Survey Of Data transfer through visible light

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Abstract - Now-a-days wireless communication uses radio waves. Spectrum is the one of the most essential requirement for wireless communication. With the advancement in technology and the number of users, the existing radio-wave spectrum fails to cater to this need. To resolve the issues of scalability, availability and security, we have come up with the concept of transmitting data wirelessly through light using LED's. An indoor visible data transmission system utilizing LEDs is proposed. In this system, these devices are used not only for illuminating rooms, but also for an optical wireless communication system. Also with this, our project also has audio system that is well suited for use in a small confined area with many audio transmitters broadcasting different audio signal

Key Words: LED, wireless, transmission etc…

1 .LITERATURE REVIEW:

Visible light communication is a fascinating and emerging communication technology employing visible light with spectrum between 400 THz and 790 THz for both illumination and data communication. Signal is transmitted with LED by their intensity modulation. Several modulation techniques could be adopted e.g. on/off keying (OOK) which is the main output for the system. The VLC uses LEDs to send data by flashing light at undetectable speed to human eyes. Its applications can be found in office broadband communications, secured communications, hybrid energy and communications, and smart home.

Every kind of light source can theoretically be used as transmitting device for VLC or LI-FI. However, some are better suited than others. For instance, incandescent lights quickly break down when switched on and off frequently. These are thus not recommended as VLC transmitters. More promising alternatives are LEDs. VLC transmitters are usually also used for providing illumination of the rooms in which they are used. The simplest form of LEDs are those which consist of a bluish to ultraviolet LED surrounded by phosphorus which is then stimulated by the actual LED and emits white light. This leads to data rates up to 40 m bit/s. RGB LEDs do not rely on phosphorus any more to generate white light. They come with three distinct LEDs (a red, a blue and a green one) which, when lighting up at the same time, emit light that humans perceive as white, because there is no delay by stimulating phosphorus. Data rates of up to 100 MB its/s can be achieved using RGB LEDs. In recent year the development of resonant cavity LEDs (RCLEDs) has advanced considerably. These are similar to RGB LEDs in that they are comprised of three distinct LEDs, but in addition they are fitted with Bragg mirrors which enhance the spectral clarity to such a degree that emitted light can be modulated at very high frequencies. In early 2010, Siemens has shown that data transmission at a rate of 500MBBit/s is possible with this approach. The most common choice of receivers is photodiodes which turn light into electrical pulses. The signal retrieved in this way can be demodulated into actual data.

2. INTRODUCTION

Li-Fi is a label for wireless communication system which is used to describe visible light communication technology applied to high speed wireless communication.
Li-Fi is transmission of data through illumination by using fiber optics and sending data through a LED that varies in intensity faster than the human eye can follow .The LED intensity is modulated so rapidly that human eyes cannot notice, so the output appears constant.
LIFI can be thought of as a light base WI Fi i.e. it uses light instead of radio waves to transmit information.

Li-Fi consists of both digital and audio data transmission. In this, an indoor visible data

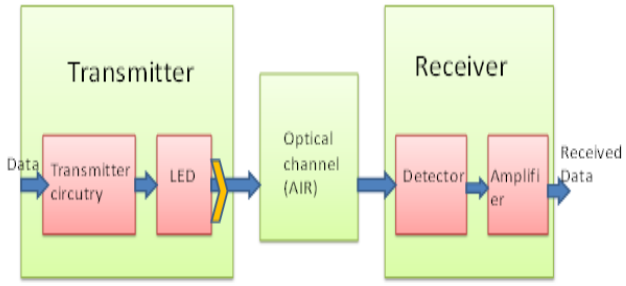
transmission system utilizing LED lights is proposed. This system of communication using Light-Fidelity can be used in critical environments, such as aircrafts or hospitals, where radio frequency (RF) based transmissions are usually prohibited or refrained to avoid interference with critical systems. Moreover, a huge amount of unregulated bandwidth is

available at infra-red and visible light frequencies. This system rapidly and subtly fluctuates the intensity of LEDs to create a binary code (on=1, off=0) in a way that is imperceptible to the human eye. The light then hits a sensitive photo sensor that decodes the data. It also has an audio system that relies on visible light for transmitting audio information to a receiver located some distance away from the system. The basic idea is based on the fact that the visible light

emitted by the LEDs can be modulated and encoded with audio information. LEDs can then be used as a communication device for the transmission of audio information. The proposed system depends on a direct line of sight between the transmitter and the receiver. The proposed system allows the user to hear from one
audio source when the receiver is pointing at that appliance. Multiple users can also work in the same compact environment and the problem due to noise nuisance can be greatly reduced.

