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

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
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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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Hossien Eldeeb

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