

e-Health Technical Committee NewsLetter

October 2020

On behalf of the e-Health Technical Committee (TC) of the IEEE Communications Society (ComSoc), we wish all our members a very instructive reading of this letter.

The contribution from this edition is coming from School of Electrical Engineering, Kookmin University, Seoul, Korea. This work was supported in part by the Ministry of Trade, Industry and Energy (MOTIE) and Korea Institute for Advancement of Technology (KIAT), in part by the Institute for Information and Communications Technology Promotion (IITP) Grant through the Korea Government (MSIT), and the Development of Intelligent and Hybrid OCC-LiFi Systems for Next-Generation Optical Wireless Communications.

Members of the e-Health community are invited to contact the author for further information or collaborations.

We also welcome all our members to share their research activities and field experiences through this open newsletter and to open up new opportunities for discussions and collaborations.

Editor: Dr. Nada Philip (Kingston University London, UK)

Table of Contents

- 1) Optical Camera Communication Applications to 5G eHealth
- 2) Call for papers – IEEE EMBS 2021

Optical Camera Communication Applications to 5G eHealth

Yeong Min Jang

School of Electrical Engineering

Kookmin University, Seoul, Korea

yjang@kookmin.ac.kr

Upcoming fifth-generation (5G) communication systems are able to bring enormous evolution in the field of

information and communication technology (ICT). The 5G Public Private Partnership (5GPPP) aiming for new 5G-enabled markets in the fields of intelligent transport, smart cities, entertainment, media, electronic health (eHealth), and education. Commercialization of 5G is expected to have a huge impact on the implementation of eHealth systems. According to the World Health Organization (WHO), eHealth is the use of ICT for health. The use of ICT for healthcare can benefit the whole community by improving the system for access to care and quality of care. Various services offered by eHealth systems can improve medical facilities and help in the decision making process. The upcoming 5G communication can provide services with ultra-low latency, ultra-high system capacity, ultra-high security, massive device connectivity, ultra-low energy consumption, and extremely high quality of experience.

Optical camera communication (OCC), a subsystem of optical wireless communication (OWC), uses light-emitting diodes (LEDs) or LED arrays as the transmitter and a camera or image sensor (IS) as the receiver, has great potential in eHealth. IEEE 802.15.7m OWC Task Group (TG) introduced multiple modulation schemes that target a broad range of OCC applications [1]. Then, in September 2020, IEEE 802.15.7a OCC TG which amendment specifies a high-rate OCC has established [2]. The detailed architecture of OCC system is provided in Figure 1.

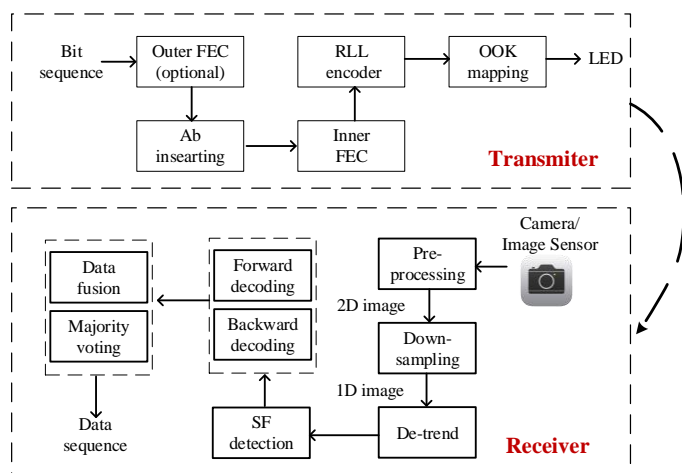


Figure 1: OCC architecture [3].

The OCC-based 5G eHealth solutions can be applied to different places such as hospitals, sports, homes, public places, workplaces, and pharmacies [4]. Hospital solutions include real-time monitoring of patients in hospitals and ambulances as well as assisting in medical data transfer, storage, and sharing, among other tasks. Sports solutions include remote monitoring of players and remote caring for emergency cases, if any. Home-based eHealth solutions provide remote monitoring of healthy patients and old patients or those with disabilities. eHealth solutions for public and workplaces deal with providing emergency solutions to the public and employers, respectively, using smartphones or other smart devices. Besides, OCC-based eHealth system can be effective in providing treatment during spreadable diseases such as COVID-19. A scenario of OCC deployment in eHealth is presented in Figure 2.

