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RESEARCH ARTICLE OPEN ACCESS

An analysis of Li-Fi technology

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ABSTRACT- Nowadays, finding Wi-Fi hotspots is really important because internet access has become so popular. Professor Harald Hass of the University of Edinburgh created the Li-fi or Light Fidelity technology. This is the latesttechnology in present day communicationsystemwhich makestheuse ofLEDs,Light
This idea works very simply, if the led is onthen logic "1" will be transmitted and if theled is off then logic "0" will be transmittedalso, LEDs can be switched on and off veryquicklywhichadds ontoanotheradvantage.
EmittingDiodesthathelpsinthetransmission of data much morefaster andflexiblethanthedatathatcanbetransmitted through Wi-Fi. It is essentially a 5G visible light communication system that works similarly to Wi-Fi by using light emitting diodes as a medium for high-speed communication.

I. INTRODUCTION

Now-a-days,internethasbecomeamajordemand people are in search of Wi-Fi hotspots. Li-fi or Light Fidelity was invented byprofessorHaraldHassofuniversityofEdinburgh.
This is the latest technology inpresentdaycommunicationsystemwhichmakesthe useofLEDs,LightEmittingDiodes that helps in the transmission of datamuch more faster and flexible than the datathat can be transmitted through Wi-Fi. It isbasicallya5Gtechnology ofvisiblelightcommunication system which utilizes lightemitting diodes as a medium of high speedcommunicationinsimilarmannerasWi-Fi.

Fig(1).BasicConcept

II. DESIGN of Li-Fi

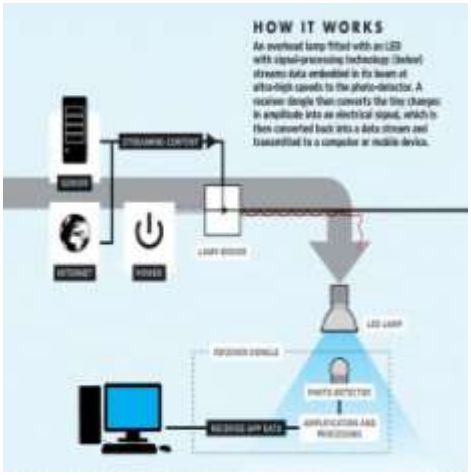
Li-FiarchitectureconsistsofanumberofLED bulbs or lamps including manywireless devices such as Mobile Phones,Laptops and PDA. The following factorsshould be taken into concern whiledesigningLi-Fi:

1. Presenceoflight.
2. Lineofsight(LOS).
3. Forbetterperformanceusefluorescentlighta ndLED.
4. Aphotodetector receiveddata.

Hence all that is required is some LEDs anda controller that will code datainto thoseLEDswitch

III. IMPLEMENTATION of Li-Fi

Li-Fi is typically implemented using whiteLED light bulbs at the downlink transmitter.The LEDs are used for illumination only onapplyingaconstantcurrenttothem.However, by fast and subtle variations of thecurrent, the optical output can be made tovaryatextremelyhighspeeds.Thisveryproperty of optical current is used in Li-Fitechnologysetup.It'soperationisverysimple as when the LED is on then a logic"1" is transmitted and when the LED is offthenalogic"0"istransmitted.Thissohappens at a very fast rate flickering of LEDwhichisnotvisibletothehumaneye.Further enhancements can be made in thismethod,likeusinganarrayofLEDsforparallel data transmission, or using mixturesofred,greenandblueLEDstoalterthelight'sfrequencywitheachfrequencyencodingadifferentdatachannel.Suchadvancements promise a theoretical speed of10Gbps – meaning one can download a fullhigh-definitionfilm injust 30seconds.

