

Detection of Hazardous Gas and Protection System in Gold Mining Using Lifi

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Abstract- *Li-Fi (Light Fidelity) is a fast and cheap version of Wi-Fi. The main equipments used are 1) a white LED, this is communication source and 2) a silicon photodiode which shows good response to visible wavelength. Important factors in Li-Fi as following: 1) Presence of Light, 2) Line of Sight (Los), 3) For better performance use fluorescent light & LED. The LED is switched on and off to produce 1s and 0s. Data is been encoded in the light to data stream by varying the flickering rate of the LED. As the flickering rate is so fast, the LED output appears constant to the human eye. The gold mining project in mining and oaring involves the science, technology, and the discovery of gold, Most injuries underground like the Toxic gas is emitted during the time of mining. The mining workers were affected by lung disease by and inhaling dust toxic gas in Gold mining environment.*

Keywords- Line of sight, fluorescent light, high brightness, silicon photodiode

I. INTRODUCTION

Li-Fi is a technology for wireless communication between devices using light to transmit data. In lifi LED lamps can be used for the transmission of data at high speed. This is the technology similar to Wi-Fi. The main difference is that Wi-Fi uses radio frequency to transmit data and LIFI uses light to transmit data. This makes Li-Fi to offer several advantages like higher bandwidth, higher transmission speeds. The technology is developed by several organizations across the globe. Visible light communication works by switching the current to the LEDs off and on at a very high rate too quick to be noticed by the human eye. As Li-Fi LEDs would have to be switched on to transmit data and also could be dimmed to too lower which is not proper to human visibility while still emitting enough light to carry data. The lifi light waves can't penetrate walls which makes it as an shorter range, though this is more reliable and secure where hacking, can't be performed. Like the Wi-Fi Direct line of sight is not required for Li-Fi to transmit a signal Li-Fi has the advantage as it is used in electromagnetic sensitive areas such as in aircraft, hospitals and nuclear power plants without causing electromagnetic interference. Both Wi-Fi and Li-Fi transmit data over the EMF waves, but Wi-Fi utilizes radio waves, Li-

Fi uses visible light, Ultraviolet and Infrared rays. While the US Federal Communications Commission has warned crisis because Li-Fi in general is to be ten times cheaper than Wi-Fi. And this Short range, low reliability and high installation costs are the total disadvantage of LIFI.

II. LITERATURE REVIEW

Thanh V. Pham, Student Member, IEEE, Multi-User Visible Light Communication Broadcast Channels With Zero-Forcing Pre-coding, Hoa Le-Minh, Member, IEEE, and Anh T. Pham, Senior Member, IEEE

The paper studied optimal pre-coding designs for MU-MISO VLC systems with practical constraints of the optical signal. To mitigate the MUI among users, ZF pre-coding technique is utilized due to its computational advantage. Capitalizing on the pre-coding designs. Numerical results showed that the generalized inverse design achieves better performance than that of the pseudo inverse design, especially in the high SNR region.

A Spectral-Efficient Transmission Scheme for Dimmable Visible Light Communication Systems Shancheng Zhao and Xiao Ma

Dimming control is of vital importance for visible light communication (VLC) systems. Conventional dimmable transmission schemes based on compensation are spectrally inefficient. In this paper, we propose the use of two techniques, i.e., time-sharing and superposition, to construct spectral-efficient dimmable transmission schemes. Hence, it provides an attractive candidate for dimmable VLC systems with demanding spectral efficiency.

User-Centric Visible Light Communications for Energy-Efficient Scalable Video Streaming Xuan Li, Yongkai Huo, Rong Zhang, Lajos Hanzo Southampton Wireless, School of ECS, University of Southampton, UK xl26g12,yh3g09,rz,lh@ecs.soton.ac.uk.

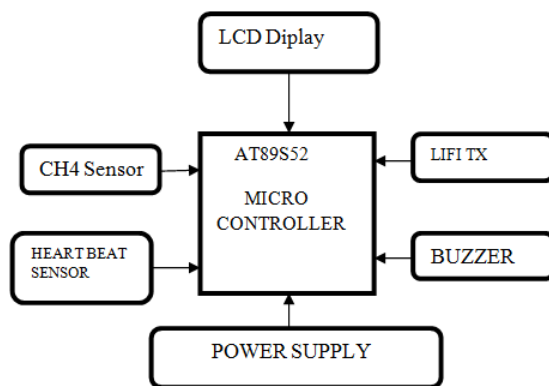
An energy-efficient indoor visible light communication (VLC) system relying on dynamic user-centric

(UC) cluster formation is designed for scalable video streaming. Explicitly, the radically new UC cluster formation technique is based on an amorphous user-to-network association structure, which is ultimately the basis of our energy-efficient indoor VLC system. Furthermore, in order to optimize the system-level energy efficiency,.

