Best projects 2018-19

A Project Report On

Li-Fi based Data Transmission System

Submitted in partial fulfilment of the Requirement for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

By

B.ROHAN KUMAR (15911A0465)
K. ASHOK YADAV (15911A0473)
Ch. GEETANJALI (15911A0467)
A. MANOJ GOUD (14911A04B5)

Under the guidance of

Mr. G. Aswini Kumar M.Tech

Assistant Professor

Department of Electronics & Communication Engineering

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

(Permanently affiliated to JNTUH, NAAC accredited, Hyderabad)

Aziz Nagar, Hyderabad

(2018-2019)

A Project Report On

Li-Fi based Data Transmission System

Submitted in partial fulfilment of the Requirement for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

By

B.ROHAN KUMAR (15911A0465)
K. ASHOK YADAV (15911A0473)
Ch. GEETANJALI (15911A0467)
A. MANOJ GOUD (14911A04B5)

Under the guidance of

Mr. G. Aswini Kumar M.Tech

Assistant Professor

Department of Electronics & Communication Engineering

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

(Permanently affiliated to JNTUH, NAAC accredited, Hyderabad)

Aziz Nagar, Hyderabad

(2018-2019)

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology,
Hyderabad-500075

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

(Autonomous)

Aziz Nagar, C.B. post, RR Dist, 500075

CERTIFICATE

This is to certify that the project work entitled **"LIFI BASED DATA TRANSMISSION SYSTEM"** is a bonafide work carried out by **B.ROHAN KUMAR 15911A0465, K.ASHOKYADAV 15911A0473, Ch.GEETHANJALI 15911A0467, A.MANOJ GOUD 14911A04B5** in partial fulfillment of the requirements for the award of degree of **BACHELOR OF TECHNOLOGY IN ELECTRONICS AND COMMUNICATION ENGINEERING** by the **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY**, Hyderabad, under our guidance and supervision.

The results embodied in this report have not been submitted to any other university or institute for the award of any degree or diploma.

Internal Supervisor
Dept Of ECE
Hyderabad

Head Of The Department
Dept Of ECE
Hyderabad

External Examiner

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

DECLARATION

This is to certify that the work reported in the present project entitled "**LIFI BASED DATA TRANSMISSION SYSTEM**" is a record of work done by us in the Department of Electronics and Communication Engineering, Vidya Jyothi Institute of Technology, Jawaharlal Nehru Technological University, Hyderabad. The reports are based on the project work done entirely by us and not copied from any other source.

B.ROHAN KUMAR	**(15911A0465)**
K.ASHOK YADAV	**(15911A0473)**
Ch.GEETHANJALI	**(15911A0467)**
A.MANOJ GOUD	**(14911A04B5)**

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

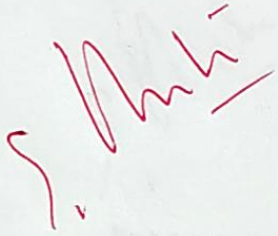
ACKNOWLEDGEMENT

We would like to express our sincere gratitude and indebtedness to my project supervisor for his valuable suggestions and interest throughout the course of this project

We are also thankful to Head of the Department for providing excellent infrastructure and a nice atmosphere for completing this project successfully.

We convey our heartfelt thanks to the lab staff for allowing me to use the required equipment whenever needed.

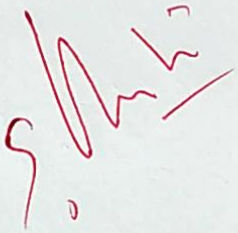
Finally, We would like to take this opportunity to thank my family for their support through the work. We sincerely acknowledge and thank all those who gave directly or indirectly their support in completion of this work.



Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

ABSTRACT

This paper presents a design and system implementation of new home automation system that uses Li-Fi technology as a network infrastructure. The proposed system consists of two main components; the first part is the web server, which presents core that controls, manages and monitors users home. The Users and administrator can locally or remotely manages and controls system code. The next part is hardware interface module, which provides appropriate interface between the sensors and the actuator of home automation system. Unlike most of existing home automation system in the market, the proposed one is scalable that a server can manage many hardware interface modules as long as it exists on Li-Fi network coverage. The proposed system is scalable, flexible and low of cost than the commercially available home automation systems.



Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

TABLE OF CONTENT

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

LIST OF FIGURES

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

LIST OF TABLES

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

CHAPTER-1
INTRODUCTION

Over the past few years there has been a rapid growth in the utilization of the RF region of the electromagnetic spectrum. This is because of the huge growth in the number of mobile phones subscriptions in recent times. This has been causing a rapid reduction in free spectrum for future devices. Light-fidelity (*Li-Fi*) operates in the visible light spectrum of the electromagnetic spectrum i.e. it uses visible light as a medium of transmission rather than the traditional radio waves.

Li-Fi stands for Light-Fidelity. *Li-Fi* is transmission of data using visible light by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. If the LED is on, the photo detector registers a binary one; otherwise it"s a binary zero. The idea of *Li-Fi* was introduced by a German physicist, Harald Hass, which he also referred to as "Data through Illumination". The term *Li-Fi* was first used by Haas in his TED Global talk on Visible Light Communication. According to Hass, the light, which he referred to as ..DLight", can be used to produce data rates higher than 1 Giga bits per second which is much faster than our average broadband connection.

