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Road Traffic Management and Safety Using Li Fi Technology

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ABSTRACT: Li Fi is a bidirectional, high speed and fully networked wireless communications similar to Wi-Fi. It uses visible light communication or infra-red and near ultraviolet (instead of radio frequency waves) spectrum. This OWC technology uses light from light-emitting diodes (LEDs). Visible light communications (VLC) works by switching bulbs on and off within nanoseconds. The bulbs could be dimmed to the point that they were not visible to humans and yet still functional. Proposed application of VLC includes use of Li Fi technology at traffic signals and at toll plazas. The system uses a toggling LED at transmitting end and a photodiode at receiving end. LEDs are used to transmit the data at transmitting end. At receiving end a photodiode is connected to PC which senses the transmitted data and feed it to the PC.A PIC microcontroller can be used for toggling of LED at transmitting end. At receiving end also one has to use a PIC microcontroller connected to output of photodiode. The light received by photodiode is converted to binary data and is fed to the microcontroller. The microcontroller is connected to the serial port of the PC.

KEY WORDS: Li Fi (Light Fidelity), Wi Fi(Wireless Fidelity), VLC(Visible Light Communication), LED(Light Emitting Diode), OWC(Optical Wireless Communication), RF(Radio Frequency)

I. INTRODUCTION

Communicating with people living in the farthest corners of the world got easier after the invention of Telephone, especially cellular phone. the mobile cellular industry has grown widely all over the globe registering more than 7 billion mobile cellular subscriptions by the end of 2015, as per the new report from International Telecommunication Union (ICT). 3.2 billion internet users globally by the end of 2015. The advancement in the wireless technology is the key for expanding the growth of internet even further to the remotest part of the world especially in the least developing countries (LDCs).

Presently wireless communication uses radio waves.But soon due to advancement in technology technology and the number of users, the existing radiowave spectrum fails to cater to this need. To resolve this, LI-Fi technology can be used. This OWC technology uses light from light-emitting diodes (LEDs) as a medium to deliver networked, mobile, high-speed communication

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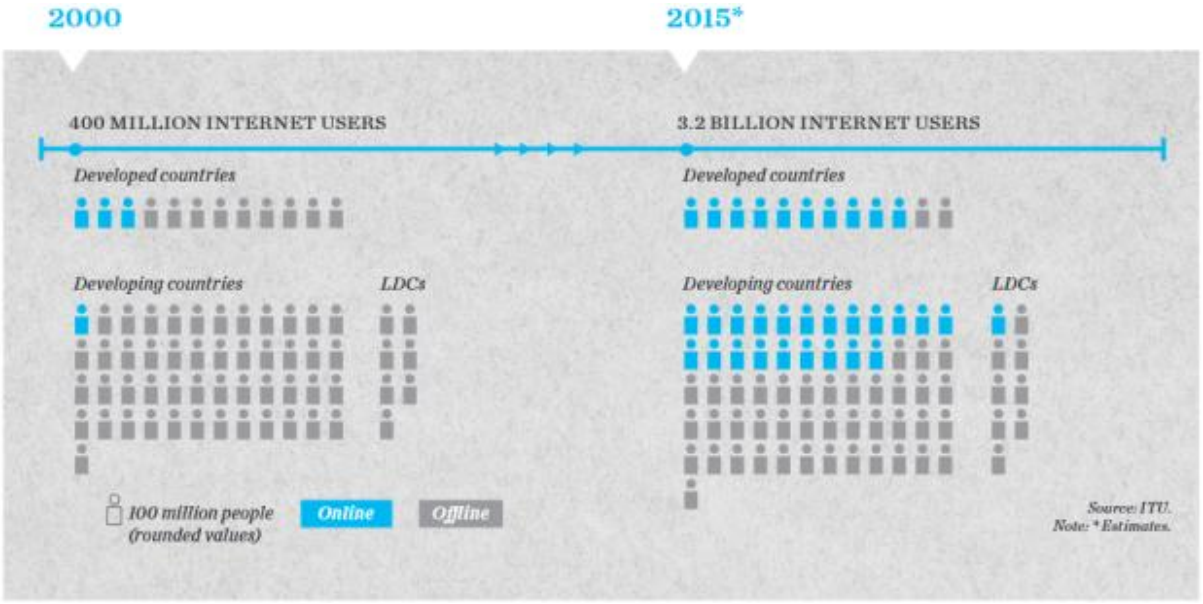


The visible light spectrum is 10,000 times larger than the entire radio frequency spectrum.

