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# Health Care Monitoring System Using Visible Light Communication

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***Abstract:***
***This research work is based on the visible light communication system for patient's health monitoring. The existing system it's based on Wi-Fi, the drawback of the existing system is due to a huge increase in scalability turns into slow speed. To overcome this, Visible light communication technology is used to transmit data ultimately via an LED luminaires that fluctuate more quickly than the human eye in the intensity.***

***In this research work, by using sensors we will monitor the patient's health condition and the output is displayed using LCD and these data are transmitted in the form of light using an LED light bulb. At the receiver end, Photo-detector collects the transmitted data and displays the output using LCD and gives a beep sound for every 15sec(respiration) and 30sec(heartbeat) using a buzzer to warn/alerts the caregivers. This helps in patient's health monitoring using the visible light communication technique rather than using previous technologies which leads the frequency intercession with the human body.***
***Keywords: LI-FI, VLC, Healthcare monitoring, patient's condition, light emitting diode bulb.***

## 1. INTRODUCTION:

Transmitting the data from one place to another place is the most important factors in real world activities. All the devices are connected wirelessly for transmission of data, by that the usage of device will increase in its density which will lead the Radio frequency signal to inactive. And further increase in devices will still reduce the strength of internet make it difficult and reduce the high data rates and to connect with the limited bandwidth available.

We all know that Everybody now-a-days wants to use mobile phone, laptop, to get connected with Wi-Fi, and this Wi-Fi technology is widely used in every public area, such as home, cafe, hotel and airport by people and the time usage of Wi-Fi systems is growing exponentially every year, but capacity is decreasing.

To get further improve from existing radio frequency based wireless communication. It is preferable for Visible light communication, since it uses visible light is a carrier for transmitting the data's (380-780nm). it's the new technology, by huge availability of spectrum allows the visible light communication system to reach high data rates.
Why the existing RF based Wi-Fi system should be replaced is that Our research was to give safer health communication system applications. The equipment used in hospitals and other vital locations is obsolete and therefore needs to be replaced by radio frequency (RF) signals

by a better communication device. A system that uses Light to connect to networks and is not hazardous by using Visible Light Communication (VLC). Reduced space on the RF spectrum, which is becoming more limited every day, is a significant reason to start using VLC systems. As the scope is less long than RF signals, it's much more likely that VLC systems will be introduced.

*1.1 Visible Light Communication*

VLC devices utilize visible light for communications spanning the spectrum with frequency range 380 nm to 750 nm, which corresponds 430THz to 790THz as shown in Figure 1.1. VLC systems have visible light in use. The low bandwidth problem in RF transmission is overcome in VLC because of the large-bandwidth capacity which is given in the figure. The VLC receiver absorbs the signals if both the transmitter and receivers are connected in the same room. If the receiver is outside the room, receiver cannot obtain the transmitted signal. And also the benefit of visible light source is that it can be utilized for both illumination and communication, which will save extra power utilized for the RF communication.

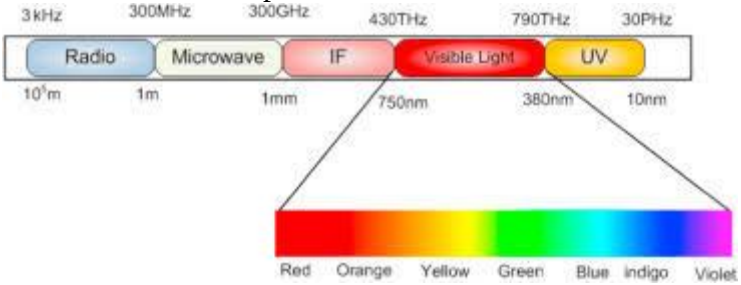


Figure 1.1 VLC frequency spectrum

While implementing VLC there are some issues faced these are

(a) Interference of light with other light source
(b) Integrating VLC over existing technologies such as WI-FI etc.
(c) Interference between VLC devices.

2. PROBLEM STATEMENT:

In the early decades, the situation was similar to a huge number of patients throughout special care units including ICU's with a limited availability of physicians, so that a nurse or doctor was necessary to attend each patient in separate wards. Thus, the patient cannot be monitored continuously so that the following problem is evolved:

- Patient couldn't be found in time and can't be helped in time.
- Human attention is required for each patient.
- Time consuming patient monitoring.
- Wi-Fi is restricted in operation theatre.
- Huge demand for bandwidth and radio spectrum.
- Wi-Fi creates a frequency overlapping issue.
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**2. PROPOSED MODEL:**

The proposed model requires Transmitter, Receiver and various sensors which is used for observing human body changes are developed. The interfacing the biomedical sensors with Li-Fi board is demonstrated by hardware is as shown in figure 3.1.