The high speed achievement of *Li-Fi* can be explained using frequency spectrum of Electromagnetic Radiations. From the electromagnetic spectrum we can see that the frequency Band of the visible light is in between 430THz to 770THz and that of Radio Frequency Band is in between 1Hz to 3THz. Hence the Frequency Bandwidth of the visible light is about 400 Times greater than the Radio Frequency Bandwidth. So more Number of bits can be transferred through this Bandwidth than in the radio frequency bandwidth. Hence Data rate will be higher in the *Li- Fi* and higher speed can be achieved. Using *Li-Fi* we can transmit any data that can be transferred using conventional *Wi-Fi* network. That can be Images, Audio, Video, Internet connectivity, etc.. but the advantages over the *Wi-Fi* Network are High speed, Increased Security, More Number of Connected Devices, and Less cost. In coming years number of devices that

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

support *Li-Fi* will hit the Market. It is estimated that the compound annual growth of *Li-Fi* market will be of 82% from 2015 to 2018 and to be worth over $6 billion per year by 2018.

1.1.Architecture of Li-Fi system

Li-Fi which can be the future of data communication appears to be a fast and cheap optical version of Wi-Fi. Being a Visible Light Communication (VLC), Li-Fi uses visible light of electromagnetic spectrum between 400 THz and 800 THz as optical carrier for data transmission and illumination. It uses fast pulses of light to transmit information in wireless medium. The main components of a basic Li-Fi system may contain the following:

a) A high brightness white LED which acts as transmission source.

b) A silicon photodiode with good response to visible light as the receiving element.

Switching the LEDs on and off can make them generate digital strings with different combination of 1s and 0s. To generate a new data stream, data can be encoded in the light by varying the flickering rate of the LED. In this way, the LEDs work as a sender by modulating the light with the data signal. The LED output appears constant to the human because they are made to flicker at a phenomenal speed (millions of times per second) and it's impossible for human eye to detect this frequency. Communication rate more than 100 Mbps can be achieved by using high speed LEDs with the help of various multiplexing techniques. And this VLC data rate can be further increased to as high as 10 Gbps via parallel data transmission using an array of LED lights with each LED transmitting a different data stream.

The Li-Fi transmitter system comprises of four primary subassemblies:

- Bulb
- RF Power Amplifier Circuit (PA)
- Printed Circuit Board (PCB)

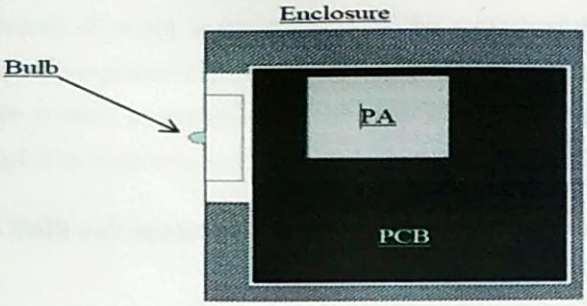


Fig 1.1: Block Diagram of Li-Fi sub-assemblies.

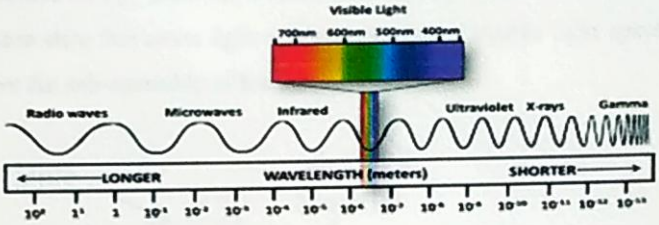


Fig 1.2 Electromagnetic Spectrum

This Mini Project discusses the implementation of the most basic *Li-Fi* based system to transmit Sound signal from one device to another through visible light. The purpose is to demonstrate only the working of the simplest model of *Li-Fi* with no major consideration about the data transfer speed. This model will demonstrate how the notion of one-way communication via visible light works, in which Light emitting diodes (LEDs) are employed as the light sources or Transmitter antennas. The model will transmit digital signal via direct modulation of the light. The emitted light will be detected by an optical receiver. In addition to the demonstration purpose, the model enables investigation into the features of the visible light and LEDs incorporated in the communication model.

The Printed circuit board (PCB) controls the electrical inputs and outputs of the lamp and houses the microcontroller used to manage different lamp

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

functions. A Radio Frequency (RF) signal is generated by the Power Amplifier and is directed into the electric field of the bulb. As a result of the high concentration of energy in the electric field, the contents of the bulb will get vaporized into a plasma state at the bulb's centre. And this controlled plasma in turn will produce an intense source of light. All of these subassemblies are contained in an aluminium enclosure as shown in Fig. 2 above.

1.2.Li-Fi Bulb sub-assembly

The bulb sub-assembly is the main part of the Li-Fi emitter. It consists of a sealed bulb embedded in a dielectric material which serves two purposes: one, it acts as a waveguide for the RF energy transmitted by the PA (Power Amplifier) and two, it acts as an electric field concentrator that focuses the energy into the bulb. The collected energy from the electric field rapidly heats the material in the bulb to a plasma state that emits light of high intensity of Visible light spectrum. Figure 3 shows the sub-assembly of the bulb.

