In the modern day, there is a serious spectrum crunch in the legacy radio frequency (RF) band, for which visible light communication (VLC) can be a promising option. VLC is a short-range wireless communication variant which uses the visible light spectrum. In this paper, we are using a VLC-based architecture for providing scalable communications to Internet-of-Things (IoT) devices where a multi-element hemispherical bulb is used that can transmit data streams from multiple light emitting diode (LED) boards. The essence of this architecture is that it uses a Line-of-Sight (LoS) alignment protocol that handles the hand-off issue created by the movement of receivers inside a room. We start by proposing an optimization problem aiming to minimize the total consumed energy emitted by each LED taking into consideration the LEDs’ power budget, users’ quality-of-service, LED-user associations, and illumination uniformity constraints. Then, because of the non-convexity of the problem, we propose to solve it in two stages: (1) We design an efficient algorithm for LED-user association for fixed LED powers, (2) using the LED-user association, we find approximate solution based on Taylor series to optimize the LEDs’ power. We devise two heuristic solutions based on this approach along with a near optimal solution. Finally, we illustrate and compare the performance of our methods via simulations.

Major: Electrical Engineering

Educational Career:
Bachelor's of Electrical Engineering, BS, 2015, Maulana Abul Kalam Azad University of Technology

Committee in Charge:
Murat Yuksel, Chair, Electrical and Computer Engineering
Yaser P. Fallah, Electrical and Computer Engineering
Nazanin Rahnavard, Electrical and Computer Engineering

Approved for distribution by Murat Yuksel, Committee Chair, on March 21, 2019.

The public is welcome to attend.