2. ADR COORDINATES	19
3.3. SIMULATIONS AND NUMERICAL RESULTS	21
3.4. CONCLUSION	23
CHAPTER 4 : CONSTRAINT FIELD OF VIEW ADR.....	24
4.1. DEFINITION OF CFOV-ADR	24
4.1.1. LOS CCI cancellation using CFOV-ADR.....	24
4.1.2. Select best combining scheme	29

4.2.	SIMULATION RESULTS	29
4.2.1.	Evaluation of lower and upper bounds for optimal FOV angle value	30
4.2.2.	Channel gain	31
4.2.3.	SINR performance	32
4.2.4.	Effect of receiver rotation	33
4.2.5.	Effect of receiver height	33
4.2.6.	Number of downlink VLC channels	34
4.3.	CONCLUSION	35
CHAPTER 5 : UPLINK MULTI-USER VLC SYSTEM		36
5.1.	INTRODUCTION	36
5.2.	UPLINK VLC SYSTEM MODEL	38
5.3.	ANGLE DIVERSITY SYSTEM	42
5.3.1.	ADT coordinates	42
5.3.2.	ADR coordinates	42
5.4.	OPTIMAL FAIR RESOURCE ALLOCATION SCHEME	43
5.4.1.	Problem formulation	44
5.4.2.	Assumptions and possible solutions	45
5.5.	SIMULATION RESULTS	46
5.5.1.	Simulation setup	46
5.5.2.	SINR and data rate analysis	46
5.3.	CONCLUSION	55
CHAPTER 5 : CONCLUSION AND FUTURE WORK		56
5.1.	CONCLUSION	56
5.2.	FUTURE WORK	57
LIST OF PUBLICATIONS		59
REFERENCES		60

LIST OF TABLES

2.1	Downlink simulation parameters with single receiver	15
2.2	Noise simulation parameters	15
3.1	ADR simulation parameters	22
4.1	SINR comparison for different receivers	33
5.1	Uplink room and user simulation parameters	54
5.2	Uplink receiver simulation parameters	54

LIST OF FIGURES

1.1	Visible light spectrum.	1
1.2	Illumination and data communication in the smart home.	3
1.3	VLC traffic and vehicular application.	4
1.4	Visible light positioning (VLP) in Toronto's airport.	5
1.5	VLC in airplane cabins.	5
2.1	VLC general block diagram system.	9
2.2	LOS channel model.	10
2.3	Equivalent baseband channel model of VLC system.	11
2.4	PD orientation angles.	12
2.5	NLOS channel model.	13
2.6	VLC room model with four LED transmitters.	14
2.7	3-D spatial distribution of received power for (a) SR with single LED transmitter(b) SR with four LED transmitters.	16
2.8	3-D spatial distribution of SINR for (a) SR with single LED transmitter(b) SR with four LED transmitters	17
3.1	Conventional angular diversity receiver: (a) Physical structure with $N_r = 7$. (b) The top view of conventional ADR. The circles indicate the locations of the PDs and γ_{PD}^2 is the azimuth angle of 2^{nd} PD.	20
3.2	3-D spatial distribution of received power for conventional ADR.	21
3.3	3-D spatial distribution of SINR for conventional ADR.	22
3.4	SINR performance of conventional ADR at different positions along the y-axis.	22
4.1	The proposed CFOV-ADR structure with 7 PDs.	24
4.2	LOS CCI in VLC system. At positions A and C, the mobile PD can receive the desired signal without significant CCI, while at position B the PD suffers from sever LOS CCI.	25
4.3	Minimum LOS incident angles ϕ^m at different positions along the y -axis ($z_r = 1m$, $\gamma_r = 0^\circ$). The center line at $x = 2.5$ and corner one at $x = 0$ give the highest value of ϕ^m along the y -axis.	29

4.4	Minimum interfering LOS incident angles ϕ^{m*} at different positions along the y -axis ($z_r = 1m$, $\gamma_r = 0^\circ$). The curve drawn at $x = 1$ gives the lowest value of ϕ^{m*} along the y -axis.	30
4.5	Lower and upper bounds of ψ_{opt} at each position along the y -axis ($z_r = 1m$, $\gamma_r = 0^\circ$).	31
4.6	SINR performance of proposed CFOV-ADR at different positions along the y -axis ($z_r = 1m$, $\gamma_r = 0^\circ$ and $\psi_{opt} = 20.4^\circ$).	32
4.7	3-D spatial distribution of SINR for proposed CFOV-ADR at $\psi_{opt} = 20.4^\circ$.	33
4.8	SINR versus receiver rotation angle γ_r with $\psi_{opt} = 20.4^\circ$ and $z_r = 1m$ at different positions inside the room.	34
4.9	SINR of CFOV-ADR at different receiver heights and along the y -axis. .	35
4.10	Number of received signals inside the room at $\psi_{opt} = 20.4^\circ$	35
5.1	Multiuser uplink VLC system using angle diversity system.	38
5.2	The LOS channel link between j^{th} transmitter and i^{th} PD.	39
5.3	The NLOS channel link between j^{th} user and i^{th} PD reflected by the k^{th} element.	40
5.4	Physical structure of angle diversity devices (A) Angle diversity transmitter (ADT) with $L = 5$, (B) Angle diversity receiver (ADR) with $F = 5$. .	41
5.5	The orientation of l^{th} LED.	43
5.6	The user distribution inside the room for two scenarios. Red circles indicate the user's locations for first scenario and blue circles indicates the second scenario. Also, green circles show the ADR positions where $R = 4$ and $M = 5$	45
5.7	The average and the minimum SINR performance versus FOV angle of the PD for proposed OFRA scheme and conventional ST one, and for the two scenarios. The semi-angle of the LED $\Theta = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	47
5.8	The average and the minimum SINR performance versus FOV angle of the PD, for proposed OFRA scheme and conventional ST one, and for the two scenarios. The semi-angle of the LED $\Theta = 60^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	47
5.9	The average and the minimum SINR performance versus the semi-angle of the LED, for proposed OFRA scheme and conventional ST one, and for the two scenarios. The FOV angle of the PD $FOV = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	48

5.10	The average and the minimum SINR performance versus the semi-angle of the LED, for proposed OFRA scheme and conventional ST one, and for the two scenarios. The FOV angle of the PD $\text{FOV} = 60^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	48
5.11	The SINR of each user for proposed OFRA scheme and conventional ST one, and for the two scenarios. $\text{FOV} = \Theta = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	49
5.12	The SINR of each user for proposed OFRA scheme and conventional ST one, and for the two scenarios. $\text{FOV} = 60^\circ$, $\Theta = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	49
5.13	The SINR of each user for proposed OFRA scheme and conventional ST one, and for the two scenarios. $\text{FOV} = 45^\circ$, $\Theta = 60^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	50
5.14	The SINR of each user for proposed OFRA scheme and conventional ST one, and for the two scenarios. $\text{FOV} = 60^\circ$, $\Theta = 60^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	50
5.15	The average and minimum SINR for proposed OFRA scheme and conventional ST one versus number of users at $\text{FOV} = 45^\circ$, $\Theta = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	52
5.16	The average number of blocked users versus number of users for $\text{FOV} = 45^\circ$, $\Theta = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	52
5.17	The average data rate versus user number for proposed OFRA scheme and conventional ST one. $\text{FOV} = \Theta = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$. . .	53
5.18	The sum capacity for proposed scheme and ST one $\text{FOV} = 45^\circ$, $\Theta = 45^\circ$, $R = 4$, $M = 5$ and $L = F = 5$	53