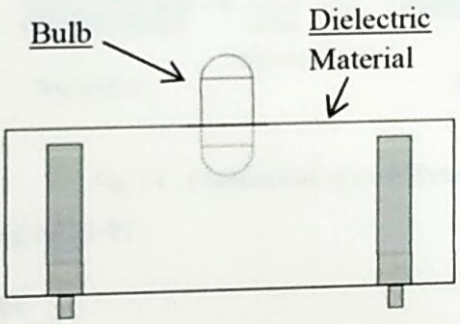


Fig 1.3:LiFi bulb sub assembly

There are various inherent advantages of this approach which includes high brightness, excellent colour quality and high luminous efficacy of the emitter – in the range of 150 lumens per watt or greater. The structure is mechanically robust without typical degradation and failure mechanisms associated with tungsten electrodes and glass to metal seals, resulting in useful lamp life of 30,000+ hours. In addition, the unique combination of high temperature plasma and digitally controlled solid state electronics results in an economically produced family of

lamps scalable in packages from 3,000 to over 100,000 lumens.

Important factors that should be considered while designing Li-Fi are as follows:

1) Presence of Light

2) Line of Sight (Los)

3) for better performance use fluorescent light & LED

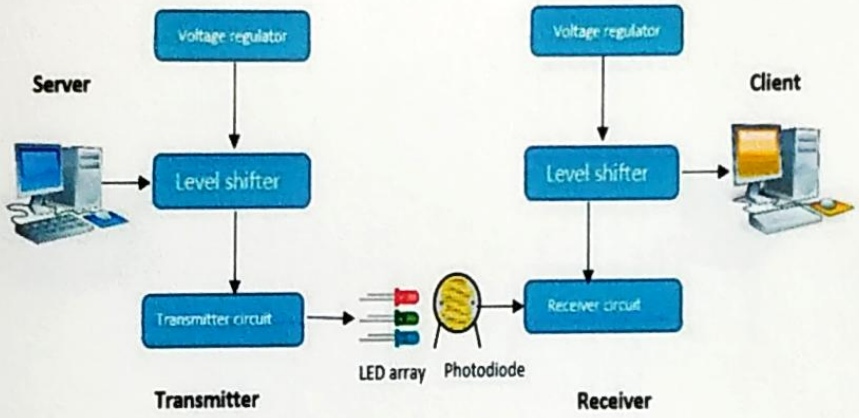


Fig 1.4 : Construction of Li-Fi System

1.3.Working of Li-Fi

Basic Concept

Light Fidelity (Li-Fi) technology is a wireless communication system based on the use of visible light between the violet (800 THz) and red (400 THz). Unlike Wi-Fi which uses the radio part of the electromagnetic spectrum, Li-Fi uses the optical spectrum i.e. Visible light part of the electromagnetic spectrum. The principle of Li-Fi is based on sending data by amplitude modulation of the light source in a well-defined and standardized way. LEDs can be switched on and off faster than the human eyes can detect since the operating speed of LEDs is less than 1 microsecond. This invisible on-off activity enables data transmission using binary codes. If the LED is on, a digital '1' is transmitted and if the LED is off, a

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

digital '0' is transmitted. Also these LEDs can be switched on and off very quickly which gives us a very nice opportunity for transmitting data through LED lights, because there are no interfering light frequencies like that of the radio frequencies in Wi-Fi. Li-Fi is thought to be 80% more efficient, which means it can reach speeds of up to 1Gbps and even beyond. Li-Fi differs from fibre optic because the Li-Fi protocol layers are suitable for wireless communication over short distances (up to 10 meters). This puts Li-Fi in a unique position of extremely fast wireless communication over short distances.

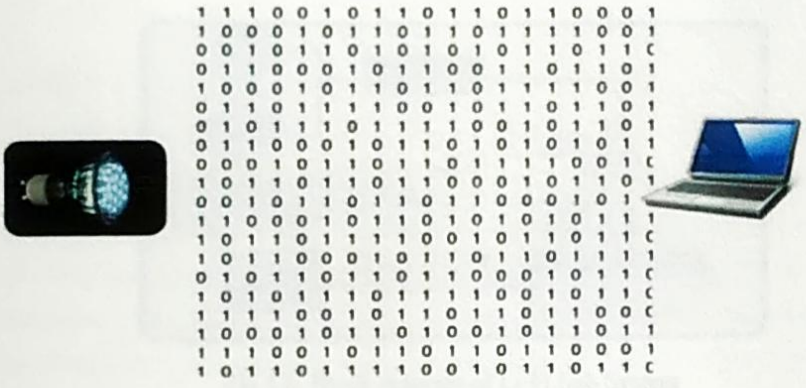


Fig 1.5 lifi transmission

How it Works

The working of Li-Fi is very simple. There is a light emitter on one end i.e. an LED transmitter, and a photo detector (light sensor) on the other. The data input to the LED transmitter is encoded in to the light (technically referred to as Visible Light Communication) by varying the flickering rate at which the LEDs flicker 'on' and 'off' to generate different strings of 1s and 0s. The on- off activity of the LED transmitter which seems to be invisible (The LED intensity is modulated so rapidly that human eye cannot notice, so the light of the LED appears constant to humans), enables data transmission in light form in accordance with the incoming binary codes: switching ON a LED is a logical '1', switching it OFF is a logical '0'. By varying the rate at which the LEDs flicker on and off, information can be encoded in the light to different combinations of 1s and 0s.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

In a typical setup, the transmitter (LED) is connected to the data network (Internet through the modem) and the receiver (photo detector/light sensor) on the receiving end receives the data as light signal and decodes the information, which is then displayed on the device connected to the receiver. The receiver (photo detector) registers a binary '1' when the transmitter (LED) is ON and a binary '0' when the transmitter (LED) is OFF. Thus flashing the LED numerous times or using an array of LEDs (perhaps of a few different colours) will eventually provide data rates in the range of hundreds of Mbps. The Li-Fi working is explained in a block diagram (Fig.6).

