



**INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
NAGPUR**

DIGITAL COMMUNICATION ECL(306)

Project report on:

**LIGHT AMPLITUDE MODULATION TECHNIQUE
-PROTOTYPE OF LIFI TECHNOLOGY**

Faculty:

Prof. Tapan kumar Jain

Submitted by:

Kartik Kinge [BT16ECE003]

Rohit Agrawal [BT16ECE015]

Aruna Mallela [BT16ECE016]

CONTENTS

Sr No	Topic	Page No
1	Abstract	2
2	Introduction	2
3	Components Required	3
4	Prototype Working	4
5	Project Picturesz	5
6	Applications of LiFi Technology	6
7	Disadvantages of LiFi Technology	6
8	Results	6
9	Conclusions	6
10	Future Scope	7
11	Bibliography	7

ABSTRACT

Li-Fi, a short form for Light Fidelity, is a wireless technology that makes use of visible light communication instead of radio waves. In this, common household LED bulbs can be utilised to allow data transfer with a speed of up to 224 gigabits per second, which equates to downloading around 18 movies each of 1.5 GB in every single second. As more and more people and their many devices access wireless internet, clogged airwaves are going to make it.

This term was coined by Professor Harald Haas during a TED TALK in the year 2011. Basically, with this technology, people will be able to use light bulbs and solar cells as wireless routers for transmitting data. He even set up a company named pureLiFi in 2012 and aims to be the world leader in Visible Light Communications technology.

INTRODUCTION

LiFi is transmission of data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb that varies in intensity faster than the human eye can follow.

Very simply, if the LED is on, you transmit a digital 1, if it's off you transmit a 0. It is possible to encode data in the light by varying the rate at which the LEDs flicker on and off to give different strings of 1s and 0s. The LED intensity is modulated so rapidly that human eye cannot notice, so the output appears constant. More sophisticated techniques could dramatically increase VLC data rate

Light is inherently safe and can be used in places where radio frequency communication is often deemed 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, but can also enable novel application. The visible light spectrum is unused; it's not regulated, and can be used for communication at very high speeds.

COMPONENTS REQUIRED

Components	Quantity
Solar panel	1
resistors	2
LEDs	3
Arduino UNO	1
Arduino Cable	1
Aux cables	1
Connecting wires	

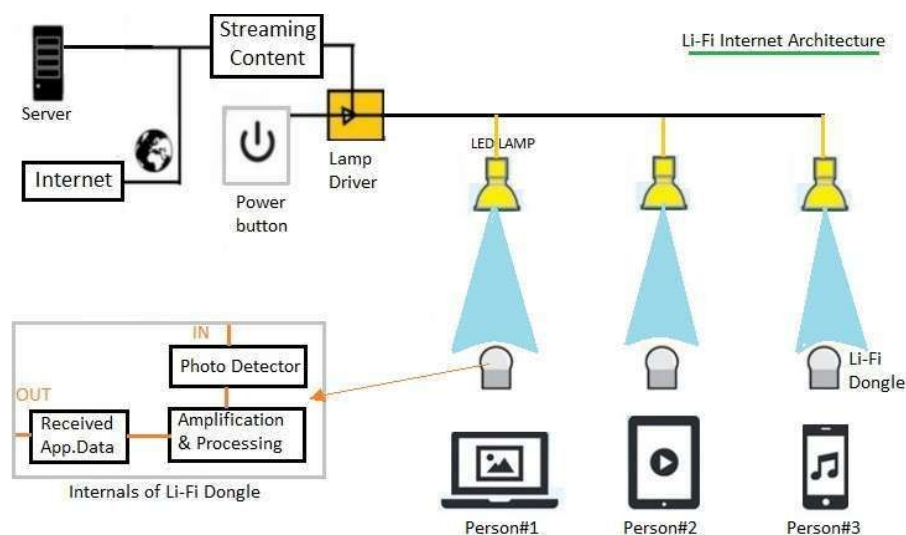
PROTOTYPE WORKING

When a constant current source is applied to an LED bulb, it emits a constant stream of photons observed as visible light. When this current is varied slowly, the bulb dims up and down. As these LED bulbs are semiconductor, the current and optical output can be modulated at extremely high speeds that can be detected by a photo-detector device and converted back to electrical current.