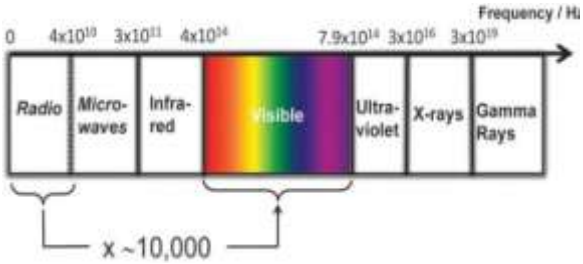


Fig(2):ImplementationofLi-Fi

ImplementationofLi-Figiveninthefigure. In figure a internet connection isconnected to the lamp driver. A switchwithlampdriverandLEDlampalsoconnectedto thislampdriverthroughfiberopticcable.Nowareceiving device, photo detector is used for receivesignalandthentoperformfurtherprocessing, this device is then connectedto PC's or Laptop's LAN port. On oneend all the data will be streamed to alampdriverwhentheLEDisswitchedonthemicrochip convertsthedigitaldata or the logic data in light form.
Thelightdetectorreceivesthelightsignalandthenconvertitagainintotheoriginaldigitalform.Hencewecanretrieve the data or the information byusingasimple circuitryofLi-Fi.

IV. VISIBLE LIGHT COMMUNICATION

Earlier, the radio waves were used buttheywereexpensiveandlesssecure.Infrared,canonlybeusedwithlowpowerasforthesakeofeyesafety.Gamma rays cannot be used as they canprovetobedangerous.Ultravioletlightisgoodforplacewhichisfreefromhumansotherwisecanbeveryharmfulto thehumans.
Sincevisiblelighthasnoharmfuleffects, it can be safe to use and is alsohavingalarger bandwidth.
VLC is a data communication medium,which uses visible light in the range of400THz to 800THz as optical carrier fordatatransmission and illumination.



Fig(3):Electromagnetic SpectrumofLight.

V. APPLICATIONS

With a wide use of data transmission thesedays,Li-Fihasprovedtobemoreadvantageousthanthepresentdaytechnology of Wi-Fi. There are many fieldswhereWi-FiandmanytechnologieshavefailedbutLi-Fihasproveditsexcellence.

UnderwaterCommunication

Touseradiofrequencyinunderwatercommunicationcanbeimpracticalduetostrongsignalabsorptioninwater.Li-Fiprovidesan undue advantageinthis case.

VI. REPLACEMENT FOR OTHER TECHNOLOGIES

Thistechnologydoesn'tusetheradiofrequency soitcanbeused inthe placeswherethetechnologieslikeBluetooth,Infrared, Wi-Fietc.arebanned.Li-Fiprovidesabestreplacementforsuchtechnologies. Ithasvariousbenefitssuchas:

SpectrumRelief:

With the increase of cell phone users, theavailable bandwidth is insufficient and canlead to over loaded condition. This problemcanbesolvedbyLi-Fiwhichusesthevisiblespectrum forcommunication.

MobileConnectivity:

VariousdevicessuchasLaptops,MobilePhones,TablettsandotherdevicescanbeinterconnecteddirectlybyusingLi-Fi.Itgives very high data rates and also providesecurity.

HazardousEnvironments:

Li-Fi isasafe alternative ascompared toradiowavesasinradiowavestheelectromagnetic interference takes place inenvironmentssuchasminesandpetrochemicalplants.

1 A very wide spectrum of operationoverthevisiblerangeofelectromagneticspectrum.

2 Extremelyhighcolorfidelity.

3 Secureaccess.

4 Easyterminal management.

5 Instantstartuptime

So,inanutshellLi-Fitechnologyisfarbetterthanthecurrenttechnologyandcanbeusedinthoseareaswhereothertechnologiesfail.

VII. FEATURES

Bandwidth:

The visible light spectrum is plentiful, muchmorethan RFandalso is freetouse.

DataDensity:

Li-Ficanachieve1000timesthedatadensity of Wi-Fi, as visible light can be wellcontainedinthelightilluminationbutincaseof RFit suffersfrominterference.

HighSpeed:

Avery highspeedofdataaccesscanbeachievedfromLi-Fiasitisfreefrominterference and also is having a very largebandwidth.

VIII. CONCLUSION

Withtheongoingincreaseinthecellularnetworks,thenewesttechnologyofLi-Fihasproventobeamilestoneincommunication systems. It uses the visiblespectrum of light which is far better than theRFasitispronetointerference.WiththeuseofLEDstheinformationcanbetransmitted at very high rates with just thesimple turning on and off of the LEDs. Thistechnology is not only free to use but alsoprovidesasafeand secureaccess.

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