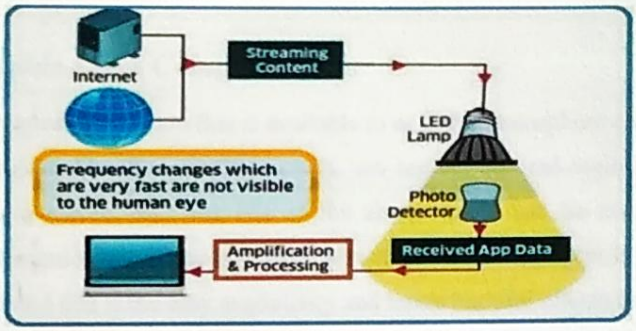


Fig 1.6: Block diagram of Li-Fi Sub System

Hence all that is required, is some or an array of LEDs and a controller that controls/encodes data into those LEDs. All one has to do is to vary the rate at which the LEDs flicker depending upon the data input to LEDs. Further data rate enhancements can be made in this method, by using array of the LEDs for parallel data transmission, or using mixtures of red , green and blue LEDs to alter the light's frequency, with each frequency encoding a different data channel. Figure 7 shows working/deployment of a Li-Fi system connecting the devices in a room.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

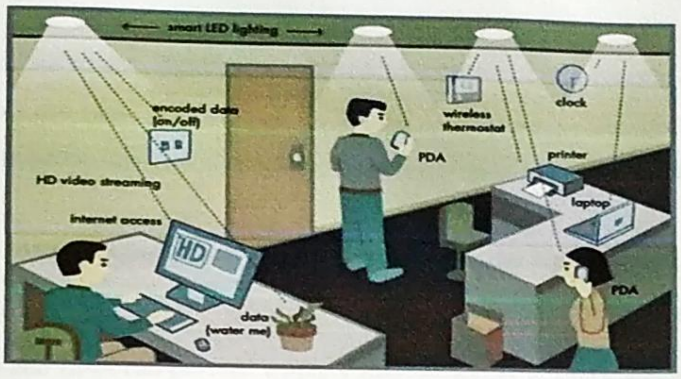


Fig 1.7: Li-Fi system connecting devices in a room

1.4.Why Visible Light Communication

The frequency spectrum that is available to us in the atmosphere consists of many wave regions like X-rays, gamma rays, u-v region, infrared region, visible light rays, radio waves, etc. Any one of the above waves can be used in the upcoming communication technologies but why the Visible Light part is chosen? **The reason behind this is the easy availability and lesser harmful effects that occur** due to these rays of light. VLC uses the visible light between 400 THz (780 nm) and 800 THz (375 nm) as medium which are less dangerous for high-power applications and also humans can easily perceive it and protect themselves from the **harmful effects whereas the other wave regions have following disadvantages:-**

- Radio waves are expensive (due to spectrum charges) and less secure (due to interference and possible interception etc.)
- **Gamma rays are harmful because it could be dangerous dealing with** it, by the human beings due to their proven adverse effects on human health.
- X-rays have health issues, similar to the Gamma Rays.
- Ultraviolet light can be considered for communication technology purposes at place without people, otherwise they can also be dangerous for the human body when exposed continuously.
- Infrared, due to high safety regulation, can only be used with low power.

Hence the Visible light portion (from red to blue) of the electromagnetic spectrum does not cause any harm to the people as visible rays are safe to use, provide larger bandwidth and also have a promising future in the communication field.

Comparison Between Li-Fi and, Wi-Fi and other Radio Communication technologies

Both Wi-Fi and Li-Fi can provide wireless Internet access to users, and both the technologies transmit data over electromagnetic spectrum. Li-Fi is a visible light communication technology useful to obtain high speed wireless communication. The difference is: Wi-Fi technology uses radio waves for transmission, whereas Li-Fi utilizes light waves. Wi-Fi works well for general wireless coverage within building/campus/compound, and Li-Fi is ideal for high density wireless data coverage inside a confined area or room and is free from interference issues unlike the Wi-Fi.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

CHAPTER 2
LITERATURE REVIEW

PROPOSED SYSTEM

In the process of home automation through the visible light consists of both hardware and software implementation.

One of the widely used devices in this project is ARDUINO UNO. It is most convenient to use. the coding or programming of this controller is also easier. One of the main advantages is that it can be write erase as many times as possible because it uses HERCULES technology.

