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SECURED LIFI (SECURED VISIBLE LIGHT COMMUNICATION)

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Abstract

Future electric lights will be comprised of white LEDS (light emitting diode).White led's with high power output are expected to serve in the next generation of lamps. An indoor visible data transmission system utilizing white led lights is proposed. In the system, these devices are used not only for illuminating rooms but also for an optical wireless communication system. This system is suitable for private networks such as consumer communication networks. However it remains necessary to investigate the properties of white led's when they are used as optical transmitters. Based on numerical analyses and computer simulations it can be used for indoor optical transmission.Moreover secured transmission is possible using steganography and password prompt for exchange

1. INTRODUCTION

Data transmission using optical wireless has been identified as a technology that can be utilized for communications 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. Researchers around the world are fine-tuning technologies that use standard lighting equipment to cheaply transmit high-speed data streams wirelessly, even while the equipment appears to be producing nothing more than normal illumination. Generally, the technologies rapidly and subtly fluctuate the intensity of light-emitting diodes, or LEDs, in a way that is imperceptible to the human eye. The idea of using light to send information, a field now known as visible light communications, has been around for well over a century. In fact, Alexander Graham Bell sent a wireless phone message in 1880 using his invention known as the Photo phone. But academic and commercial interest in visible light communication has accelerated in recent years. The increasing popularity of LED lights, which can be more finely controlled than traditional incandescent bulbs, makes light-based technology more practical and economical. Also, the exponentially growing demand of wireless communication devices has taxed radio spectrum, resulting in a need to find alternatives. In addition, commercially available light emitting diodes (LEDs) and photodiodes(PDs) can be utilized for data transmission and reception. In addition, transmissions can be stopped simply by blocking the light, and thus can be stopped by walls, so there is less risk of data leaking out of a house or office. And researchers say they believe that signals can piggyback on lights that are already in use — street

lamps, car headlights or room lighting. Use of MATLAB has made it possible to provide the feature of steganography.

2. REQUIREMENT OF THE SYSTEM

Requirement 1:- The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set.

Requirement 2:- L14G2 is an NPN **phototransistor**. It acts as a photo detector in the sense that it can convert the incident light into electric response. They are commonly used as sensors usually paired with a light source like LED.

Requirement 3:- A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level.

Requirement 4:- The rectifier is used to convert A.C to D.C voltage. The design that we have carried out is of the full wave rectifier, using 1N4001 diodes are use.

Requirement 5:- MATLAB is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications.

3. SYSTEM ARCHITECTURE

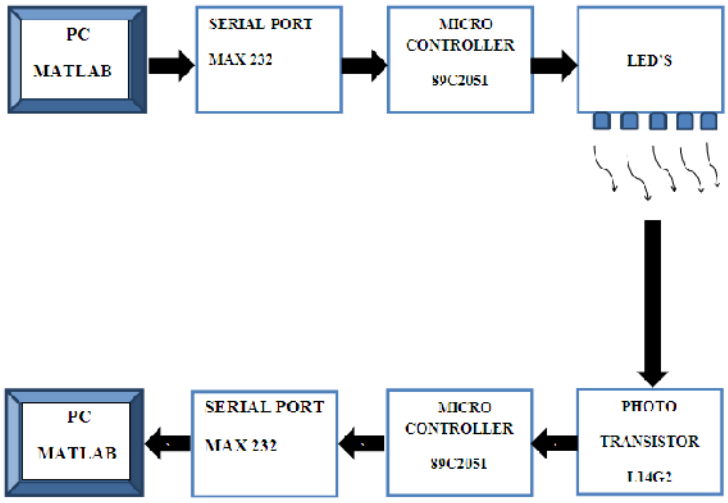

Figure 1: System Block Diagram

Data Transmission

The image to be sent is initially processed by calculating the pixel size of the image. The image contains a text hidden inside it and that is what steganography. The pixel size of the image is calculated as follows:

E.g:- If the image is say 320 X 240px.Then the total pixels would be 76800px. Now to convert the image as per RGB we can do it as 76800 x 3=230400. So for the entire image to be transmitted 230400px must be sent. Further the frames are sent through the serial port MAX 232.The serial port is used because the logic levels for the computer and the micro-controller is different. The micro-controller is triggered depending on the data sent to it and with respect to that data the led's are toggled i.e. their intensity is modulated to send the data to the phototransistor.

