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Advancement in Wireless Communication using Li-Fi

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Abstract: ***Li-Fi stands for Light Fidelity. This is veritably new technology and it was proposed by German physicist Harald Haas in 2011 TED (Technology, Entertainment, Design) A Global Talk on Visible Light Communication (VLC). Li-Fi makes use of light emitting diodes (LEDs) for transmission of data. This term Li-Fi refers to visible light communication (VLC) technology and uses light as medium to deliver high-speed communication in a manner analogous to Wi-Fi and complies with the IEEE standard. This new technology known as "data through illumination" which means transmission of data through LED lights which vary in intensities faster than the human eye can follow. This technology is grounded on intensity and eventuality of light emitting diode.This paper draws its attention on construction and working of Li- Fi based system and compares its performance with the being wireless network technologies.***

Keywords - Li-Fi, RF(Radio Frequency), Wi-Fi, LED(Light emitting diode), VLC (Visible light Communication).

1. Introduction

Li-Fi stands for "Light Fidelity". The technology uses an LED light bulb that varies inintensity briskly than the mortal eye can follow to shoot data through illumination. Li-Fi uses light as a carrier as opposed to traditional use ofradio waves as in Wi-Fi.Li-Fi stands for Light Fidelity. The technology is veritably new and was proposed by the German physicist Harald Haasin 2011 TED (Technology, Entertainment, Design) Global Talk on Visible Light Communication (VLC). Li-Fi is a wireless optical networking technology that uses light emitting diodes (LEDs) for transmission of data. The term Li-Fi refers to visible light communication (VLC) technology that uses light as medium to deliver high-speed communication in a manner analogous to Wi-Fi and complies with the IEEE standard. The working principle of Li-Fi is itself veritably simple, if the LED is ON, the signal transmitted is a digital 1 whereas if it is OFF, the signal transmitted is 0.By varying the rate at which LEDs flicker, and we can render colorful data and transmit it. With adding demand for wireless data, lack of radio spectrum, and issues with dangerous electromagnetic pollution, Li-Fi appears as a new greener, healthier and cheaper volition. The main target for our design is purely concentrated on transfer of data in the form of light.

2. COMPONENTS DESIGNING

The introductory block illustration consists of input from server or internet, content to be streamed, converter, LED, photo detector, amplifier and processor. Input consists of analog signal, which is generally taken from the Audio affair of the Mobile Phone, Laptop or any other Musical Instruments. The signal will be at low voltage position which is not enough to drive an LED, So in order to drive the LEDs we have to amplify the signal using amplifiers. It substantially consists of two corridor i.e. comparator and lamp driver. The input signal from an audio device will be at low voltage position, so in order to modulate the signal using visible light, we have to convert the signal into a Pulse wave format (signal representing 0 & 1). To negotiate this task we use an Op-Amp Comparator which uses µA 741 Op-Amp IC. The comparator compares the input signal with a reference voltage and produces an output which will be in Pulse wave form. The pulse wave formed is amplified and modulated at the Lamp Driver.
The pulse wave from the comparator has to be amplified to drive the LEDs. Modulation of the input signal and Carrier Light signal is also taking place at the Lamp driver using a Transistor called BC 548, which is a general purpose Silicon Transistor used as Modification transistor as well as Modulation transistor. The amplified and modulated pulse signal is used to drive the LEDs.

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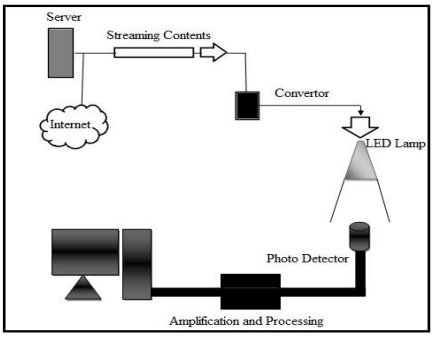

Figure 1.1 Block diagram of circuit

The transmitted signal from the LEDs has to be detected, demodulated and conceded. So in order to descry the communication signal from the blinking LED light, we use a photocell or a Solar Cell (which comprises a large number of print cells connected in series). The demodulated signal will be at low voltage range. This amplifier will be the same type of amplifier which we used on the transmitter side. This is due to the fact that if any phase crimes passed, it'll be cleared at this stage. The processor will convert the electrical signal as per the input.

3. CIRCUIT DIAGRAM AND WORKING

Circuit substantially correspond of Arduino, Power force, Resistors, Op-amp IC (741), Transistor, Photodiode, Light source etc as shown in figure1.2