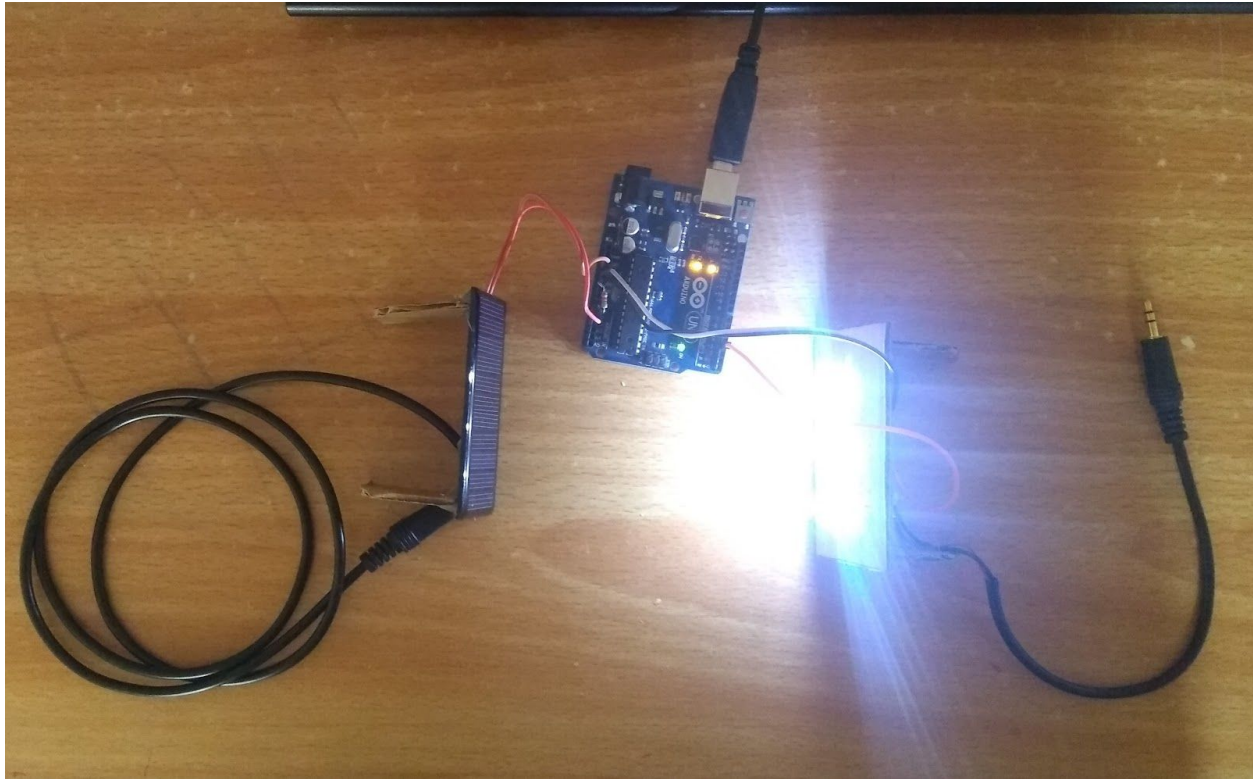
The intensity modulation is too quick to be perceived with the human eye and hence the communication seems to be seamless just like RF. So, the technique can help in transmitting high-speed information from an LED light bulb. However, it's much simpler, unlike RF communication which requires radio circuits, antennas, and complex receivers.

Li-Fi uses direct modulation methods similar used in low-cost infrared communications devices like remote control units. Moreover, infra-red communication has limited powers due to safety requirements while LED bulbs have intensities high enough to achieve very large data rates.