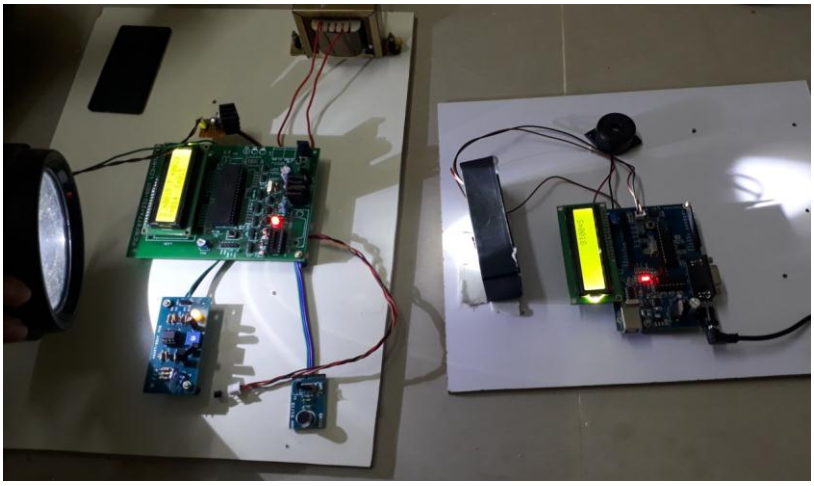

Figure 3.1 Hardware setup of HMS using VLC

*2.1 Transmitter Section:*

Transmitter section consists of step-down transformer which is used to converting the available voltage to required voltage (230V-5V), a bridge rectifier, a voltage regulator, a filter capacitor. With this sensors like Heartbeat, Temperature and sound sensors. These sensors are connected to PIC16F877A, it's a low power consuming high performance microcontroller with system memory of 8KB. The reason for selection of PIC16F877A is it is inbuilt with UART, which can be used for serial communication. Figure3.1.1 shows the proposed block diagram for Transmitter section of Healthcare monitoring system using VLC.

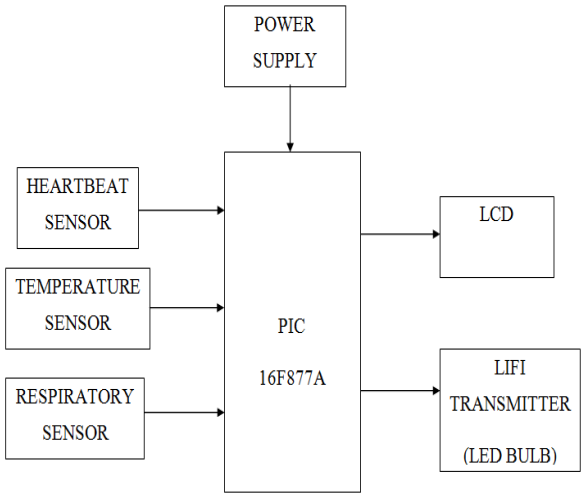


Figure 2.1.1 Block Diagram Of Transmitter

Figure 2.1.2 Working Model Of Transmitter For HMS Using VLC

*2.2 Receiver section:*

This section is also known as monitoring section because the patient's results are monitored from time to time through LCD. Receiver section consists of photo detector, Arduino UNO328P, LCD and buzzer. A photo detector works as a converter for converting the transmitting light source to electricity. The received electric signal won't be sufficient for signal processing because it will be weak and over noise so it need to be amplified. For modulating the signal An envelope detector and a low pass filter are further used, arduino UNO328P can work with digital signal so voltage comparator is used to convert signal into digital format. Figure 3.2.1 shows the proposed block diagram for Receiver section of Healthcare monitoring system (HMS) using VLC.

