

Data are traveling by light

August 1 2011



In the future data will be transferred to laptops with the help of LEDs. (© Fraunhofer HHI)

Regular LEDs can be turned into optical WLAN with only a few additional components thanks to visible light communication (in short, VLC). The lights are then not just lighting up, they also transfer data. They send films in HD quality to your iPhone or laptop, with no loss in quality, quickly and safely.

Just imagine the following scenario: four people are comfortably ensconced in a room. Each one of them can watch a film from the Internet on his or her laptop, in HD quality. This is made possible thanks to optical WLAN. [Light](#) from the [LEDs](#) in the overhead lights serves as the transfer medium. For a long time, this was just a vision for the future. However, since scientists from the Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute HHI in Berlin, Germany, have developed a new transfer technology for video data within the scope of the OMEGA project of the EU, its implementation in real life is getting markedly closer. At the end of May, the scientists were able to present the results of the project in Rennes, France. They were able to transfer data at a rate of 100 megabits per second (Mbit/s) without any losses, using LEDs in the ceiling that light up more than ten square meters (90 square feet). The receiver can be placed anywhere within this radius, which is currently the maximum range. “This means that we transferred four videos in HD quality to four different laptops at the same time,” says Dr. Anagnostis Paraskevopoulos from the HHI.

“The fundamentals of visible light communication (VLC) were developed together with the industry partners Siemens and France Telecom Orange Labs,” said the expert. At HHI, the team of project manager Klaus-Dieter Langer is now further developing the new technology. “For VLC the sources of light – in this case, white-light LEDs – provide lighting for the room at the same time they transfer information. With the aid of a special component, the modulator, we turn the LEDs off and on in very rapid succession and transfer the information as ones and zeros. The modulation of the light is imperceptible to the human eye. A simple photo diode on the [laptop](#) acts as a receiver. As Klaus-Dieter Langer explains, “The diode catches the light, electronics decode the information and translate it into electrical impulses, meaning the language of the computer.” One advantage is that it takes only a few components to prepare the LEDs so that they function as transfer media. One disadvantage is that as soon as something gets

between the light and the photo diode (for example, when someone holds his hand over the diode) the transfer is impaired. Laptops, Palm devices or mobile telephones are all potential end devices.

The scientists emphasize that VLC is not intended to replace regular WLAN, PowerLAN or UMTS. It is best suited as an additional option for data [transfer](#) where radio transmission networks are not desired or not possible – without needing new cables or equipment in the house. Combinations are also possible, such as optical WLAN in one direction and PowerLAN for the return channel. Films can be transferred to the PC like this and also played there, or they can be sent on to another computer.

The new transmission technology is suitable for hospitals, for example, because radio transmissions are not allowed there. Despite this fact, high data rates must be transmitted without losses and unzipped, according to the experts. If part of the communication occurs via the light in the surgical room, this would make it possible to control wireless surgical robots or transmit x-ray images. In airplanes, each passenger could view his own entertainment program on a display, saving aircraft manufacturers miles of cables. Another possible venue for the application of this technology are production facilities, where radio transmissions very often interfere with the processes.

Currently the scientists are developing their systems toward higher bit rates. “Using red-blue-green-white light LEDs, we were able to transmit 800 Mbit/s in the lab,” said Klaus-Dieter Langer. “That is a world record for the VLC method.”

The HHI scientists will showcase how videos are transmitted by light in Hall 11.1, Booth 8 at the International Telecommunications Fair IFA (Internationale Funkausstellung IFA) in Berlin from September 2-7, 2011.

Provided by Fraunhofer-Gesellschaft

Citation: Data are traveling by light (2011, August 1) retrieved 9 April 2024 from
<https://phys.org/news/2011-08-data-are-traveling-by-light.html>

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