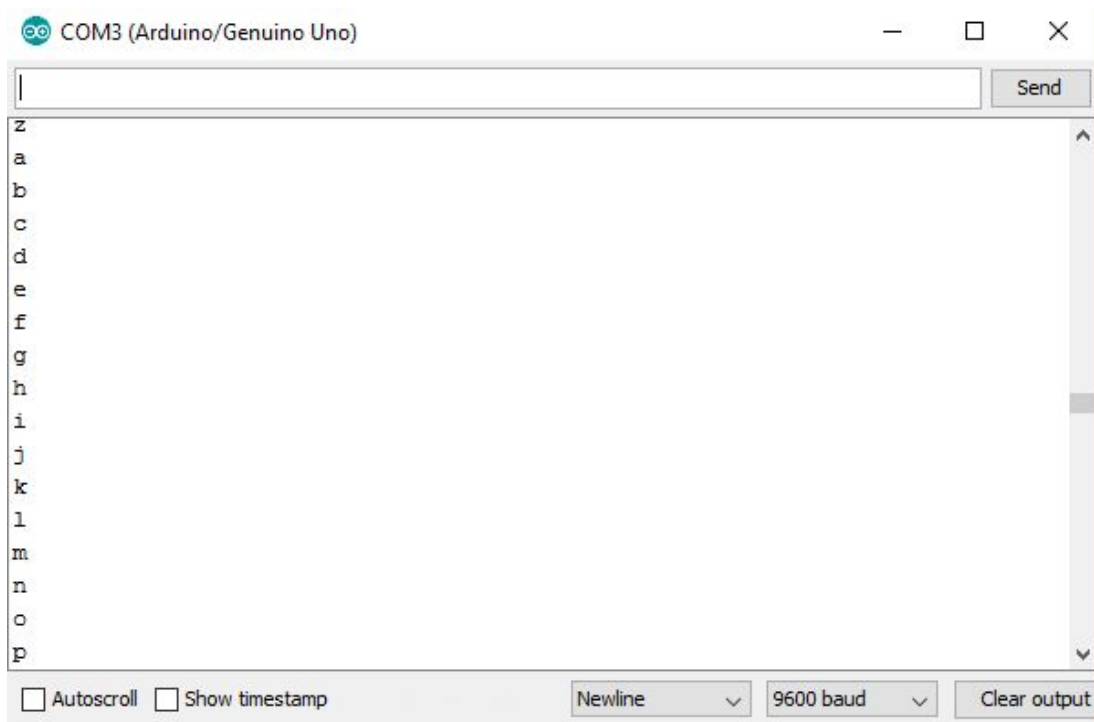
What we are doing is making a voltage divider from the arduino's 5V pin to GND, using a fixed resistor and a photoresistor. The voltage between these two resistors is then read by an analog pin. When light shines on the solar panel, it's value drops and a bigger part of the 5V from the arduino drops over the fixed value resistor. Hence getting the analog output which is proportional to input light intensity.



PROJECT PICTURES



Lifi in Working (Top View)



Output display at Serial Port

APPLICATIONS OF LIFI TECHNOLOGY

- Can be used in the places where it is difficult to lay the optical fiber like hospitals. In operation theatre LiFi can be used for modern medical instruments.
- In traffic signals LiFi can be used which will communicate with the LED lights of the cars and accident numbers can be decreased.
- Thousand and millions of street lamps can be transferred to LiFi lamps to transfer data.
- In aircraft LiFi can be used for data transmission.
- It can be used in petroleum or chemical plants where other transmission or frequencies could be hazardous.

DISADVANTAGES OF LI-FI TECHNOLOGY

- Internet cannot be used without a light source. This could limit the locations and situations in which Li-Fi could be used.
- Because it uses visible light, and light cannot penetrate walls, the signal's range is limited by physical barriers.
- Other sources of light may interfere with the signal. One of the biggest potential drawbacks is the interception of signals outdoors. Sunlight will interfere the signals, resulting in interrupted Internet.
- A whole new infrastructure for Li-Fi would need to be constructed

RESULT

The working demonstration of LiFi was successfully demonstrated with transfer speed of **160 bytes/sec**.

CONCLUSION

The possibilities are numerous and can be explored further. If this technology can be put into practical use, every bulb can be used something like a Wi-Fi hotspot to transmit wireless data and we will proceed toward the cleaner, greener, safer and brighter future

FUTURE SCOPE

- Problem of syncing between two arduinos should be solved
- Error correction code can be added
- Implementing Manchester coding along with defined protocol can solve the syncing issue of two devices.

BIBLIOGRAPHY

- <https://en.wikipedia.org/wiki/Li-Fi> dated 15th November 2018
- <https://www.techworld.com/data/what-is-li-fi-everything-you-need-know-3632764> dated 15th November 2018
- Books: Digital Communication By Simon Hykin