Li-Fi Based Health Inspector

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Abstract- *Patient health monitoring approach uses WiFi on monitoring contrivances to continuously monitor the health factors. The radio waves emanated by these contrivances are unsafe for the patients who are oversensitive to radio waves want an alternative. The nurses or care takers can't keep an eye on the patients 24X7. Light Fidelity is a reliable way out for this obstruction. Li-Fi is a 5G wireless optical networking technology that take advantage of light-emitting diodes LEDs) for data transmission in a alike as Wi-Fi. The system senses the heart rate, body temperature and stress level of the patient and sends to the doctor through light. The mobile phones on the receiver end could sense the light pulse.*

Keywords- Li-Fi, Wi-Fi, PWM, LOS, LED, ICU, ambient light sensor.

I. INTRODUCTION

Li-Fi works in a different manner. Rather than using radio frequencies, it utilizes visible light to transmit data, which send pulses of light down optical fibres to transmit data. Li-Fi takes the identical standard –relay data via light – but (the clue's in the name) it does it wirelessly. It does this by by means of light from LEDs. The lights are switched on and off at nanosecond speeds, which are extremely too fast for the human eye to see and it's this that carries the data. The LEDs can be swapped on and off millions of times a second, Li-Fi can produce much higher bandwidth than traditional Wi-Fi.
Li-Fi could leverage fibre-to-door providers like Alphabet Access (aka Google Fiber) to supply high-speed wireless internet at the tap of a light switch. It could carry fast, reliable internet access out-of-doors as it beams down from street lamps – for while the light has to be on to carry data, LEDs themselves can be diffused to such a degree that we're hardly aware they're on. But perchance the major insinuation is for the Internet of Things.

The thought of always-on electronics that continuously interface with each other, the web and us is a long-held reverie that may be slowly becoming a truth, but one thing that holds it back is still the relative shakiness of Wi-Fi. With more Wi-Fi devices yelling for bandwidth, their signal-to-noise ratio decreases, dawdling them down and now and then even booting devices off the network altogether.

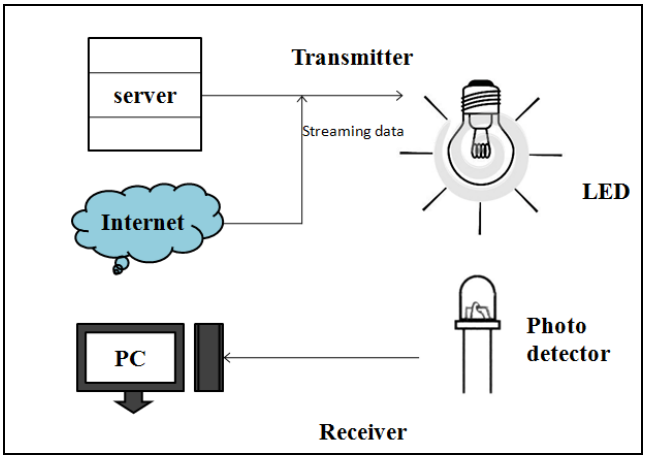

Figure 1. Working of Li-Fi

This slow down the very functions that the Internet of Things is intended for down to a crawl. On the other hand, with Li-Fi, the idea of multiple Android-powered devices communicating to each other all of the time gets one step closer to actuality.

II. LITERATURE SURVEY

Li-Fi can achieve about 1000 times the data density of Wi-Fi and Very high data rate. Li-Fi is particularly used in various applications such as video and audio downloads, live streaming, etc. These applications place heavy demands on the downlink bandwidth, and minimal uplink capacity. By using this technology, majority of the internet traffic is off-loaded from existing RF channels, thus also extending cellular and Wi-Fi capacities [3].

The transmitted data signal is received back at the receiver with reduced noise interference using the transmitter and receiver circuit. On-Off keying modulation technique reduces the power consumption, compared to other modulation techniques. The output voltage and optical power decreases with respect to the increased transmission distance between the transmitter and receiver [5].

There are various modulation techniques are used in VLC, such as Orthogonal frequency-division multiplexing (OFDM), On-off keying(OOK),Pulse-width modulation (PWM),Pulse-position modulation (PPM),Sub-carrier Index Modulation OFDM (SIM-OFDM) modulation techniques etc.

There are some challenges in Li-Fi technology. Light waves can easily be blocked; It requires Line of Sight, etc are the examples [6].
The following table will provide the comparison between Wi-Fi and Li-Fi.

Table .1 comparison between Wi-Fi and Li-Fi

S:no	parameters	Wi-Fi	Li-Fi
1	SPEED	54-250 Mbps	1-3.5 Gbps
2	RANGE	20-100 meters	10 meters
3	NETWORK TOPOLOGY	Point-to-multi point	Point-to-point
4	TRANSMISSION MEDIUM	Light as a carrier	Radio spectrum
5	FREQUENCY BAND	2.4 GHz	100 times of THz

III. SYSTEM DESIGN

The proposed system has two parts. One is transmitter and another one is receiver end. In the transmitter end, Pulse Rate Sensor, Galvanic Skin Response Sensor and temperature sensor are used to monitor health parameters of a bed ridden patient. These sensors are integrated with Arduino UNO microcontroller. The output from the sensors are converted to binary format and send to the LED.