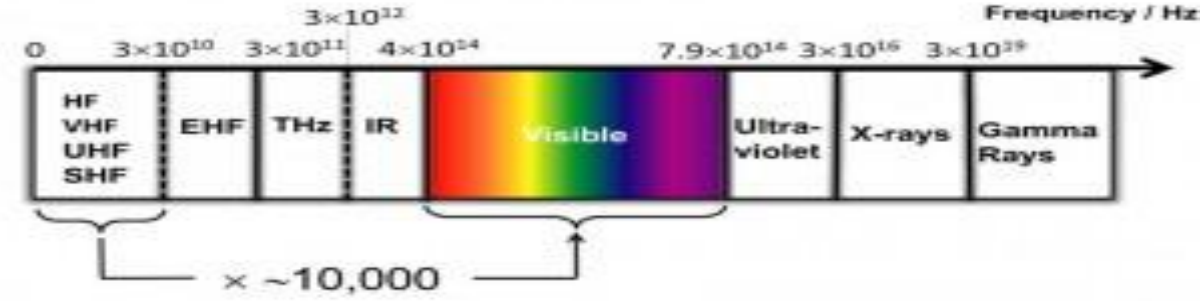
Researchers have reached data rates of over 10 Gbit/s, which is more than 250 times faster than superfast broadband.

Li-Fi is expected to be ten times cheaper than Wi-Fi.

I present new applications which will be made possible by visible light communication technology. Here, LED headlights and tail-lights are being introduced This can be used for vehicle-to-vehicle and vehicle-to-roadside communications. This can be applied for road safety and traffic management.

Overview of LI-Fi: Li Fi is a bidirectional, high speed and fully networked wireless communications similar to Wi-Fi. It uses visible light communication. Li-Fi could lead to the Internet of Things with LED lights on the electronics being used as Li-Fi internet access points.

Visible light communications (VLC) works by switching bulbs on and off within nanoseconds. Although Li-Fi bulbs would have to be kept on to transmit data, the bulbs could be dimmed to the point that they were not visible to humans and yet still functional.



When a constant current is applied to an LED light bulb a constant stream of photons are emitted from the bulb which is observed as visible light. If the current is varied slowly the output intensity of the light dims up and down. Because LED bulbs are semi-conductor devices, the current, and hence the optical output, can be modulated at extremely high speeds which can be detected by a photo-detector device and converted back to electrical current. The intensity modulation is imperceptible to the human eye, and thus communication is just as seamless ad RF. Using this technique, high speed information can be transmitted from an LED light bulb. Li-Fi is much simpler and uses direct modulation methods similar to those used in low-cost infra-red communications devices such as remote control units. Infra-red communication is limited in power due to eye safety requirements, whereas LED light bulbs have high intensities and can achieve very large data rates

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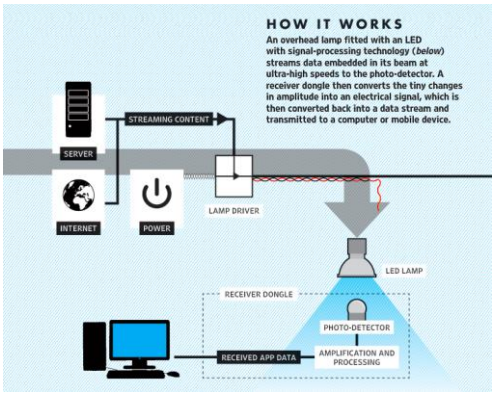
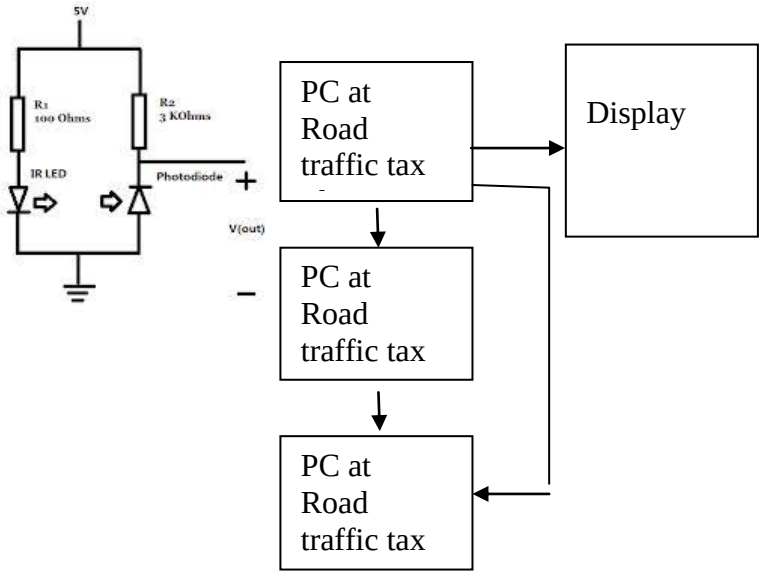
II. DESIGN OF LI FI