Joint Measurement and Trajectory Recovery in Visible Light Communication Dongfang Zheng, Gang Chen, and Jay A. Farrell, Fellow, IEEE

.VLC extracts a bit sequence from a series of photo detector scans. Among this data is an LED ID that ensures the reliable data association in navigation and data communication. Recovering the LED data and ID requires the accurate prediction of each LED's projected position on the photo detector array to extract efficiently and reliably the LED ON-OFF status in each photo detector scan.

III. BLOCK DIAGRAM



MONITORING SECTION:

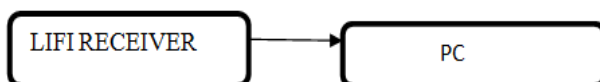


Fig.1 Block Diagram

IV. PREVIOUS WORK AND EQUIPMENT

The number of equipment involved in the working principle as follows:

- Micro controller AT89S52.
- LCD Display.
- LIFI Transmitter.
- Buzzer
- CH4 Sensor.
- Heart Beat Sensor.

- Power Supply
- LIFI Receiver
- Personal Computer.

1. Micro controller AT89S52

The device which is used in this project was the 'AT89S52' which is a typical 8051 microcontroller manufactured by Atmel. The block diagram provided by Atmel™ the architecture of this device 89S52 seemed to be a bit complicated. The 89S52 has four different ports, each ports having eight Input/output lines provides a total of 32 Input/Output lines. Those ports can be used to output DATA and orders to do other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have dual functionality that shows that they can be used for two different functions.



Fig.2 AT89S52

Low-power, high-performance of CMOS 8-bit microcontroller. The device which is used as Microchip high-density and nonvolatile memory technology. On-chip flash that allows the program memory to be reprogrammed in-system. This microcontroller which suits for many embedded control applications.

2. LCD Display

An **liquid-crystal display (LCD)** is small low cost display and its used to interface with microcontroller because of an embedded controller. This controller standard across many displays (HD44780) which means many microcontroller have libraries that makes displaying the messages as easy as a single line of code. Liquid crystals which is not directly emitted the light. By using the reflector which is used to produced the images in colour or monochrome. LCDs are available to display arbitrary images or fixed images with low information content and it may be displayed or hidden, such as preset words, digits as in digital clock. They use the same basic technology, except that arbitrary images. LCDs are used in a wide range of applications including LCD televisions, computer monitors, instrument panels, indoor and outdoor signage. Small LCD screens are widely used in

portable consumer devices such as digital cameras, watches, calculators, and mobile telephones, and also smartphones. LCD screens have



Fig.3 LCD Display

replaced heavy, bulky cathode ray tube (CRT) displays in all applications. LCD screens are made of wider range in compare to plasma, with LCD screens are available in various rages from small watch screen to big size TV since LCD screens do not made by the use of phosphors they don't have any image burn-in. LCDs are, however, better to image persistence, and it is more energy-efficient and the be disposed is more safer than a CRT can. Its low electrical power consumption which are most efficient than CRT.

3. LIFI Transmitter

Visible light communication is the term in optical wireless communication system that conveys information by modulating light which is visible to the human eye. Communication is done by switching on and off LED lights at a speed higher than is impossible to predict in human eye, its bcz human eyes can detect changes in light brightness and power, but they cannot predict light that is switched on and off rapidly. A photodiode, is used in case that it can easily recognize the rapid on-off of LED lights. A photodiode is also know as photo detector that produces an electrical current that is proportional to the optical power in the photo detector surface. To make this possible visible-light communication technology that supports both illumination and wireless communication LED's are used. where in RF wireless communication, it requires specialized tools to find a service area, where the VLC service area will be easily detected. The visible spectrum is the part of the electromagnetic spectrum having wavelengths from about 380 nm to 780 nm