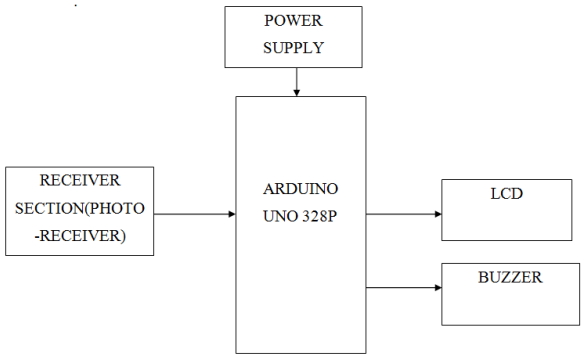


Figure 2.2.1 Block Diagram Of Receiver

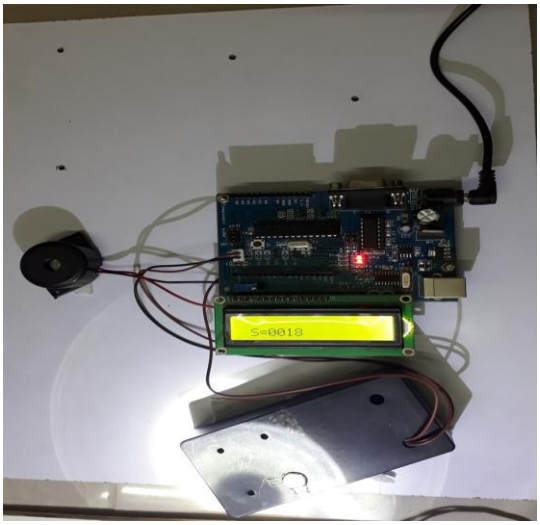


Figure 2.2.2 Working Model Of Receiver

## 3. LIMITATIONS

1. Line Of Sight must be perfect to transmit and receive the data.
2. Light beams do not have a long range
3. A whole new infrastructure for Li-Fi would need to be constructed.
4. Light can't penetrate through bricks or walls, so it can used only in a single room.

## 4. CONCLUSION

Li-Fi is best suitable platform in future healthcare services in the hospital. Using Li-Fi technology Patient monitoring can be done efficiently. In this paper, the demonstration of VLC in HMS is explained. It is clear that VLC can successfully use as safe and secure a high-speed data processing to monitoring temperature, heartbeats, respiration of human body. The best thing of using VLC over other thing is that it reduces the interference of radio signal with human body. In the future this proposed system can be used to monitor many patients. Every light in the health centers can be used to monitor the patient condition and also, if proposed system successfully implemented it could be a biggest achievement in medical industry.

## REFERENCES

[1] O.D. Alao, J. V Joshua, A.S Franklyn, O. Komolafe “Light Fidelity (Li-Fi): An Emerging Technology for The Future” IOSR Journal of Mobile Computing Application (IOSR-JMCA) e-ISSN: 2394-0050, P-ISSN: 2394-0042.Volume 3, Issue 3. (May. - Jun. 2016), PP 18-28.

[2] Pawar, A. Anande, A. Badhiye, I. Khatua ’Li-Fi’: Data Transmission through illumination International Journal of Scientific Engineering Research, Volume 6, Issue 10, October-2015.

[3] Ankit Navalakha, NeeluMaheshwari, “Data Services of Li- Fi in Hospital Management”, International Journal of Science and Research (IJSR) 2015.

[4] Syrian Arab Republic: Overview Li-Fi Technology ,Higher Institute for Applied Sciences and Technology Communications Department, Technical Report , April 2015

[5] Kalpana.P.M, "Design and Development of PIC Microcontroller based Wireless Architecture for Human Health Monitoring", International Journal of Innovative Research in Science, Engineering and Technology Vol. 4, Issue 4, April 2015.

[6] Dr. Harald Haas, " wireless data from every light bulb ", TED Global, Edinburgh, July 2011.

[7] Maurya Katta : A Secure Li-Fi Modern Healthcare System Using Body Sensor Network, International Journal of Pure and Applied Mathematics Volume 119 No. 12 2018, 13135-13142.

[8] Harald Haas, Liang Yin,: 'What is Li-Fi?' published in journal of light wave technology, Volume: 34, Issue:6, March 15, 2016.

[9] Kalpana.P.M, "Design and Development of PIC Microcontroller based Wireless Architecture for Human Health Monitoring", International Journal of Innovative Research in Science, Engineering and Technology Vol. 4, Issue 4, April 2015.

[10] Birgit Wilhelm , Senait Forst , Matthias M. Weber , Martin Larbig , Andreas Pftzner , Thomas Forst "Evaluation of CGMS During Rapid Blood Glucose Changes in Patients with Type 1 Diabetes", Diabetes Technology and Therapeutics 8:2, 2006, pp.146-155

[11] MohitHapani, Mangesh Joshi and RajkumarMaradia, "Secured li-fi (secured visible light communication", International Journal of Students Research in Technology and Management Vol 1, No.05, September 2013, ISSN 2321-2543 2015.

[12] Meria M George, Nimmy Mary Cyriac Sobin Mathew, "Patient Health Monitoring System using IOT and Android", Journal for Research— Volume 02— Issue 01 — March 2016.