EXISTING SYSTEM

- ZigBee
- Z-Wave
- WiFi
- Bluetooth
- Infrared
- Insteon
- IFTTT(If This Than That)
- AllJoyn
- ULE

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

Zigbee

- Maximum network size : 65k+
- Connecting technology RF (radio frequency)
- Working frequency : 2.4GHz
- Network configuration :
  Star+Mesh
- Power requirement : 10mW
- Range : ~75m
- Battery life : 100-1000+ Days

Bluetooth

- Maximum network size : 7
- Connecting technology RF (radio frequency)
- Working frequency : 2.4GHz
- Network configuration : Star
- Power requirement : 100mA
- Range : ~10m
- Battery life : 1-7 day

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

Z-wave

- Maximum network size : 200+

Connecting technology RF (radio frequency)

- Working frequency : 915MHz
- Network configuration : Mesh
- Power requirement : 23mW
- Range : ~100m
- Battery life : 300-500 days

WiFi

- Maximum network size : 7
- Connecting technology RF (radio frequency)
- Working frequency : (2.4-5)GHz
- Network configuration : Star

Range : ~100m

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology,
Hyderabad-500075

CHAPTER 3
METHODOLOGY

BLOCK DIAGRAM

RECEIVER SECTION

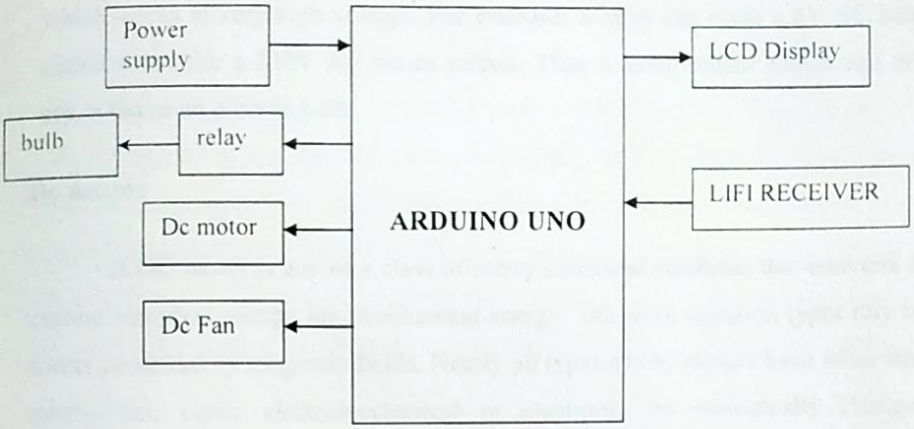


Fig 3.1: receiver section

TRANSMITTER SECTION

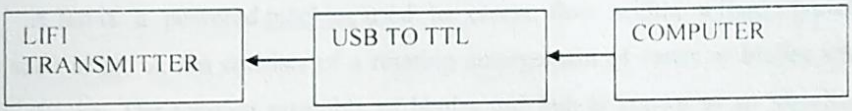


Fig 3.2: transmitter section

Block diagram description:

Power supply system:

The vitality supply is intended to exchange over extreme voltage air con mains solidarity to a sensible low voltage supply for computerized circuits and awesome contraptions. A power convey can by way of isolated into an enhancement of impedes, each individual in all which performs out a chose capacity. A D.C. Control supply which keeps up the yield voltage reliable independent of A.C mains instabilities or load assortments is known as "Oversaw D.C Power Supply".

Relay:

Relayisanelectromagneticdevicewhichisusedtoisolatetwocircuitselectricallya nd connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at allow voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.

Dc motor:

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

Dc fan:

A fan is a powered machine used to create flow within a fluid, typically a gas such as air. A fan consists of a rotating arrangement of vanes or blades which act on the air. The rotating assembly of blades and hub is known as an impeller, a rotor, or a runner. Usually, it is contained within some form of housing or case. This may direct the airflow or increase safety by preventing objects from contacting the fan blades. Most fans are powered by electric motors, but other sources of power may be used, including hydraulic motors, hand cranks, internal combustion engines, and solar power.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

LCD Display:

Fluid gem shows (LCDs) have substances, which join the homes of every refreshment and gems. Instead of having a liquefying part, they have a temperature assortment inside which the atoms are nearly as versatile as they is presumably in a fluid. anyway are assembled together in an arranged frame like a precious stone.

LIFI:

Over the past few years there has been a rapid growth in the utilization of the RF region of the electromagnetic spectrum. This is because of the huge growth in the number of mobile phones subscriptions in recent times. This has been causing a rapid reduction in free spectrum for future devices. Light-fidelity *(Li-Fi)* operates in the visible light spectrum of the electromagnetic spectrum i.e. it uses visible light as a medium of transmission rather than the traditional radio waves.

ARDUINO UNO:

Arduino UNO Arduino is an open-source electronics platform based on easy-to-use hardware and software. It's intended for anyone making interactive projects. Arduino can take the input from many sensors attached to it & can give the output to many lights, motors etc. There is no prerequisite knowledge of Advance electronics for operating Arduino. All you should know is basic electronics and C programming language. Arduino platform mainly contains a Hardware Board called Arduino Board & software Arduino IDE to program it. Other external hardware like Sensor Modules, Motors, lights etc. could be attached with the board. ARDUINO BOARDS:- Arduino UNO, Arduino MEGA, Arduino MINI, Arduino DUE, Arduino YUN, Arduino Lily pad. The most common Board used is Arduino UNO. "UNO" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

USB TO TTL:

The CP2102 is a highly-integrated USB-to-UART Bridge Controller providing a simple solution for updating RS-232 designs to USB using a minimum of components and PCB space. The CP2102 includes a USB 2.0 full-speed function controller. USB transceiver, oscillator, EEPROM, and asynchronous serial data bus (UART) with full modem control signals in a compact 5 x 5 mm MLP-28 package. No other external USB components are required.