Data Reception

When the led's light is incident on the phototransistor which would be on the receiver end, then the phototransistor being an N-P-N transistor would trigger its output depending on the data. Further depending on the output voltage level of the transistor the micro-controller which has a fixed threshold compares the voltage and gives the output. The MATLAB program on the receiver side now tries to regain the frames and provide the output image.

I. FLOWCHART

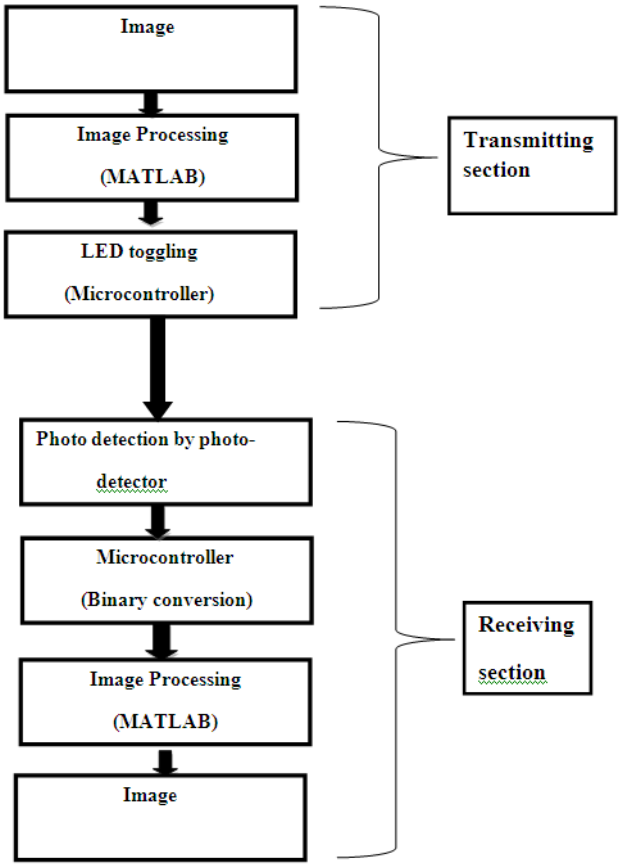

Figure 2:- Flowchart of System

IMAGE

In this project data transmission is done via visible light. The data is to be transmitted is an image.

IMAGE PROCESSING

The image to be transmitted needs to be processed. Image processing here is done in a computer software 'MATLAB'. In MATLAB the number of pixels of that particular image is calculated in the first stage. The second stage mainly consists of converting each pixel into its equivalent binary code. This code is then transferred over to the microcontroller via serial port.

LED TOGGLING

The converted binary codes are transmitted over to receiver taking visible light as its medium with the help of leds. These leds are toggled in accordance with the binary codes that the microcontroller receives through the serial port.

PHOTO DETECTION BY PHOTOTRANSISTOR

On the receiver side we have a phototransistor which detects the light incident on it. The analog voltage generated at the output of this detector is then given to the microcontroller.

MICROCONTROLLER

At the input of the microcontroller the analog voltage is converted into binary format. This is done with the help of the threshold level which is predefined. The binary code produced by the microcontroller is then transferred via serial port for the image to be reconstructed.

IMAGE PROCESSING

The binary code received through the serial port is then processed in MATLAB where the transferred image is rebuilt using the binary codes received from the microcontroller.

4. RESULT

White led's which can be used for illuminating rooms can be used as optical transmitters for sending data. White LEDs are set to penetrate many areas of everyday life. An interesting property of these devices (in addition to their lightening capabilities) is that they can be utilized for data transmission.The result that is expected from the project is to transmit and receive data (image) between two computers using visible light (white led's).