OCC-based systems can provide highly reliable communication for access network-to-sensor/patch connectivity. The application of an OCC system to a healthcare system is a novel idea. The patients have wearable sensors/patches with LEDs or LED arrays. Sensors/patches measure the health data, e.g., electrocardiography (ECG), electroencephalogram (EEG), photoplethysmogram (PPG), electromyography (EMG), pulse rate, and blood pressure, whereas LEDs or LED arrays transmit the information. The OCC systems receive the medical information and forward it to the desired destination, e.g., hospitals, doctors, servers, and smartphones. An overview of OCC based eHealth device is provided in Figure 3.

ACKNOWLEDGMENTS

This work was supported in part by the Ministry of Trade, Industry and Energy (MOTIE) and Korea Institute for Advancement of Technology (KIAT) through the International Cooperative R&D program (No. P007800004), in part by the Institute for Information and Communications Technology Promotion (IITP) Grant through the Korea Government (MSIT) under Grant 2017-0-00824, and the Development of Intelligent and Hybrid OCC-LiFi Systems for Next-Generation Optical Wireless Communications.

REFERENCES

- [1] IEEE-SA. IEEE Std 802.15.7-2018 - IEEE Standard for Local and Metropolitan Area Networks—Part 15.7: Short-Range Optical Wireless Communications; <https://ieeexplore.ieee.org/document/8697198>
- [2] IEEE Mentor for 802.15.7a Task Group docs; https://mentor.ieee.org/802.15/documents?is_dcn=DCN%2C%20Title%2C%20Author%20or%20Affiliation&is_group=007a
- [3] M. Z. Chowdhury, M. T. Hossan, A. Islam, and Y. M. Jang, "A comparative survey of optical wireless technologies: Architectures and applications," *IEEE Access*, vol. 6, pp. 9819–9840, Jan. 2018.
- [4] M. Z. Chowdhury, M. T. Hossan, M. Shahjalal, M. K. Hasan, and Y. M. Jang, "A new 5G eHealth architecture based on optical camera communication: An overview prospects and applications," *IEEE Consumer Electronics Magazine*, vol. 9, pp. 23-33, May 2020.

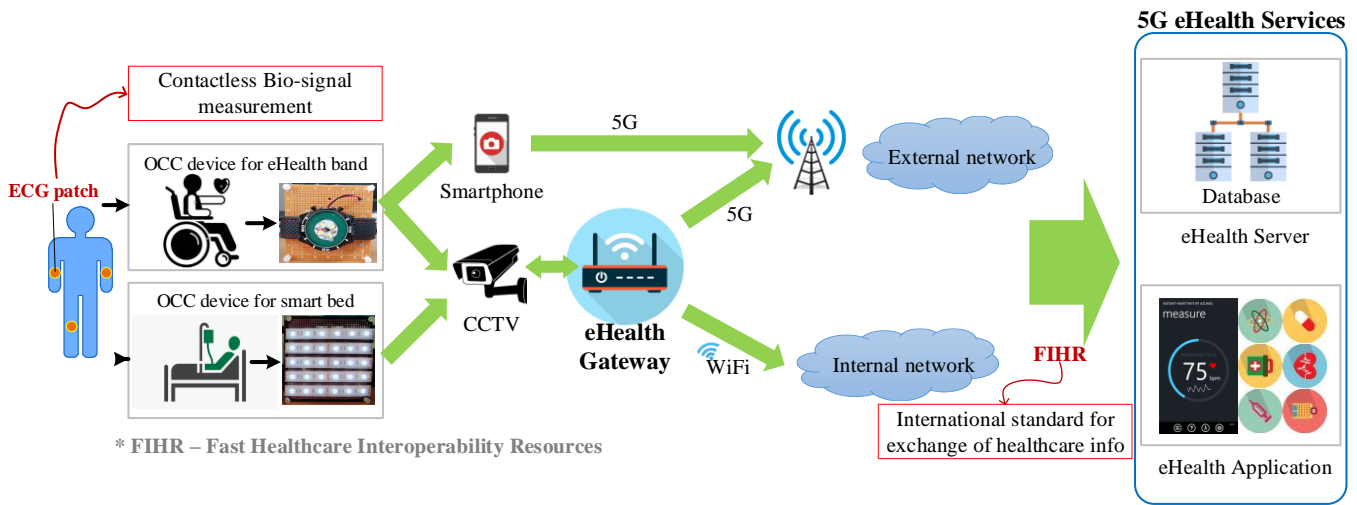


Figure 2: OCC deployment in eHealth.