However because of its small size, and it is also an MLP, a certain degree of technical difficulty welding. So we designed of this compact USB-UART module, leads to the interface including 5V, TXD, RXD, GND, CTS, RTS, which TXD, RXD can directly connected to the MCU serial port, RXD to MCU-TXD, TXD to MCU-RXD , it can also be connected to the Bluetooth module, GPS and other serial devices, CTS and RTS handshake signals as for special occasions, usually you needless, it easy for the initial product debugging. LED mounted on the drive after the often shiny. The module uses USB male seat, can be connected directly to PC USB seat can also be connected to a USB extension line.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

CHAPTER 4

SOFTWARE DESCRIPTION

ARDUINO UNO SOFTWARE:

ARDUINO SOFTWARE

Arduino IDE WHAT IS IDE?

- **The Arduino integrated development environment (IDE) is a cross-platform** application written in Java, and derives from the IDE for the Processing programming language and the Wiring projects.
- It is designed to introduce programming to artists and other newcomers unfamiliar **with software development**.
- It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a **"sketch**
- Arduino programs are written in C or C++. The Arduino IDE comes with a software library called "Wiring" from the original Wiring project, which makes many common input/output operations much easier.
- **The source code for the IDE is available and released under the GNU General** Public License, version 2. How to start Arduino software? 1. Get an Arduino board and USB cable 2. Download the Arduino Software (IDE) Download Arduino IDE from https://www.arduino.cc/en/Main/Software 3. Connect the board Connect your **Arduino UNO hardware to PC or Laptop**

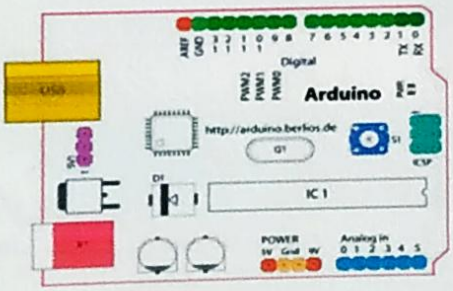


Fig 4.1 : Arduino Board

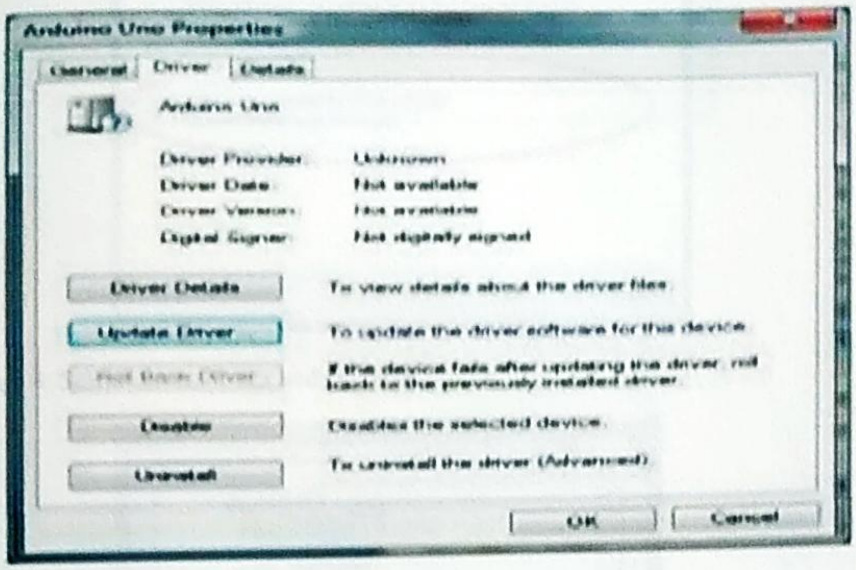
Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

2. Download the Arduino Software (IDE) Download Arduino IDE from https://www.arduino.cc/en/Main/Software

3. **Connect the board** Connect your Arduino UNO hardware to PC or Laptop via USB cable. 4. Install the drivers

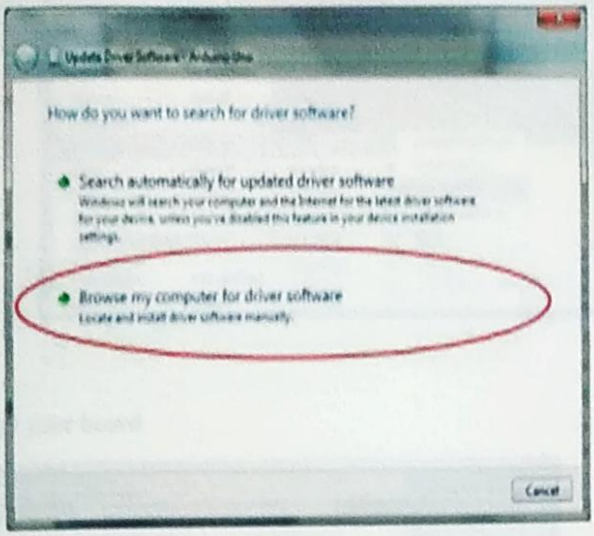
Step 1:Open Device Manager

Step 2:Double click the unknown Arduino Uno device, a property window pops up

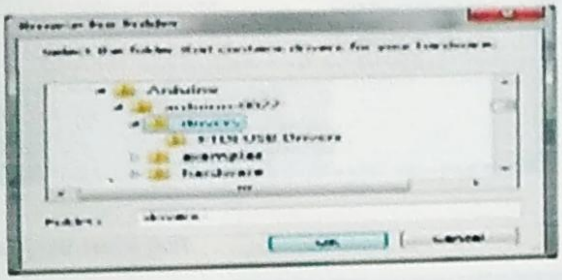


Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

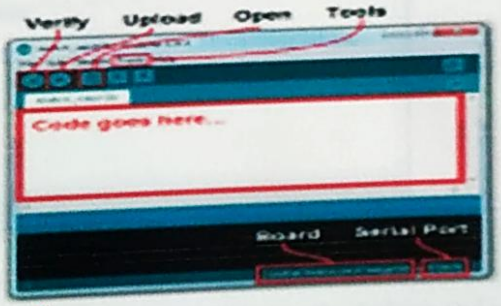
Step 3 : Choose the 'Driver' tab, and select 'Update Driver...'