Fig.4 LIFI Transmitter

In a Li-Fi transmitter, a digital signal processor or attached to an LED driver takes data from a network, server, or the internet and converts it into a digital signal—basically a sequence of discrete voltage levels. The LED driver in each time converts the digital signal into a photonic signal, transmitting it at a very high that is an Orthogonal Frequency Division Multiplex (OFDM)

4. Buzzer

It works at voltage range between 3V to 28V, to operate depending on its type. A buzzer in general its designed to operate at 6 V and works very well for supply voltage between 4 V and 8 V, and a buzzer can work more perfectly if it is designed to operate at 12 V and work ranging at a voltage between 6 V and 28 V There are also buzzers that work directly on the AC mains 230 V as thous type of buzzer is more convenient to use as it has no work, except the eventual control stage which will enable it. if we provide a simple DC voltage, it sounds. In the case of piezoelectric it requires an AC voltage to operate. It provides an optimal resonance frequency at an range few kHz). This type of transducer that can be found on the back of the watch .



Fig.5 Buzzer

Some CUI piezo buzzers are also comes with a feedback line. Buzzers Driving circuits in which the feedback tend to be simpler than those circuits without. Feedback is done by dividing the piezo element into two, electrically isolated parts. When the main piezo element is activated it supresses the feedback portion, creating a voltage on the

feedback line. A simple way to use feedback is to have the feedback line connected to the base of a transistor.

5. GAS Sensor

In today's technology monitoring the gas content is really and great challenge.. From home appliances to industries monitoring of gases is critical part . Gas sensor continuously react to the gas present, thus keeping the system updated about the gas content in the atmosphere. The gas sensor consists of steel exoskeleton .The gas detector is a device that detects the presence of gases in an area, often act as part of a safety system. This type of equipment is used to detect a gas leak or other emissions. A gas detector is consist of an alarm to operators in the area where the leak is occurring, giving the working people time for evacuation . This type of device is important to detect many type of harmful gases which effects humans and all living creatures.. Gas detectors can be used to detect combustible, flammable and toxic gases,. This type of device is used widely in industry like oil rigs, manufacture processes. They may be used in fire fighting .Gas leak detection is the process of identifying hazardous gas leaks by using the sensors. The toxic gases can also occur other industries like as painting, fumigation, fuel filling, construction etc



Fig6.Ch4 sensor

6. Heart beat sensor

The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body through that organ. In case of applications where heart pulse rate is to be monitored, the pulse timing is more important. The blood flow volume is decided by the rate of heart pulses and since blood has the ability to absorb light the each single pulse is equaling to heart pulse

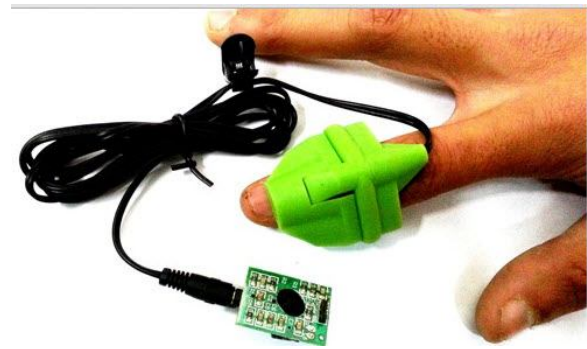


Fig7.Heart Beat sensor

The general this sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed is based on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate .This signal is an DC signal which is corresponding to the tissues and the blood volume. Thus the major process is to separate that AC component. Heartbeat sensor provides an simple way to study the function of the heart which can be measured by the principle of psycho-physiological signal. The amount of the blood in the finger changes with respect to time. The sensor illuminate(i.e an very small LED light) a light lobe through the ear and measures the light that gets transmitted to the Light Dependent Resistor. The amplified signal gets inverted and filtered,within the Circuit. For the calculate of the heart beat rate based on the blood flow to the fingertip, a heart-rate sensor is been setted with the help of LM358 OP-AMP for monitoring the heartbeat pulses.

7. Power Supply

A power supply is an electrical device that supplies electric power to the required electric devices The main function of a power supply is to convert electric current from the source to the voltage, current, and frequency to power the loadas per the requirements. As the, power supplies are sometimes used as an electric power converters. Some power supplies are modeled as separate standalone pieces, while others are designed for the load appliances that they power. Other functions that power supplies are performed are limiting the current drawn by the load to the limited levels, shutting off the flow of current in the time of an electrical fault, and power-factor correction, and storing energy so it can continue to provide the load current in the event of a temporary interruption in the source power. All power supplies have a power input connection, in which it receives

energy in the form of electric current from a source, and one or more power output connections that deliver current to the load.

