Continuous Data Transmission in Smart Communication systems using Light Fidelity

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Wireless communications such as Wi-Fi and Bluetooth are commonly used in the daily life. However, while more and more wireless devices occupy the available frequencies, the frequency spectrum is reaching a maximum capacity. In this proposal, the Li-Fi communication using light waves between two devices which becomes a future solution to transmit data with the full range of visible and infrared light spectrums and which are all able to transmit and receive a data in day and night. In Li-Fi, the data communication happens indoors with low latency, high speed and also it is very difficult to hijack from outside the room. On the receiver side, a LDR receives the signal. The system consists of two Arduino Uno (microcontroller) devices as the transmitter and receiver. The user interface based on the C++ programming language which is used to control the sending and receiving of data in smart communication system. The Infrared signals in the beginning and end of the data transmission in the LEDs are act as switching on and off signals in the form of binary 0's and1's . Here we are easily able to transmit and receive the data between two devices using LDR and the LI-FI makes this smart communication system as very efficient one.

1. INTRODUCTION

Wireless communication schemes like Wi-Fi especially uses radio/micro wave frequencies for data transmission, primarily because of the possibility of high sensitivity receivers and ability to provide broad coverage at low frequencies and high frequency line of sight communication. But, radio frequency can support only a finite bandwidth due to confined spectrum availability. The idea behind this communication scheme is transmission of 'Data through illumination '. The intensity of the LEDs is varied by alternating the current passed through them at very high speeds . However, the human eye cannot recognize this change and the LEDs appear to have a constant intensity. This ON-OFF activity of LED lights facilitate data transmission using binary codes i.e., when the LED is ON, logical '1' is transmitted and when the LED is OFF, logical '0' is transmitted. Electronic devices acquires data with photodiode within area of light visibility.

This means that everywhere where LEDs are used, lighting bulbs can deliver not only the light but wireless connection at the same time. With increasing requirement for wireless data, lack of radio spectrum and issues with hazardous electromagnetic pollution, LiFi emerges as a new greener, healthier and cheaper alternative to Wi-Fi. Wireless systems and to overcome the confined amount of radio based wireless spectrum available by attaining a completely different part of the electromagnetic spectrum. The consortium believes is possible to achieve more than 10 Gbps . Li-Fi also used in sensitive areas without causing interference. However, the light waves used cannot pervade through walls .Later in 2012, Pure VLC, a firm set up to depreciate Li-Fi, for firms installing LED-lighting systems . Moreover Li-Fi makes feasible to have a wireless Internet in specific environments where due to interferences or security considerations Wi-fi is not allowed.

White LED's are used for indoor wireless networks for communication. These equipments should have capacity of wireless optical communication. The medium of communication is visible light. The communication throughout the whole room is provided by high power lighting equipment. This is often easy to install and low in terms of cost. However, arrangement of lighting device is fixed over the white ceiling.

1.1.EXISITING SYSTEM VS PROPOSED SYSTEM

On the other hands, power line communication make it possible to use electricity for this medium of communication in Power line channel each terminal connected to power line can communicate.

It is desirable to achieve more than 10Gbps speed using this optical wireless technology also known as Li-Fi. The communication is done in direct line of sight manner by deploying transmitter and receiver .The speed of data transmission will reduce or data transmission will stop if line of sight is not used. As only photo receptors are used it is also more secure than other wireless networks, which can receive data within transmitted cone of light signals LED lights a particularly popular choice, because they can flicker quickly enough to transmit a meaningful amount of data and are widely used for illumination purposes .

In this paper, text transmission between two devices is done by using the medium of visible light of electromagnetic spectrum. LiFi is always a greater technology providing greater speeds for communication. In this LiFi, text transmission works based on a simple technology. When LED light is ON digital data bit stream of one is transmitted. When LED light turns off, digital bit stream of zero is transmitted. Based on this simple technique text transmission was done through visible light communication.

The inconvenience in existing method is that, Wifi system provides ,

1) High radiated radio waves is used for data communication between two devices .
2) Secured data transmission is not available here ,even though, wps key encryption can be provided ,it can also be hacked in many ways .
3) It also provides damage to your health as its emits radio waves .
4) Interference of signals is also a major concern.

The proposed system will overcome these disadvantages,

1) No interference on radio frequency signals as this communication totally depends on light.
2) It is based on a simple technique of illumination cum communication.
3) Moreover data speed of this LIFI is extremely fast when compared to other means of communication.
4) Since the communication is based on visible light which is the most used part in electromagnetic spectrum for communication.
5) As, data transmitted through light so health problems will takes place.

1.2.Hardware

The hardware components used in this system include

A.Arduino Uno

The Arduino uno is an open source microcontroller board based on the Microchip

Atmega328p microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards(shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

B.MOSFET

The MOSFET we used in our project is IRFZ44N.It is an N-channel MOSFET with a high drain current of 49A and low Rds value of 17.5 mΩ.It also has a low threshold voltage of 4V at which the MOSFET will start conducting. Hence it is commonly used with microcontrollers to drive with 5V.