Step 4: Select drivers folder and click OK

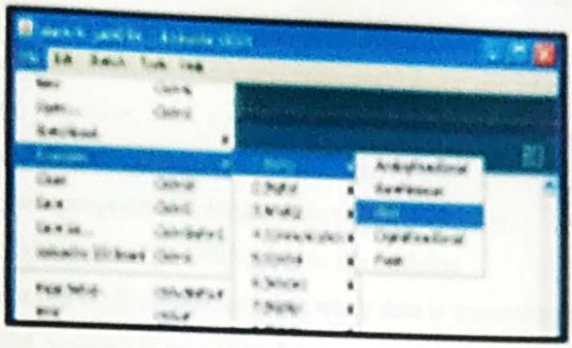


Step 5: Launch the Arduino application

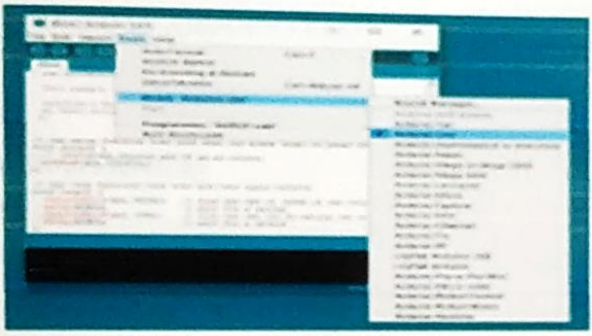


Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

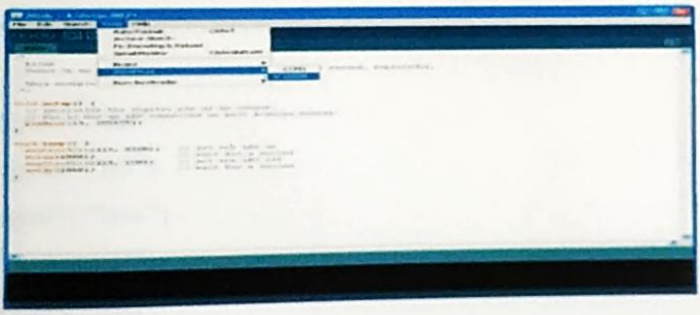
Step6. Open the blink example



Step 7. Select your board



Step 8. Select your serial port

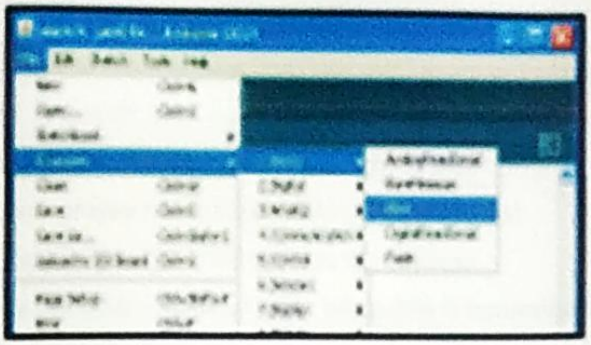


Step 9. Upload the program

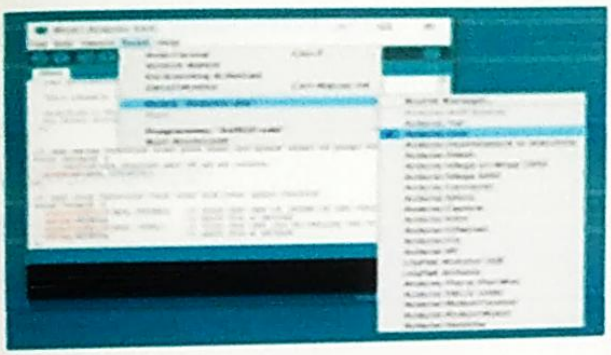
Serial Communication Used for communication between the Arduino and a computer or other devices. All Arduino boards have at least one serial port (also known as a UART or USART): Serial. It communicates on digital pins 0 (RX) and 1 (TX) as well

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology
Hyderabad-500075

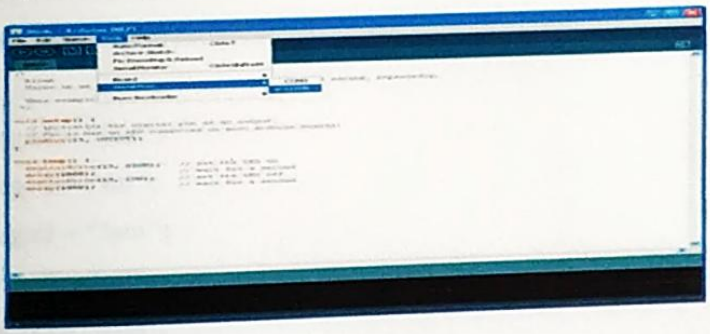
Step6. Open the blink example



Step 7. Select your board



Step 8. Select your serial port



Step 9. Upload the program

Serial Communication Used for communication between the Arduino and a computer or other devices. All Arduino boards have at least one serial port (also known as a UART or USART): Serial. It communicates on digital pins 0 (RX) and 1 (TX) as well

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.

as with the computer via USB. Thus, if one use these functions, one cannot also use pins 0 and 1 for digital input or output. One can use the Arduino environment's built-in serial monitor to communicate with an Arduino board. Click the serial monitor button in the toolbar and select the same baud rate used in the call to begin().