3. RELATED WORK

Block diagram of digital data transmission is given in the fig. This part mainly divided into two sections one is transmitter card unit and another one is receiver unit. The transmitter card unit has internal memory to store the digital codes. The data can be entered through keyboard, this data is displayed in the LCD. The Controller Send it to buffer amplifier through serial port and send it to receiver part through IR transmitter. The receiver part receives the data from photo receiver and sends it to microcontroller through serial port. Controller stores it in the memory and also it displays the data in the LCD display. This is how the digital data can be transmitted



4. HARDWARE

List Hardware and Software Requirements with specifications

LCD: to display transmitted and received digital data through PS2 keyboard.

IR PHOTO RECEIVER: to receive the encrypted data frame. These IR photo receiver having wide receiving bandwidth as compare to normal photo diode. Photo detector is used to detect modulated light signal from the transmitter and convert the signal into an electrical signal.

LED

LED falls within the family of P-N junction devices. The light emitting diode (LED) is a diode that will give off visible light when it is energized. In any forward biased P-N junction there is, with in the structure and primarily close to the junction, a recombination of hole and electrons. This recombination requires that the energy possessed by the unbound free electron be transferred to another state. The process of giving off light by applying an electrical source is called electroluminescence.

Figure No. 1.19: LED & LED Symbol

LED is a component used for indication. All the functions being carried out are displayed by led .The LED is diode which glows when the current is being flown through it in forward bias condition. The LEDs are available in the round shell and also in the flat shells. The positive leg is longer than negative leg.

IR LED: EVERLIGHT's Infrared Emitting Diode (IR333C/H0/L10) is a high intensity diode, molded in a water clear plastic package. The device spectrally matched with phototransistor, photodiode and infrared receiver module

DIODE

The diode is a p-n junction device. Diode is the component used to control the flow of the current in any one direction. The diode widely works in forward bias.

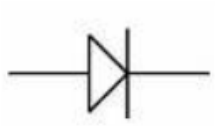


Figure No. 1.13: Diode

Diode When the current flows from the P to N direction. Then it is in forward bias. The Zener diode is used in reverse bias function i.e. N to P direction. Visually the identification of the diode`s terminal can be done by identifying he silver/black line. The silver/black line is the negative terminal (cathode) and the other terminal is the positive terminal (cathode).

MICROCONTROLLER AT89S52: to decode the keyboard codes, display the codes or character on LCD and transmit/receive data through serial port. It is a low power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash Programmable and Erasable Read Only Memory ROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the MCS-51. Instruction set and pin out. The on chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, it provides a highly flexible and cost effective solution so many embedded control applications.

RECTEFIER (IN4007 diode): to convert ac signal in dc signal.

CAPACITORS

In a way, a capacitor is a little like a battery. Although they work in completely different ways, capacitors and batteries both store electrical energy. If you have read How Batteries Work.

then you know that a battery has two terminals. Inside the battery, chemical reactions produce electrons on one terminal and absorb electrons at the other terminal.

REGULATOR (7805): to provide constant 5 volt supply inspite the change in input voltage.

RESISTORS

The flow of charge through any material encounters an opposing force similar in many respects to mechanical friction .this opposing force is called resistance of the material .in some electric circuit resistance is deliberately introduced in form of resistor. Resistor used fall in three categories , only two of which are color coded which are metal film and carbon film resistor .the third category is the wire wound type ,where value are generally printed on the vitreous paint finish of the component. Resistors are in ohms and are represented in Greek letter omega, looks as an upturned horseshoe. Most electronic circuit require resistors to make them work properly and it is obliviously important to find out something about the different types of resistors available. Resistance is measured in ohms, the symbol for ohm is an omega ohm. 1 ohm is quite small for electronics so resistances are often given in kohm and M ohm.

