Project: IEEE P802.15.7a OCC TG

Submission Title : Pothole Detection from the Rear LED Shapes of the Forwarding Vehicle using Optical Camera Communication (OCC)
Date Submitted : [May 1, 2021]

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Abstract : If the forwarding vehicle (FWV) goes over a pothole, the alignment of the rear LEDs on the following vehicle's (FV's) image sensor will be changed. This unfavorable road condition is detected using OCC.

Purpose : To assist in ensuring comfortable driving by providing pothole alert to the drivers.

Introduction

❑ Currently, light-emitting diodes (LEDs) and cameras are commonly used almost everywhere.

❑ Optical camera communication (OCC) can utilize existing lighting sources as transmitters and cameras as receivers with little modification.

❑ Camera can track objects as well as decode data from modulated light.

❑ Hence, OCC is one of the most promising technologies for vehicular communication as it can work satisfactorily in outdoor environment at various weather conditions.

❑ OCC-based vehicle localization and communication schemes are already developed.

❑ Here, we have identified pothole from the rear LED shapes of the FWVs to contribute to OCC-based advanced driver-assistance system.
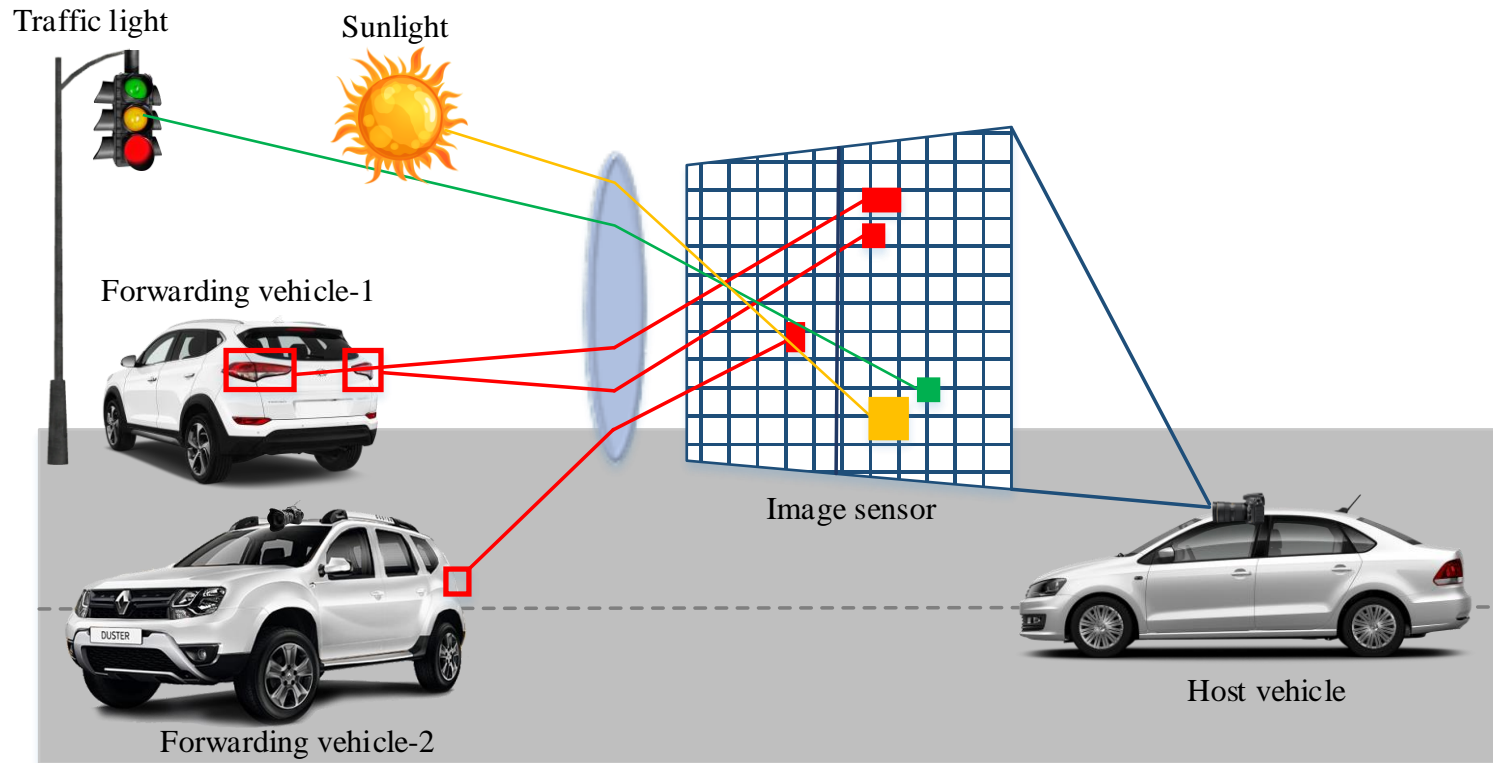
A general on-road scenario