8. LIFI Receiver

Visible light communication is the term in optical wireless communication system that conveys information by modulating light which is visible to the human eye. Communication is done by switching on and off LED lights at a speed higher than is impossible to predict in human eye, its bcz human eyes can detect changes in light brightness and power, but they cannot predict light that is switched on and off rapidly. A photodiode, is used in case that it can easily recognize the rapid on-off of LED lights. A photodiode is also know as photo detector that produces an electrical current that is proportional to the optical power in the photo detector surface. To make this possible visible-light communication technology that supports both illumination and wireless communication LED's are used. where in RF wireless communication, it requires specialized tools to find a service area, where the VLC service area will be easily detected. The visible spectrum is the part of the electromagnetic spectrum having wavelengths from about 380 nm to 780 nm

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8. Personal computer

A personal computer (PC) is a multi-purpose deiced computer the size, capabilities, and price make it efficient for personal use. PCs are designed to be operated directly by an individual user, except than an computer expert or technician. Computer which are time-sharing models are used with larger ,more expensive microphones, pc's are widely used id day today life for many propose. In industrial applications are much wider in automated devices which are total based on pc's programming. The early designing of pc's

are not more efficient but the development in the design made it more compact and cost efficient .The pc's are able to perform high speed multitasking and simultaneously perform wide range of operations. Pc's are next generation performance and automation improvement systems. In our project pc's are used for data monitoring from the LIFI receiver and transmitting it to the main server for further monitoring of data form the underground tunnels project and gold mining projects.

PROPOSED SYSTEM

The proposed system monitors toxic gas in the environmental, delivers the changes in gold mining using various sensors as mentioned above. Here CH₄ sensor is used to sense the level of methane gas present in the mine and to transmittre the data o the officials about the presence of hazardous gas. If so found iwe can alert the workers by an buzzer. The Heart beat sensor is used to monitor the heartbeat of the worker and these data are transmitted to the monitoring section through VLC to the main pc's. In the gold mining process the toxic level in the atmospheric gas is sensed by CH₄ sensor and displayed in the LCD and if the toxic level exceeds the threshold value the buzzer sound and simultaneously the LIFI transmit the data to the receiver and to the main servers pc. Light fidelity (Li-Fi) technology is introduced to transmit the monitored data. In this Light fidelity technology, we can data transmission and reception in a hazard less manner.

V. RESULT

The result shows that the data transmitted in LIFI is accurate and fast . This reduces the possibility of death due to heart attack in gold mining .

VI. ADVANTAGES

- Fastest and cheapest wireless communication systems
- High density coverage in a confined region
- Speed more than 10 Gbps.

VII. CONCLUSION

This methodology produces effective results with more accuracy for data transmission also. To the best of our knowledge, no such method exists for fast transmission of data in gold mining and all underground projects.

VIII. ACKNOWLEDGEMENT

We would like to thank all those who provide us the possibility to propose this project. A special gratitude to our Project Guide Mrs.C.Shalini Associate professor and Project coordinator Mrs. S. Jeya Anusuya, Associate professor, whose contribution in giving suggestions and encouragement helped us for this project to complete.

REFERENCES

- [1] Thanh V. Pham, Student Member, IEEE, Multi-User Visible Light Communication Broadcast Channels With Zero-Forcing Pre-coding ,Hoa Le-Minh, Member, IEEE, and Anh T. Pham,Senior Member, IEEE
- [2] A Spectral-Efficient Transmission Scheme for Dimmable Visible Light Communication Systems Shancheng Zhao and Xiao Ma
- [3] Lookup: Robust and Accurate Indoor Localization Using Visible Light Communication Gyula Simon, Member, IEEE, Gergely Zachár, and Gergely Vakulya
- [4] Linear Transceiver Designs for MIMO IndoorLight Communications under Lighting Constraints Rui Wang, Qian Gao, Jiayi You,
- [5] Erwu Liu, Ping Wang, Zhengyuan Xu, User-Centric Visible Light Communications for Visible Energy-Efficient Scalable Video Streaming Xuan Li, Yongkai Huo,
- [6] Rong Zhang, Lajos Hanzo Southampton Wireless, School of ECS, University of Southampton, UK xl26g12,yh3g09,rz,lh@ecs.soton.ac.uk.