5. FEATURES AND APPLICATION

FEATURES

It is a new source of data transmission. (i.e) VISIBLE LED LIGHTS. Bandwidth is not limited.It can produce data rates faster than 10 megabits per second, which is speedier than your average broadband connection. Transmitters and receivers devices are cheap, and there is no need for expensive RF units. As light waves do not penetrated opaque objects, they can not be eavesdropped. It is very difficult for an intruder to (covertly) pick up the signal from outside the room. i.e .There can be no theft of

data.Visible light radiations are undoubtedly free of any health concerns. Therefore, these systems will receive acceptance for use in hospitals, private homes, etc. Furthermore, no interference with RF based systems exist, so that the use in airplanes is uncritical. Visible LEDs can offer very high brightness, very low power consumptions and long lifetime. They can serve two purposes at the same time: lighting and high speed wireless data transmission. The visible spectrum covers wave lengths from 380 nm to 750 nm. Visible light communication could be used in conjunction with Powerline communication (PLC). VLC is a natural broadcast medium, it is sometimes desired to send information back to the transmitter. Taking the fiber out of fiber optics by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. VLC can be used as a communications medium for ubiquitous computing, because light-producing devices (such as indoor/outdoor lamps, TVs, traffic signs, commercial displays, car headlights/taillights) are used everywhere.

The most important feature added to it is steganograohy. It is the process of hiding a text within the image which can be decode with a key known to both sender and receiver only. This feature is useful where out of many users sharing the lifi sever only few receivers need to know the data.

APPLICATION

It should be noted that most proposed applications are far from being market-ready. Therefore, most applications mentioned in this section have often been tried out in research settings, but their usage in real world scenarios is still somewhat hypothetical One of the major applications of VLC, especially in the medical field, consists of estimating one's location.[Liu et al. 2008] propose a scenario for visually handicapped people. Location estimation is put to use in this scenario to guide people through a series of hallways. All hallways are assumed to be illuminated by fluorescent lights which are capable of transmitting a unique ID via VLC. Estimating the current location consists of two steps: Firstly, the distance to each fluorescent light in reach is computed and secondly, the current position is estimated based on the previously computed distances. The distance to each light source is computed by first measuring the angle of incident light with assistance of a photo sensor that is attached to the person's shoulder. Then, using some trigonometric functions, the distance between the receiver and the light source in horizontal direction is calculated. The distance to each light source describes a unique range curve (a rectangle with two half circles at each end). The intersection of all distance range curves is the estimated location.

6. FUTURE SCOPE

Whether you're using wireless internet in a coffee shop, stealing it from the guy next door, or competing for bandwidth at a conference, you've probably gotten frustrated at the slow speeds you face when more than one device is tapped into the network. As more and more people and their many devices access wireless internet, clogged airwaves are going to make it increasingly difficult to latch onto a reliable signal.

But radio waves are just one part of the spectrum that can carry our data. What if we could use other waves to surf the internet?

The solution is data through illumination taking the fiber out of fiber optics by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. It's the same idea behind infrared remote controls, but far more powerful.

D-Light, can produce data rates faster than 10 megabits per second, which is speedier than your average broadband connection. We expect a future where data for laptops, smart phones, and tablets is transmitted through the light in a room. And security would be a snap if you can't see the light, you can't access the data.

You can imagine all kinds of uses for this technology, from public internet access through street lamps to auto-piloted cars that communicate through their headlights. And more data coming through the visible spectrum could help alleviate concerns that the electromagnetic waves that come with WiFi could adversely affect your health.

There are around 14 billion light bulbs worldwide, they just need to be replaced with LED ones that transmit data.VLC is a factor of ten cheaper than Wi-Fi Because it uses light rather than radio-frequency signals, VLC could be used safely in aircraft, integrated into medical devices and hospitals where Wi-Fi is banned, or even underwater, where Wi-Fi doesn't work at all.

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