CALL FOR WORKSHOP PAPERS

SECTION I: Workshop Information

Workshop Number: WS-04

Workshop Title: 9th IEEE GLOBECOM Workshop on Optical Wireless Communications (OWC'20)

Workshop Scope:

In recent years, there is a growing interest in the research and development of optical wireless communication (OWC) systems. This is partly due to tremendous advancements in optical sources from high power light emitting diodes (LEDs) and solid-state lasers in different optical spectra (such as infrared, visible, ultraviolet). The US Department of Energy considers LEDs as next generation green lighting devices to replace incandescent and fluorescent lamps. By using the lighting infrastructure, LEDs offer opportunities for wireless communications. This comes at a time where the shortage of RF spectrum becomes a key issue, because new bandwidth-hungry applications in the future Internet of Things (IoT) require additional license-free wireless transmission bands and a dense new infrastructure. Finding ways to exploit the new optical spectrum for the purpose of wireless communications is a big interdisciplinary research challenge for component makers, RF and optical frontend engineers, communications protocol experts, network designers and end users.

For lower data rates, optical image sensors are utilized as receivers based on IR or visible bands, what is referred to as optical camera communication (OCC). OCC has an advantage that it does not need any modification on the receiver where current off-the-the-shelf smartphones, digital cameras, rear vehicle cameras, and surveillance cameras can serve as possible receivers to facilitate a large body of applications. Cameras offer millions of pixels, which provide large degrees of freedom (DoFs) to transmit data and to handle the wireless access for a massive number of users. The image sensors of current cameras usually supports three colors to enable the transmission over the color domain. OCC has attracted much interest in IoT, indoor localization, motion capture, and intelligent transportation systems (ITS). Current OCC systems offer one-way (simplex) links with the main use case being indoor positioning and navigation. A first IEEE Std. 802.15.7m for OCC published recently, defining several communication modes with low data rates.

For higher data rates, other detectors such as large-area photodiodes, avalanche photodiodes and vacuum tubes are useful. Communication systems operate typically LiFi as a special form of OWC which envisions an entire wireless network based on the lighting infrastructure to support high-speed data, multiuser access, mobility (handover) that can be integrated into the future wireless networks. The LiFi concepts is very similar to conventional mobile communications like WiFi and 5G, and a very timely technology, especially for 6th generation (6G) cellular communications. With few adaptations, LiFi could leverage most existing wireless protocols. The major difference is that, instead of radio waves, light serves as wireless medium. Currently, there are exciting developments using arrays vertical-cavity surface emitting lasers (VCSELs) manufactured in high volumes for applications in mobile phones, i.e. 3D imaging, face recognition, LIDAR. Individual VCSELs can offer a modulation bandwidth of tens of GHz, i.e. comparable to the new THz radio channels. In the baseband, the LiFi community studies e.g. specific forms of OFDM for intensity modulation with direct detection (IM/DD), dynamic link adaptation over time-varying channels, distributed MIMO for OWC, optical beamforming using focal plane arrays, multiuser support using TFDMA, OFDMA, NOMA, SDMA, enhanced security and horizontal as well as vertical handover to other wireless technologies.

SECTION II: Topics of Interest

The workshop plans to focus on short to medium range optical wireless communications, from indoor to outdoor, from atmosphere to ground and underwater. Topics of interest include, but are NOT limited to:

- Mobile-to-infrastructure, mobile-to-mobile, and infrastructure-to-infrastructure OWC
- Vehicle-to-vehicle and vehicle-to-traffic light OWC
- Optical wireless interconnects in the datacenter
- Communication characteristics of single- and multi-chip lighting LEDs and VCSEL arrays
- OWC transceiver design and optimization
- Beam diverging and concentrating techniques
- Modeling of directed and diffusely reflected light beams addressing novel topics like distributed OWC, optical beamforming/-tracking and UV
- Modeling of various noises in optical wireless communication
- Impact of lighting in concurrent OWC design
- OWC frontend design for half and full duplex
- Wavelength division in optical wireless communication techniques
- Modulation, coding and detection for intensity modulation with direct detection (IM/DD) to increase spectral and/or energy efficiency
- Advanced OFDM for spectrally efficient transmission
- Serial modulation for energy efficient transmission
- Dynamic link adaptation over time-varying OWC channels
- Distributed multi-input multi-output optical wireless communication techniques
- Mobility, beam-tracking and steering for indoor and outdoor environments
- Use of LED, VCSEL, and PD arrays for pointing, acquisition and tracking in mobile scenarios
- Multiuser support using e.g. TFDMA, OFDMA, NOMA, SDMA
- Integration of optical navigation/positioning and communication protocols
- OWC duplexing schemes
- Horizontal handover for OWC and interference management
- Enhanced security support for OWC
- Vertical handover in hybrid LiFi/WiFi networking topologies
- Hybrid OWC/RF outdoor links for operation in bad weather
- Seamless integration of LiFi into existing mobile networks, such as 5G
- Role of OWC in 5G and beyond mobile networks
- Wavelength planning in optical communication techniques
- New aspects of IRC and applications
- Visible light communication (VLC) and visible light positioning (VLP)
- Optical camera communication (OCC)
- UVC atmospheric scattering and absorption channel modeling
- UVC system design perspectives
- UVC range/rate/BER performance tradeoffs
- Optical wireless sensor networks
- Underwater optical channel modeling and system design
- Fading mitigation in FSO links: spatial, temporal, polarization, coding, and adaptive approaches

SECTION III: Important Dates

Paper submission: **14 August, 2020 (firm)**

Notification of acceptance: **15 September, 2020**

Final papers submission: **1 October, 2020**

Submission Guidelines

IEEE OWC Workshop accepts only novel, previously unpublished papers in the area of optical wireless communications. Prospective authors are encouraged to submit a 6-page IEEE conference style paper (including all text, figures, and references) through EDAS via https://www.edas.info/newPaper.php?c=27652&track=103043

SECTION IV: List of Committee Members

Workshop Organizers: Takaya Yamazato, Volker Jungnickel, Chi-Wai Chow, Koji Kamakura

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- Masayuki Kinoshita, Chiba Institute of Technology, Japan