Figure No. 1.14: Symbol of Resistance

Resistors used in electronics can have resistances as low as 0.1 ohm or as high as 10 M ohm.

CRYSTAL OSCILLATOR: It provide clock pulses of 11.0952 Mhz frequency. It can be used as UART clock (6×1.8432 MHz). It allows integer division to common baud rates (96×115200 baud or 96×96×1,200 baud). It is a common clock for Intel 8051 microprocessors It uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators. The crystal oscillator circuit sustains oscillation by taking a voltage signal from the quartz resonator, amplifying it, and feeding it back to the resonator. The rate of expansion and contraction of the quartz is the resonant frequency, and is determined by the cut and size of the crystal. When the energy of the generated output frequencies matches the losses in the circuit, an oscillation can be sustained. One of the most important traits of the crystal oscillator is that it exhibits very low phase noise. In the crystal oscillator, the crystal mostly vibrates in one axis, therefore only one phase is dominant. This property of low phase noise makes them particularly useful in telecommunications where stable signals are needed, and in scientific equipment where very precise time references are needed. The result is that a quartz crystal behaves like a circuit composed of an inductor, capacitor and resistor, with a precise resonant frequency

MAX 232: The **MAX232** is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip

The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 VTTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V.

The later MAX232A is backwards compatible with the original MAX232 but may operate at higher baud rates and can use smaller external capacitors – 0.1 µF in place of the 1.0 µF capacitors used with the original device.

The newer MAX3232 is also backwards compatible, but operates at a broader voltage range, from 3 to 5.5 V.

TRANSFORMER: Transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors — the transformer's coils or "windings". Except for air-core transformers, the conductors are commonly wound around a single iron-rich core, or around separate but magnetically-coupled cores. A varying current in the first or "primary" winding creates a varying magnetic field in the core (or cores) of the transformer. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the "secondary" winding. This effect is called mutual induction.

If a load is connected to the secondary circuit, electric charge will flow in the secondary winding of the transformer and transfer energy from the primary circuit to the load connected in the secondary circuit.

The secondary induced voltage VS, of an ideal transformer, is scaled from the primary VP by a factor equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

By appropriate selection of the numbers of turns, a transformer thus allows an alternating voltage to be stepped up — by making NS more than NP — or stepped down, by making it

BASIC PARTS OF A TRANSFORMER

In its most basic form a transformer consists of:

- A primary coil or winding.
- A secondary coil or winding.
- A core that supports the coils or windings.

Refer to the transformer circuit in figure as you read the following explanation: The primary winding is connected to a 60-hertz ac voltage source. The magnetic field (flux) builds up (expands) and collapses (contracts) about the primary winding. The expanding and contracting magnetic field around the primary winding cuts the secondary winding and induces an alternating voltage into the winding. This voltage causes alternating current to flow through the load. The voltage may be stepped up or down depending on the design of the primary and secondary windings.

5. APPLICATION

List probable applications of project

Mobile Connectivity: Short range links give very high data rates and also provides security.
Hospital & Healthcare: Li-Fi emits no electromagnetic interference and so does not interfere with medical instruments
Vehicles and Transportation : This can be used for vehicle-to-vehicle and vehicle-to-roadside communications. This can be applied for road safety and traffic management.
Education System: provide faster internet speeds. All the people can make use of the same speed as has been designated.

6. CONCLUSION

Light is inherently safe and can be used in places where radio frequency communication is often dee.med problematic , such as in aircraft cabins or hospitals . So visible light communication not only has the potential to solve the problem of lack of spectrum space .and it can be used for communication at very high speed. All one has to do is to vary the rate at which the LEDs fluctuation depending upon data we want to encode .By this project we concluded that , light can be very good medium of transferring data between systems. we will proceed toward the cleaner greener safer and brighter future

7. REFERENCES

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BIOGRAPHIES

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