Researchers at the University of South Florida have developed a novel beamforming scheme for Visible Light Communication (VLC) Systems.

VLC offers the usage of visible light for data transmission as well as illumination. Information is modulated to the intensity of the light and a photo detector receiver senses the change in the intensity and converts that to the information. However, in an environment where multiple LEDs are deployed at different locations for a homogenous illumination, the data-carrying light of each LED or LED array are omni-directionally broadcasted, causing interference with each other. In conventional VLC systems, regular beamforming is not feasible due to the inherent frequency of the light, which is too high to implement the aforementioned phase difference based design. Optical beamforming techniques that concentrate the light on a specific region exist in the literature. However, VLC aims to provide homogenous illumination as well as data transmission and as a result optical beamforming may not be a good solution for VLC. Therefore, there is a need for information beamforming for VLC systems that transmits the data only to a specific region while broadcasting the light to the surrounding environment.

USF inventors have developed a technique in which beamforming is performed in the information domain without hurting the illumination. In other words, the information is directed to a specific region while homogenous light is broadcasted omni-directionally. Varying the intensity of the light as a sinusoidal signal may allow for implementing RF signals with the visible light. While imitating an RF signal with visible light, the amplitude of transmission symbols is represented by the variation amount of light intensity independent of the intensity itself. The average intensity for symbols with any amplitude is determined as the same, preventing any light flickering. The invention addresses the controlling of the data directionality in VLC without hurting the ability to illuminate a space.

ADVANTAGES:

- Data is transmitted only to a specific region while broadcasting the light omni-directionally
- No flickering of light

Controlled Data-Directionality in VLC Systems Without Hurting Illumination

(a) VLC using an array of light emitting diodes (LEDs) and (b) example of sinusoidal intensity variation of a light signal

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