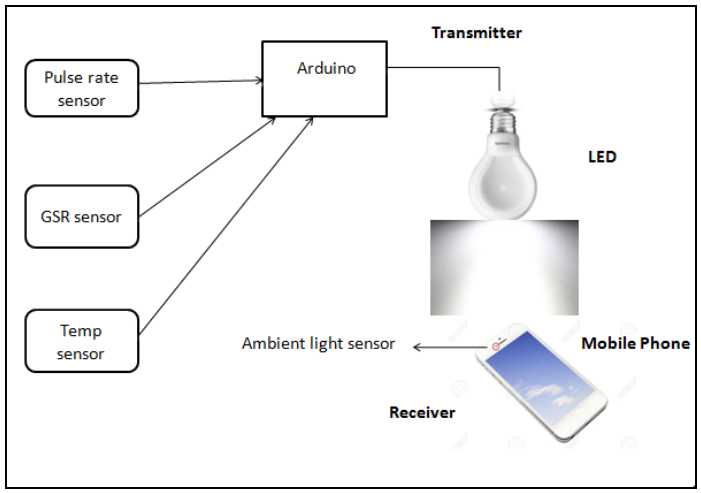

Figure 2. Block diagram for proposed system

Here the parts are arrived and then passed to the machining station 1 by the conveyor and then passed through the next station consequently by the help of mean conveyor belt system and the after the third station they are made into batches and then palletized and then sent into the warehouse for the storing and transportation.

Pulse Width Modulation (PWM) technique is usedfor supplying electrical power to a load that has a relatively slow response. The supply signal consists of a string of voltage pulsations such that the girth of discrete poundings reins the actual voltage level to the capacity. Both AC and DC signal scan be simulated with PWM.

Mobile application is used to receive light signals. By using Ambient Light Sensor the light signals are received. The binary values are converted to decimal one and displayed in the screen.

IV. TRANSMITTER

This system utilizes four sensors to screen different wellbeing parameters. Respiration sensor, Pulse rate sensor, Galvanic skin reaction sensor and Temperature sensor are the different sensors used to screen four essential wellbeing parameters of the confined to bed patient.

Pulse Rate Sensor:

The heartbeat/pulse will be detected and tallied. At that point, the beats every moment will be ascertained. So with a specific end goal to identify the beat we will pass light (utilizing a LED) from one side of the finger and measure the intensity of light obtained on the opposite side (utilizing a LDR).

At whatever point the heart pumps blood all over light is consumed by expanded platelets and we will watch a change in the force of light obtained on the LDR. Thus the resistance estimation of the LDR increments. This variety in resistance is changed over into voltage variation using a signal conditioning circuit generally an OP-AMP.

Galvanic skin response sensor:

In skin conductance reaction technique, conductivity of skin is measured at fingers of the palm. The rule or hypothesis behind working of galvanic reaction sensor is to gauge electrical skin resistance in view of sweat delivered by the body.

At the point when abnormal state of sweating happens, the electrical skin resistance drops down. A dryer skin records substantially higher resistance. The skin conductance reaction sensor measures the psycho galvanic reflex of the body.

Temperature sensor:

The course of specific infections can be checked by measuring body temperature, and the effectiveness of a

treatment started can be assessed by the doctor. Diverse parts of the body have distinctive temperatures. The normally acknowledged normal center body temperature (taken inside) is 37.0°C (98.6°F).

V. RECEIVER

Mobile phones are used as a receiver module. The ambient light sensor in the mobile phone has an ability to receive light signals. It will act as a photo detector.

Ambient light sensor:

Figure 3. Ambient light sensor

Ambient light feelers are utilized as tail lighting controls in any number of LCD display products from customer electronics to locomotive, and by automatically adjusting display brightness, they can conserve battery life, which is a key benefit in mobile device applications.

By using this sensor, the light signals are received. A mobile application was developed to convert this light signals into a binary data and displayed the values of the four sensors such as air flow,pulse rate,temperature and stress level in the monitor.

It is possible to transmit data using visible light as a medium. By doing same modifications in the basic circuit such as usage of 10w cool white LED as a transmitter, it will also be probable to transfer higher class of data such as videos and sound distant from just text or simple bits. By using the ambient light sensor in the mobile phone, light signals will be received.

VI. RESULTS AND DISCUSSIONS

This type of communication will also reduce the risks off radiation hazards and can be used almost anywhere even at places such as hospitals, nuclear power stations, etc where electronic devices are banned due to the fear of radiation. This technology can also be used to replace the existing Wi-Fi system to connect to the internet. The distance between the transmitter and receiver is 21cm. Reliable transmission can be achieved by using the health monitoring sensors.

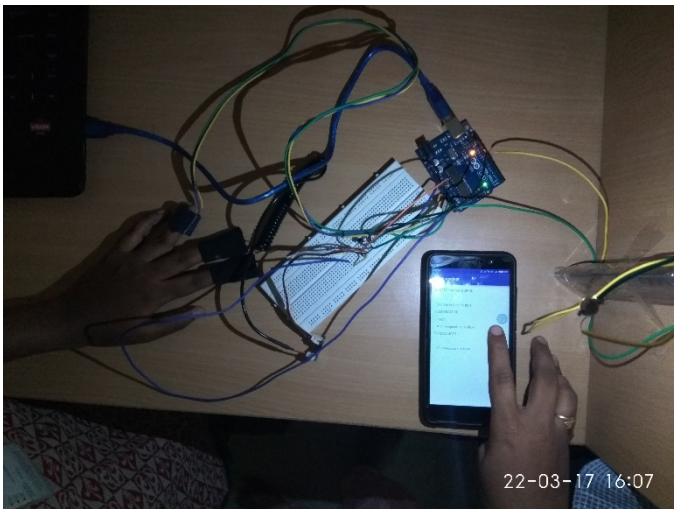

Figure 4. Monitoring System

V. CONCLUSION

The system was implemented successfully and data transmission through illumination is achieved. This prototype can be enhanced to any application like vehicle to vehicle communication, internet connectivity and so on. Data can be received by using mobile phones with the help of ambient light sensor. Distance between the light source and the receiver has been achieved to 21cm using this system. The system can be enhanced further to increase the distance that can be covered up to 150 cm.

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