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Applications of Photonics and Li-Fi

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Abstract – Photonics is the science and technology of generating, controlling and detecting photons, which are particles of light. Photonics form the basics of technologies like smart phones, laptops, internet, medical instruments and lighting technology. Further in the paper, we will discuss about the applications of photonics, photon crystal, economic impact of photonics and recent studies about using this technology to transfer data.

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APPLICATIONS

Photonics, also known as the science of harnessing light has several interesting applications. Some of them are:

- **Consumer equipment**: barcode scanner, printer, CD/DVD/Blu-ray devices, remote control devices
- **Telecommunications**: optical fiber communications, optical down converter to microwave
- **Medicine**: correction of poor eyesight, laser surgery, surgical endoscopy, tattoo removal
- **Industrial manufacturing**: the use of lasers for welding, drilling, cutting, and various methods of surface modification
- **Construction**: laser levelling, laser range finding, smart structures
- **Aviation**: photonic gyroscopes lacking mobile parts
- **Military**: IR sensors, command and control, navigation, search and rescue, mine laying and detection
- **Entertainment**: laser shows, beam effects, holographic art Information processing
- **Metrology**: time and frequency measurements, range finding
- **Photonic computing**: clock distribution and communication between computers, printed circuit boards, or within optoelectronic integrated circuits; in the future: quantum computing

PHOTONIC CRYSTAL

A photonic crystal is a periodic optical nanostructure that affects the motion of photons in much the same way that ionic lattices affect electrons in solids. Photonic crystals occur in nature in the form of structural coloration—and, in different forms, promise to be useful in a range of applications.

Photonic crystals can be fabricated for one, two, or three dimensions. One-dimensional photonic crystals can be made of layers deposited or stuck together. Two-dimensional ones can be made by photolithography, or by drilling holes in a suitable substrate. Fabrication methods for three-dimensional ones include drilling under different angles, stacking multiple 2-D layers on top of each other, direct laser writing, or, for example, instigating self-assembly of spheres in a matrix and dissolving the spheres.

Photonic crystals can, in principle, find uses wherever light must be manipulated. Existing applications include thin-film optics with coatings for lenses. Two-dimensional photonic-crystal fibers are used in nonlinear devices and to guide exotic wavelengths. Three-dimensional crystals may one day be used in optical computers.

ECONOMIC IMPACT

Photonic Engineering understands light in all its various forms, and exploring ways to impose information onto these photons in a way that we can then access and use it later. It works with ultraviolet and infrared light - the visible and invisible lights. The

overall economic impact of optics and photonics is two-fold:

- The direct impact stems from the fact that photonic and optics components and systems constitute economic markets in their own right, growing at rates that far surpass the average growth rate of any other areas of the economy.
- Much more important is the huge secondary impact, resulting from the use and applications of photonics and optics components, systems, tools and techniques in practically all other sectors of the economy.

The 1998 report prepared by the National Research Council "Harnessing Light: Optical Science and Engineering for the 21st Century" recognizes optics as an enabling technology, i.e. a technology playing a supporting role in several areas of national interest.

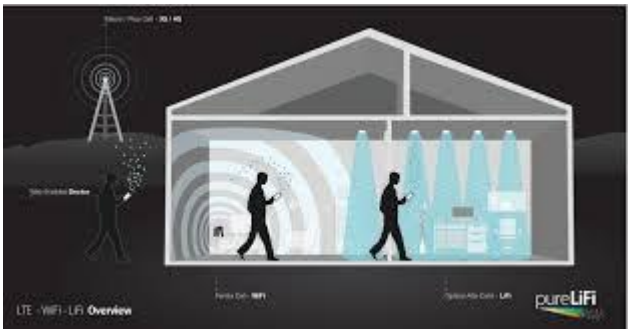
Below are the seven areas identified by the report, in which photonics has already made and is expected to make an even larger impact in the future, along with examples of photonics applications in those respective fields. This list is a selective one rather than all inclusive, as there is virtually no field of human activity on which optics and photonics has not made an impact, and new applications are emerging at an amazing pace. At the same time, the boundaries between these fields are rather fluid and blurry, as more often than not the same photonic components, techniques and/or systems are used or adapted for use in many more than only one field. Therein lies the strength of the interdisciplinary nature of photonics, and the tremendous opportunities it opens.

- Information Technology and Telecommunications
- Health Care and the Life Sciences – Biophotonics
- Optical Sensing, Lighting, Energy and Displays
- Optics in Manufacturing
- National Security and Defense
- Manufacturing of Optical Systems and Components
- Education and Research

LI-FI

Apart from all these applications, what interests me the most is recent research work on wireless networks using light wave, also called as LiFi technology. Lifi is the use of the visible light portion of the electromagnetic spectrum to transmit information at very high speeds. This is in contrast to established forms of wireless communication such as Wi-Fi which use traditional radio frequency (RF) signals to transmit data.

Li-Fi (Light Fidelity) is a bidirectional, high speed and fully networked wireless communication technology similar to Wi-Fi. The term was coined by Harald Haas and is a form of visible light communication and a subset of optical wireless communications (OWC) and could be a complement to RF communication (Wi-Fi or Cellular network), or even a replacement in contexts of data broadcasting. It is so far measured to be about 100 times faster than some Wi-Fi implementations, reaching speeds of 224 gigabits per second. Harald Haas, who teaches at the University of Edinburgh in the UK, claims to be the inventor of Li-Fi. He is one pioneer using the term Li-Fi and is Chair of Mobile Communications at the University of Edinburgh and co-founder of pure Li-Fi. He promoted this technology in his 2011 TED Global talk and helped start a company to market it. Pure Li-Fi, formerly pure VLC, is an original equipment manufacturer (OEM) firm set up to commercialize Li-Fi products for integration with existing LED-lighting systems. In October 2011, companies and industry groups formed the Li-Fi Consortium, amount of radio-based wireless spectrum available by exploiting a completely different part of the electromagnetic spectrum.



REFERENCES

1. https://www.kettering.edu/academics/departments/physics/research/photonics-and-fiber-optics-lab/about-photonics
2. https://www.kettering.edu/academics/departments/physics/research/photonics-and-fiber-optics-lab/photonics-applications
3. https://en.wikipedia.org/wiki/Photonic_crystal
4. https://www.youtube.com/watch?v=NaoSp4NpkGg
5. https://en.wikipedia.org/wiki/Li-Fi