

Bachelor/Master's Thesis

Evaluation of a hybrid LiFi/PLC communication system

Abstract

Powerline communication (PLC) is a technology that allows data transmission over a building's existing electrical power cables. It can be used to provide wired connectivity in situations where it is impractical to install traditional Ethernet cables, such as in older buildings or in locations with thick concrete walls. PLC technology works by modulating data onto a high-frequency carrier signal, e.g. 2-80 MHz, and transmitting it over the power cables. There are several different standards for PLC, including HomePlug, G.hn, and ITU-T G.9960.

LiFi (Light Fidelity) is a wireless communication technology that uses visible light as a medium for transmitting data. It is also known as visible light communication (VLC) or optical wireless communication (OWC). In a LiFi system, data is encoded onto a modulated light signal and transmitted via a light-emitting diode (LED) or other light sources like lasers. On the receiver side the signal is received by a photo detector for demodulation. LiFi has several advantages over traditional radio frequency (RF) technologies such as 802.11 WiFi. It is less susceptible to interference and can be used in areas where RF is restricted or not allowed, such as airplanes and hospitals. LiFi is still in the early stages of development, and it is not yet widely available.

As part of the LINCNET project, we are developing a hybrid PLC/LiFi communication system. The key idea is to use PLC for backhauling whereas LiFi is used as access technology. In order to have a cost-effective solution, we aim for a solution where the LiFi access points acts as analog amplify-forward relays.

Content

The goal of this thesis is to evaluate the approach mentioned above analytically as well as experimentally.



Possible milestones are as follows:

- Literature research on PLC and LiFi.
- Understanding analog amplify-forward relaying with its pros and cons
- Analytical calculations
- Prototyping using COTS/custom hardware for PLC/LiFi
- Performing experiments to assess the feasibility of envisioned approach.
- Evaluation and discussion of results.

Requirements

A solid understanding of *Wireless Communication Networks* with focus on PHY/MAC layer is required. Moreover, it is important to have skills in *Matlab* as well as practical experience in prototyping (Linux, measuring instruments like spectrum analyzer).