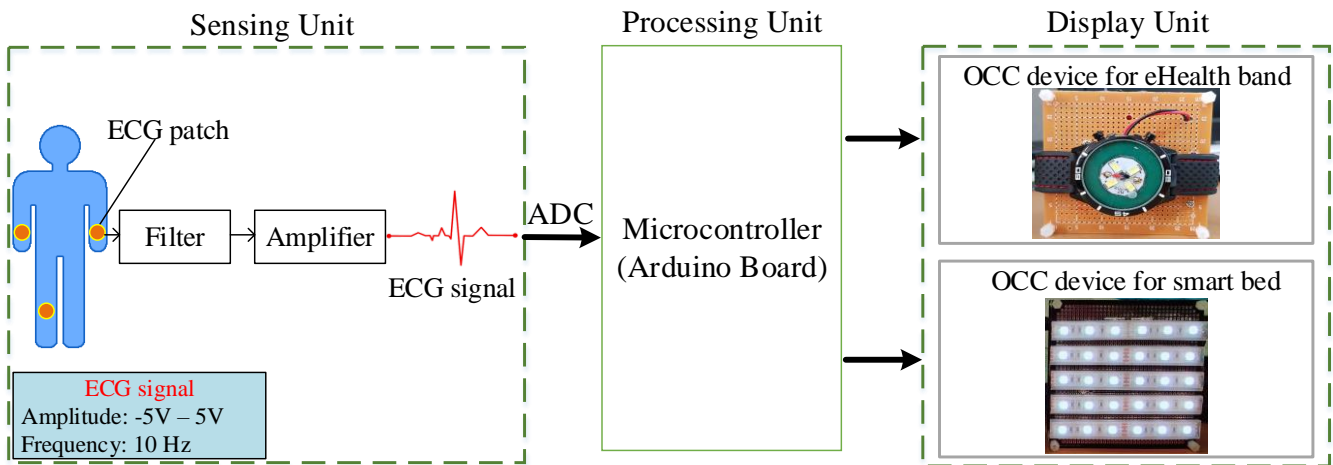


Figure 3: OCC based eHealth device.

Call for Papers

IEEE-EMBS 2021

The IEEE Engineering in Medicine and Biology Society is pleased to announce the 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society to be held in Guadalajara, Mexico, July 26-30, 2021.

The theme of the conference is “Changing Global Health Care in the Twenty-First Century”. As the world’s largest international biomedical engineering conference. A broad array of scientific tracks will cover diverse topics of cutting edge research and innovation in biomedical engineering, healthcare technology R&D, translational clinical research, technology transfer and entrepreneurship, and biomedical engineering education. In addition to the high-profile keynotes, the conference program will feature mini- symposia, Workshops, Special sessions, oral and poster sessions, sessions for students and young professionals, sessions for clinicians and entrepreneurs, and exhibits from vendors and universities.

Conference themes include:

- Biomedical Signal Processing
- Biomedical Imaging and Image Processing
- Micro/Nano-bioengineering Cellular/Tissue Engineering & Biomaterials
- Computational Systems, Modeling and Simulation in Medicine, Multiscale Modeling & Synthetic Biology
- Cardiovascular and Respiratory Systems Engineering
- Neural and Rehabilitation Engineering
- Biomedical Sensors and Wearable Systems
- Biorobotics and Biomechanics
- Therapeutic & Diagnostic Systems and Technologies
- Biomedical & Health Informatics
- Biomedical Engineering Education and Society
- Translational Engineering for Healthcare Innovation and Commercialization

Important Dates

Sessions Proposals, Mini-Symposia, Workshops, and Special Sessions

Submission deadline Nov 20, 2020

Accept/reject notification Dec 21, 2020

Final submission deadline Jan 14, 2021

Full papers

Submission deadline Jan 22, 2021

Accept/reject notification April 9, 2021

Final Submission deadline April 23, 2021

1-page papers (Research Poster Papers)

Submission deadline April 16, 2021

Accept/reject notification April 26, 2021

Final submission deadline May 3, 2021

Further details on the call can be found here: <https://embc.embs.org/2021/>