Figure 1. A general outdoor environment of vehicular OCC system.
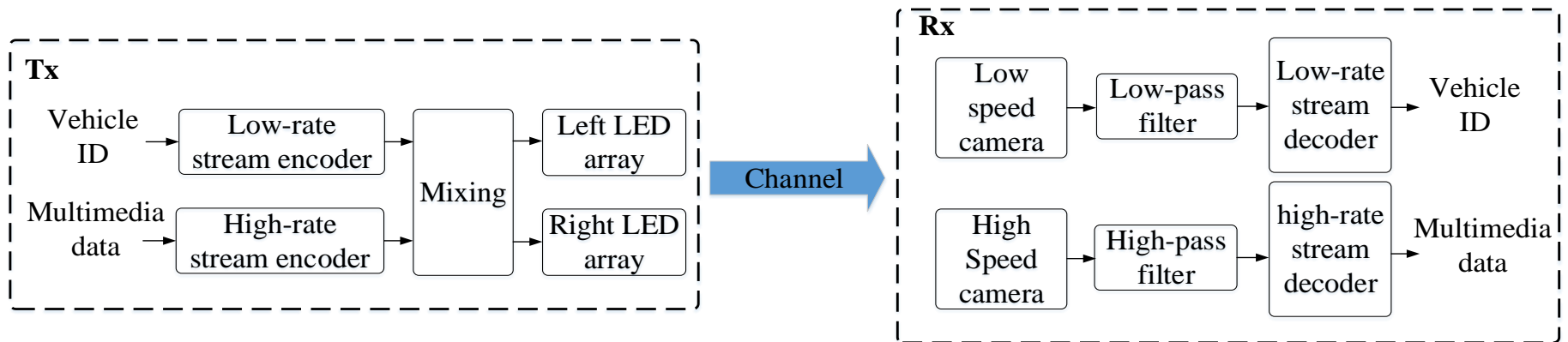
General architecture of VOCC system
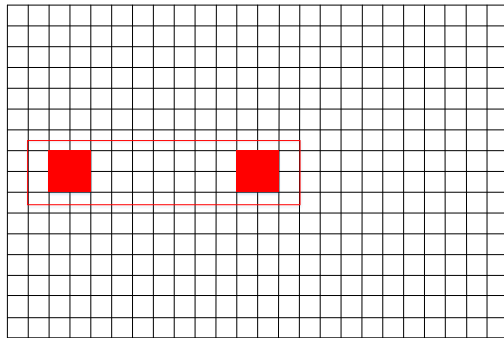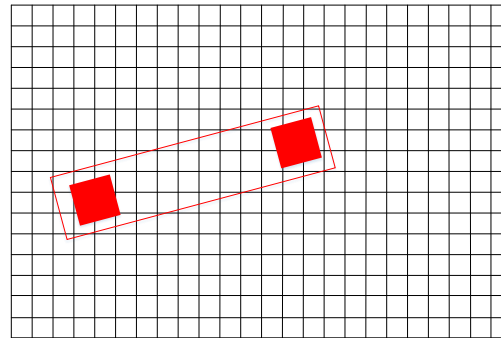

Figure 2. General block diagram for VOCC system

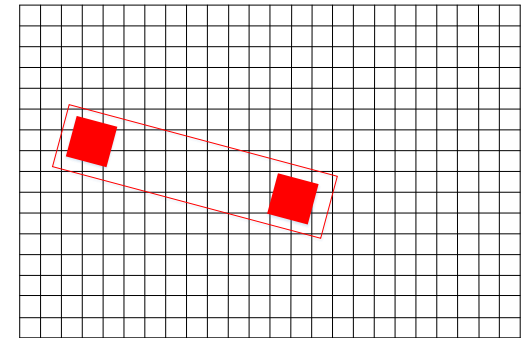# Misalignment of rear LED shapes due to pothole

(a)   (b)   (c)

Figure 3. Alignment of rear LEDs when the FWV goes over a) a plain surface, b) a pothole under the left wheel, and c) a pothole under the right wheel.

Conclusions

❑ As vehicular LEDs need to be detected for OCC system, several information can be extracted form the rear LED shapes.

❑ Pothole can be detected along with the localization, road curvature estimation that is crucial for developing advanced driver assistance system using OCC.

❑ As different vehicles have different LED sizes with various designs, the depth of pothole is estimated from the taillights of any vehicles with a prior knowledge of the actual distance between the rear LEDs using OCC.

❑ Pothole detection will help to avoid uncomfortable situations specially for patients and elderly peoples.