The data which is to be transmitted is embedded in the light beam. It is fed to the lamp driver which drives a LED lamp. The receiver dongle consists of a photo detector, amplification and processing unit and data converter. Here, the data is again converted to electric signal which is then fed to a computer or mobile.

III. WORKING

The above technology can be used for road safety and traffic management. One can make use of head lights and tail lights of vehicles. As every vehicle has assigned on number, one unique code is assigned to every vehicle. The head light and tail light transmits this code after a regular interval. When the vehicle passes through the toll plaza, the code is send to the PC at toll plaza. Complete information about your vehicle is then displayed on the pc. Traffic police can make use of this information if required. Person then pays the toll (Road Service Tax) and move ahead. Thus information about each and every vehicle passed, Number of vehicles passed in one day and total service tax collected is recorded in central server of such road service tax system. The complete system thus becomes transparent to a common tax payer. All the computers at all toll plazas are networked together. Thus they can share the required information about each and every vehicle.



The anti nationalists normally use stolen cars for their activities. The normal tendency is to change the number plates and use the cars. But with our proposed system, it will not be possible to do so, It is because then in that case the signal

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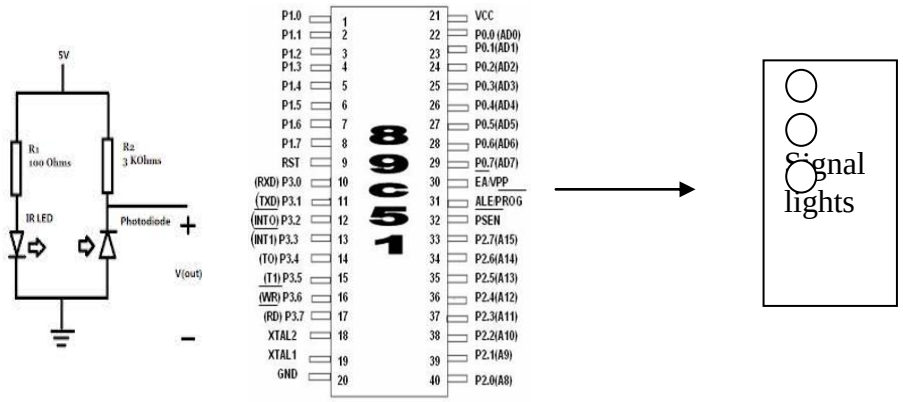
transmitted by vehicle Head/Tail light will display the information on the PC at toll plaza which do not match with its number. Therefore such vehicle can be stopped at such places.
The same system can be used for creating green corridor to the emergency vehicle.
Here, the signal transmitted by the emergency vehicle is send to a photodiode. The output of the photodiode is applied to the microcontroller which drives the signal lights for fixed time duration. When signal transmitted by the emergency vehicle overrides this signal, the signal turns green and remains green till the vehicle is passed. Once the vehicle is passed the microcontroller again switches to its normal mode of operation. Thus as the emergency vehicle passes ahead, it will make the signal green creating Green Corridor for it.



IV. CONCLUSION

Thus such system provides a good solution to todays non transparent road service tax system. The system uses Li Fi technology which is a green system as Radio waves produce harmful effect on human being. It also can provide 'Green' corridor to emergency vehicles. Anti nationalist activities conducted by using stolen vehicles can be stopped. Rather, it will become difficult for anyone to steal a vehicle.

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