Abstract

Visible Light Communication (VLC) is an emerging field in optical wireless communication that uses light emitting diodes (LEDs) for data transmission. LEDs are being widely adopted both indoors and outdoors due to their low cost, long lifespan and high efficiency. Furthermore, LEDs can be modulated to provide both illumination and wireless communication. There is also potential for VLC to be incorporated into future smart lighting systems. One of the current challenges in VLC is being able to deal with noise and interference; including interference from other dimmed, Pulse-Width Modulated (PWM) LEDs. Other noise includes natural light from the sun and artificial light from other non-modulating light sources. Modelling these types of channels is one of the first steps in understanding the channel and eventually designing techniques for mitigating the effects of noise and interference. This dissertation presents a semi-hidden Markov model, known as the Fritchman model, that discretely models the effects of as well as errors introduced from noise and interference in on-off keying modulated VLC channels. Models have been developed for both the indoor and outdoor environments and can be used for VLC simulations and designing error mitigation techniques. Results show that certain channels are able to be better modelled than others. Experimental error distributions shows insights into the impact that PWM interference has on VLC channels. This can be used for assisting in the development of error control codes and interference avoidance techniques in standalone VLC systems, as well as systems where VLC and smart lighting coexist. The models developed can also be used for simulations of VLC channels under different channel conditions.