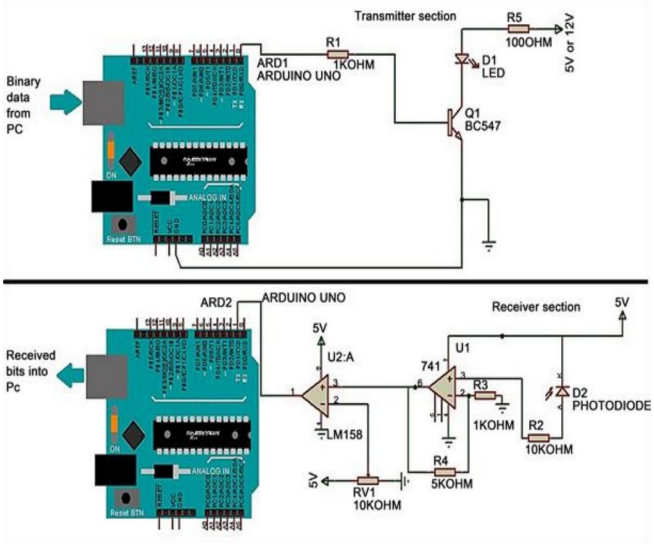

Figure 1.2: Circuit Diagram of Transmitter and Receiver

Here in this study, we will discuss the Arduino UNO board (figure 1.3). Arduino UNO is the utmost introductory and affordable Arduino board and is the most popular of all Arduino boards with a market share of over 50%.
The Arduino UNO is regarded as an excellent simulation board for newcomers in electronics and rendering. UNO is grounded on the ATmega328P microcontroller. The Arduino UNO comes with a variety of features and capabilities. As mentioned earlier, the microcontroller used in UNO is the ATmega328P, which is an 8-bit micro-controller grounded on AVR armature.
UNO has 14 digital input legs - output (I / O) that can be used as input or output by connecting to various external devices and devices. Of these 14 anchors, six anchors are able of producing PWM signals. All digital anchors operate at 5V and can produce a current of 20mA. Some digital I / O pins have special functions described below.

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Figure 1.3: Arduino UNO Board

Photon Detector (Figure 1.4), the incoming light produces free electrons which can carry electrical current so that the electrical conductivity of the detector material changes as a function of the intensity of the incident light. Photoconductive detectors are fabricated from semiconductor materials similar as silicon.

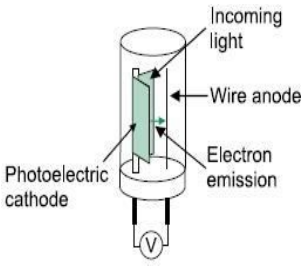

Figure1.4 Photon Detector

A light-emitting diode (LED) (figure 1.5) is a semiconductor light source that emits light when current overflows through it.

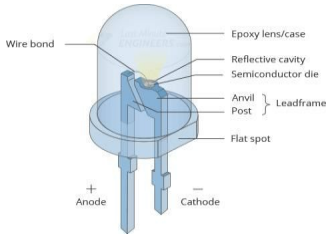

Figure 1.5 LED

Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy needed for electrons to cross the band gap of the semiconductor.

4. CONCLUSION

The chances are numerous and thus the disquisition can be done. If this technology might be put into day to day use, every bulb can act commodity like a Wi-Fi hotspot to help transmit wireless data and we will do towards the result, greener, safer and a better future. The conception of Li-Fi is presently attracting lots of interest, not least because it may offer a genuine and also effective alternative to radio-based Wi- Fi.As a growing number of individualities and their numerous device access wireless internet, the airwaveshave grown to be increasingly

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clogged. making it increasingly more delicate to get an honest, high-speed signal. This may break issues like the deficit of radio-frequency bandwidth likewise permit web where conventional radiobased remote isn't allowed for illustration aircraft or hospitals.

REFERENCES

[1] Harald Hass, "Wireless data from every light bulb", TED Global, Edinburgh, July, 2011.
[2] Li-Fi (Light Fidelity)-The future technology In Wireless Communication Neha Singh, International Journal of advances in computing & communications, vol.1, 2013.
[3] Qian Huang, Xiaohang Li, Mark Shaurette "Integrating Li-Fi Wireless Communication and Energy Harvesting Wireless Sensor for Next Generation Building Management" International Hig
[4] Samidha Garg, S.N.Singh; 'Performance Comparison Of High Frequency Single Phase PWM Inverters Using PSpice',Volume No.1,Issue No.1,2013,PP.001-008,ISSN :2229-5828
[5] Satyendra Sharma, Dr.Brahmjit Singh; 'Planning and Optimization of UMTS Network Radio Link with Limited Interference',Volume No.2,Issue No.1,2013,PP.009-012,ISSN :2229-5828
[6] +Rishi Singhal, S.P. Singh and Dr V. K. Pandey; 'Design of Phase Compen-sation Circuits For Multistage OP-AMP',Volume No.2,Issue No.1,2013,PP.017-019,ISSN :2229-5828
[7] Mohd Yunus Khan, Saroj Kumar Padhi and R.K. Singh; 'Extraction ,Characterization And Engine Performance of Jatropha Curcas Oil',Volume No.2,Issue No.1,2013,PP.021-028,ISSN :2229-5828
[8] Srivastav, Vivek; 'Analytical Study of Traffic Behaviour in a Network on Chip Architecture',Volume No.2,Issue No.1,2013,PP.029-032,ISSN :2229-5828
[9] Saumya Priya Basu , Saumya Das , Sanjita Das, Manas K Das; 'Effect of Methanoic Extract of the Leaves of Calotropis Gigntea R.BR. On Leukocyte and Neutrophil Migration',Volume No.2,Issue No.1,2013,PP.033-036,ISSN :2229-5828
[10] Deepak Bhardwaj , S P Singh, VK Pandey; 'VHDL Implementation of Interleavers : Fundamental and Recent Developments for Wimax and Wlan',Volume No.2,Issue No.1,2013,PP.037-043,ISSN :2229-5828
[11] Malviya, Ragini; 'Study and Simulation of the Unified Power Flow Contr-oller(UPFC) In Power System',Volume No.2,Issue No.1,2013,PP.045-050,ISSN :2229-5828
[12] Rajesh Lavania, Manu Pratap Singh; 'Performance Analysis For Multilayer Feed Forward Neural Network With Grad-ient Descent with Momentum & Adaptive Back Prop-agation and Bfgs QuasiNew-ton Back Propagation for Hand Written Hindi Characters of Swars',Volume No.2,Issue No.1,2013,PP.051-065,ISSN :2229-5828

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