

SUMMARY OF Ph.D. DISSERTATION

School Science for open and environmental system	Student Identification Number	SURNAME, First name KOMINE, Toshihiko
Title Visible Light Wireless Communications and Its Fundamental Study		
Abstract <p>In 1990's, white LEDs (Light Emitting Diodes) have been invented for various uses and subsequently investigated. Compared with conventional lighting devices, the white LED has lower power consumption, lower voltage, longer lifetime, smaller size, faster response, and cooler operation. The white LED will eventually replace incandescent or fluorescent lights in offices and homes.</p> <p>In this dissertation, an indoor visible light wireless communication system utilizing white LED lighting equipment is proposed. In this system, these devices are used not only for illuminating rooms but also for a wireless optical communication system. This dual function of LED, for lighting and communication, is creating many new and interesting applications. The function is based on the fast switching of LEDs and the modulation of the visible light waves for free-space communications. The system has large power compared with infrared wireless communication system. Based on lighting engineering, their communication performances are evaluated.</p> <p>Then, various new communication schemes in indoor visible light environment are proposed and discussed. A diversity technique is proposed so that shadowing problem may be alleviated. Moreover, to overcome the intersymbol interference caused by optical path difference between lighting equipments, an adaptive equalizer is proposed and discussed. The effectual interval of training sequence for channel estimation alleviates the influence of shadowing.</p> <p>Finally, an integrated system of visible light wireless communication and power line communication for improvement of convenience and user friendliness is proposed. This system can also be considered as a very economical integration between power line communication and wireless communication. In this system, there is no necessity to lay a new communication cable in a ceiling. And, by screwing the electric bulb into a socket, the data transmission becomes possible.</p> <p>From these proposals, it is found that the idea of the proposed systems is very promising for future high speed wireless networks and the visible light wireless communication can be one choice for an indoor optical wireless data transmission system.</p>		