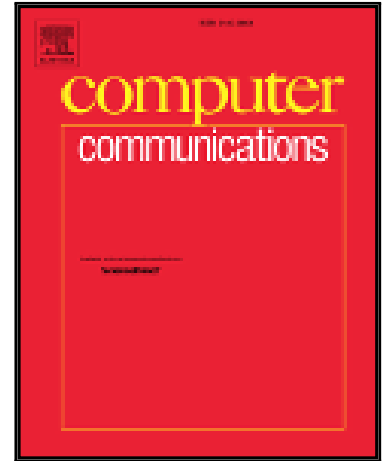


Accepted Manuscript

Cooperative MIMO-OFDM Based Inter-Vehicular Visible Light Communication using Brake Lights

Omer Narmanlioglu, Bugra Turan, Sinem Coleri Ergen, Murat Uysal

PII: S0140-3664(17)30502-9
DOI: [10.1016/j.comcom.2018.02.003](https://doi.org/10.1016/j.comcom.2018.02.003)
Reference: COMCOM 5641



To appear in: *Computer Communications*

Received date: 29 April 2017
Revised date: 6 February 2018
Accepted date: 8 February 2018

Please cite this article as: Omer Narmanlioglu, Bugra Turan, Sinem Coleri Ergen, Murat Uysal, Cooperative MIMO-OFDM Based Inter-Vehicular Visible Light Communication using Brake Lights, *Computer Communications* (2018), doi: [10.1016/j.comcom.2018.02.003](https://doi.org/10.1016/j.comcom.2018.02.003)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Cooperative MIMO-OFDM Based Inter-Vehicular Visible Light Communication using Brake Lights¹

Omer Narmanlioglu*, Bugra Turan[†], Sinem Coleri Ergen[†] and Murat Uysal*

*Department of Electrical and Electronics Engineering, Ozyegin University,
Istanbul, Turkey, 34794.

E-mail: omer.narmanlioglu@ozu.edu.tr, murat.uysal@ozyegin.edu.tr

[†]Department Electrical and Electronics Engineering, Koc University,
Istanbul, Turkey, 34450.

E-mail: bturan14@ku.edu.tr, sergen@ku.edu.tr

Abstract

Inter-vehicular connectivity to enhance road safety and support highly autonomous driving is increasingly becoming popular. Despite the prevalent works on radio-frequency (RF) based vehicular communication schemes, visible light communication (VLC) is considered to be a promising candidate for vehicular communications due to its low complexity and RF interference-free nature. Deployment of multiple light emitting diodes (LEDs) enables multiple-input multiple-output (MIMO) transmission in the context of vehicular VLC. This paper investigates applicability of both point-to-point (direct) vehicular VLC and decode-and-forward relaying based cooperative vehicular VLC including relay terminals between source and destination terminals to enhance road safety based on real world measurements. We consider direct current biased optical orthogonal frequency division multiplexing (DCO-OFDM) based MIMO transmission scheme and evaluate the performances of different MIMO modes including repetition code (RC) and spatial multiplexing (SM), different modulation orders with different transmitter-receiver selection mechanisms to support line-of-sight (LoS) and beyond LoS multi-hop vehicular VLC. The results reveal that the selection of the closest transmitters to the receivers provides better performance due to high signal-to-noise-ratio requirements for RC mode whereas SM suffers from channel correlation. Usage of all possible transmitters does not always yield better performance due to the power division at the transmitter side. On the other hand, the performance of RC shows more degradation on higher-order modulations that are required to yield the same throughput with SM. Therefore, considering the higher order modulation requirement for RC based VLC, SM is concluded to be a favorable MIMO scheme for cooperative vehicular VLC. We further demonstrate the benefits of multi-hop transmission over direct transmission with respect to different number of relay vehicles as a consequence of varying inter-vehicular distances between source and destination vehicles.

Keywords: Vehicular communication, visible light communication, cooperative communication, MIMO, OFDM.

1. Introduction

Increasing road safety and enabling autonomous driving are considered within the ultimate goals of the future of mobility. Current vehicle perception sensors are able to detect acceleration, deceleration and the presence of nearby vehicles. However, extending perception range of on board Advanced Driver Assistance Systems (ADAS) sensors and conveying safety critical information such as emergency brake, wheel slip and road surface conditions through vehicle to vehicle communications (V2V) is provisioned to further enhance safety, increase traffic flow and smoothness. Moreover, vehicle to everything (V2X) communications schemes

¹A preliminary of this paper was presented at the IEEE Vehicular Networking Conference (VNC), Columbus, Ohio, USA, 8-10 December 2016.

Download English Version:

<https://daneshyari.com/en/article/6880035>

Download Persian Version:

<https://daneshyari.com/article/6880035>

[Daneshyari.com](https://daneshyari.com)