C.Light-Emitting Diode(LED)

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. 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 required for electrons to cross the band gap of the semiconductor.Unlike a laser, the light emitted from an LED is neither spectrally coherent nor even highly monochromatic.We have used a 1 watt LE in our project.

D. Light-Dependent Resistor(LDR)

LDR is a passive component that decreases resistance with respect to receiving luminosity (light) on the component's sensitive surface. A photoresistor can b e applied in light-sensitive detector circuits and light - activated and dark-activated switching circuits acting as a resistance semiconductor.

E. Rotary Potentiometer

A potentiometer is a three-terminal resistor with a rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat.The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name.

1.3.Software

The Arduino IDE is a cross -platform application that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards .The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedure.

1.4.Data transmission in Li-Fi

In the transmitter side,the Data(text,Audio, Image,Video)to be transmitted is first converted into stream of bits in an Arduino uno with the help of C++ programming. Leds transmit the data with the help of PWM.The converted stream of bits are used as a input for pulse width modulation.
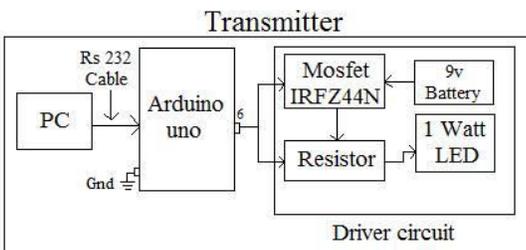

Fig:Block diagram of transmitter

A IRF3074l-v MOSFET is used to switch voltages between the 9v battery and the Arduino uno to power the 1 watt LED.In the receiver side, the LDR and Rotary potentiometer produces varying resistivity based upon the varying light intensity.
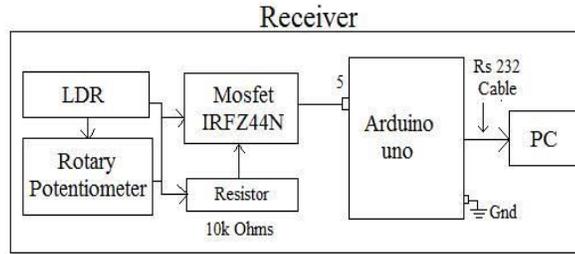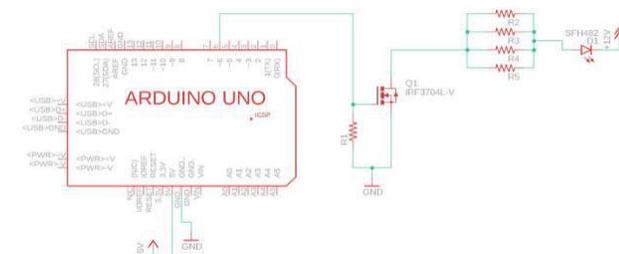

Fig:Block diagram of Receiver

Based upon the varying resistivity the output voltage is varied.Then the output voltage is used to reconstruct the data received from transmitter with the help of arduino uno using C++ programming.
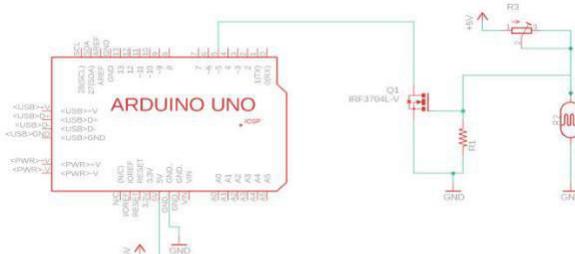
1.5.Experimental setup

A.Transmitter setup

Circuit diagram of Transmitter

B.Receiver setup

Circuit diagram of Receiver

2.Result and Discussion

2.1.Results

The transmitted text is successfully received in the receiver side. The communication speed is gradually increased with an gradual increase in the intensity of the light.The low cost system works perfectly without any loss of data that is transmitted.

2.2.CONCLUSION

This technology is still under research and surely it will be a breakthrough in communication .It assures data speed of 100gbps which is entirely greaterthan radio waves . In this paper transmission of t e x t is done through this LiFi technology. The scope of this LiFi was ultimately greater. The goal of this paper is LiFi provides secured ,low cost ,easy data transmission and provides reliable communication. It can also be used in industrial ,medical, military applications . LiFi is still in its beginning stages, but improvements are being made rapidly, and soon this technology will be able to be used in our daily lives . It is intended that this research will provide the starting steps for further study .

2.3.References

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2.4. Bibliography

We have achieved continuous data transmission using smart systems with light fidelity and we have been doing research in light fidelity for the past two years

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