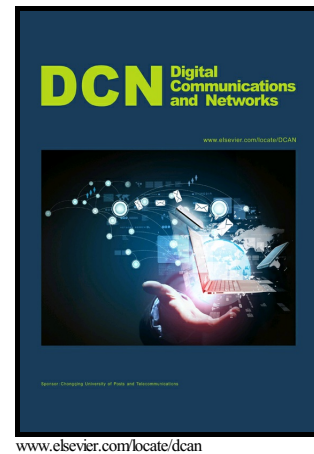


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Visible Light Communication: Applications, Architecture, Standardization and Research Challenges

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Visible Light Communication: Applications, Architecture, Standardization and Research Challenges

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Abstract

The Radio Frequency (RF) communication suffers from interference and high latency issues. Along with this, RF communication requires a separate setup for transmission and reception of RF waves. Overcoming the above limitations, Visible Light Communication (VLC) is a preferred communication technique because of its high bandwidth and immunity to interference from electromagnetic sources. The revolution in the field of solid state lighting leads to the replacement of florescent lamps by Light Emitting Diodes (LEDs) which further motivates the usage of VLC. This paper presents a survey of the potential applications, architecture, modulation techniques, standardization and research challenges in VLC.

Keywords: VLC; LEDs; Li-Fi; OOK; PWM; PPM; CSK.

1. Introduction

The limited radio frequency spectrum puts constraints on the increasing demand for ubiquitous connectivity and high capacity. According to CISCO, there will be an 11-fold increase in mobile data traffic in 2018 compared to 2013 as shown in Fig. 1[1]. The increase in the number of devices accessing the mobile networks is the primary reason for the drastic increase in mobile data traffic. Along with this, the development of online social services (such as Facebook and Twitter) has further increased the mobile data traffic. Apart from the spectrum deficiency issues in RF wireless communication, interference is another problem since most wireless devices are electromagnetic. The RF communication suffers from problems such as the following. (a) Interference, according to Federal Aviation Administration (FAA) the use of mobile phones on aircraft causes interference with communication and navigational systems. Along with this, mobile phones on aircraft will also cause disruption with ground system towers as argued by the Federal Communication Commission (FCC). (b) Regardless of the interference, it is clear that in a wireless communication system that needs very low latency requirements (such as in vehicular communication, safety system), the use of radio frequency is not suitable due to its bandwidth limitations. (c) As RF waves easily penetrate the walls, therefore they suffer from security issues. (d) The increase in RF waves, transmission power beyond a certain limit results in risks to human health (e) RF communication suffers from power inefficiency because we require a separate setup for communication of the RF waves. To overcome the drawbacks of the RF communication systems it is imperative to design new communication technologies.

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