Information passes between the computer and Arduino through USB cable. Information is transmitted as 0's and 1's , also known as bits.

- Compiling turns your program into binary data (ones and zeros)
- Uploading sends the bits through USB cable to the Arduino
- The two LEDs near the USB connector blink when data is transmitted
- RX blinks when the Arduino is receiving data
- TX blinks when the Arduino is transmitting data

CODE EMBEDDED IN ARDUINO UNO

```
//lifi project
#include <SoftwareSerial.h>
#include <String.h>
#include <LiquidCrystal.h>

//SoftwareSerial lifi(3, 4); // RX, TX

LiquidCrystal lcd(13, 12, 11, 10, 9, 8);

String s1 = "fon";
String s2 = "fof";
String s3 = "bon";
String s4 = "off";
String s5 = "von";
String s6 = "vof";
int fan=7;
int bulb=6;
int motor=5;
```


Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

```
String lifidata;
int count = 0;
char singleChar;
String readMsg;



void setup() {
 Serial.begin(9600);
//  lifi.begin(9600);
 lcd.begin(16, 2);                              // Set up the LCD's number of
columns and rows:
 lcd.clear(); // clear LCD display              // Clear the display
 pinMode(fan,OUTPUT);
 pinMode(bulb,OUTPUT);
 pinMode(motor,OUTPUT);

 lcd.setCursor(0, 0);                                  // Set LCD cursor position
(column, row)
 lcd.print("WELCOME TO THE");   // Print text to LCD
 lcd.setCursor(0, 1);
 lcd.print("  LIFI BASED   ");   // Print text to LCD
 Serial.println("WELCOME TO THE LIFI BASED");
 delay(2000);
 lcd.clear(); // clear LCD display                // Clear the display
 lcd.setCursor(0, 0);                                  // Set LCD cursor position
(column, row)
 lcd.print("HOME AUTOMATION ");   // Print text to LCD
 Serial.println("HOME AUTOMATION");
 delay(2000);
 lcd.clear();
 lcd.print("----WAITING---");
 Serial.println("----WAITING---");
```

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology
Hyderabad-500075

```
  digitalWrite(fan,LOW);
  digitalWrite(bulb,LOW);
  digitalWrite(motor,LOW);


}

void loop() {
   if (Serial.available() > 0)
  {
   singleChar = Serial.read();
  //  Serial.print(F("SINGLE CHAR:")); Serial.println(singleChar);
   count++;
   readMsg += singleChar;
   if (count == 3)
   {
    Serial.print(F("RECV DATA:")); Serial.println(readMsg);
    lcd.setCursor(2, 0);
    lcd.print(readMsg);delay(2000);
    if (readMsg == s1) {
     Serial.println(F("FAN TURNED ON"));
     lcd.clear();
     lcd.setCursor(0, 0);
     lcd.print("FAN TURNED ON");
     delay(1000);
     count = 0;
     readMsg = "";
     lcd.clear(); // clear LCD display                    // Clear the display
     digitalWrite(fan,HIGH);
    }
    else if (readMsg == s2) {
     Serial.println(F("FAN TURNED OFF"));
     lcd.clear();
```

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

```
 lcd.setCursor(0, 0);
 lcd.print("FAN TURNED OFF");
 delay(1000);
 count = 0;
 readMsg = "";
 lcd.clear(); // clear LCD display                    // Clear the display
 digitalWrite(fan,LOW);

}
else if (readMsg == s3) {
 Serial.println(F("BULB TURNED ON"));
 lcd.clear();
 lcd.setCursor(0, 0);
 lcd.print("BULB TURNED ON");
 delay(1000);
 count = 0;
 readMsg = "";
 lcd.clear(); // clear LCD display                    // Clear the display
 digitalWrite(bulb,HIGH);
}
 else if (readMsg == s4) {
 Serial.println(F("BULB TURNED OFF"));
 lcd.clear();
 lcd.setCursor(0, 0);
 lcd.print("BULB TURNED OFF");
 delay(1000);
 count = 0;
 readMsg = "";
 lcd.clear(); // clear LCD display                    // Clear the display
 digitalWrite(bulb,LOW);
}
 else if (readMsg == s5) {
 Serial.println(F("MOTOR TURNED ON"));
```


Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

```
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("MOTOR TURNED ON");
    delay(1000);
    count = 0;
    readMsg = "";
    lcd.clear(); // clear LCD display                    // Clear the display
    digitalWrite(motor,HIGH);
  }
   else if (readMsg == s6) {
    Serial.println(F("MOTOR TURNED OFF"));
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("MOTOR TURNED OFF");
    delay(1000);
    count = 0;
    readMsg = "";
    lcd.clear(); // clear LCD display                    // Clear the display
    digitalWrite(motor,LOW);
  }
   else {
    Serial.println(F("INVALID DATA DETECTED"));
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("INVALID DATA");
    delay(1000);
    count = 0;
    readMsg = "";
    lcd.clear(); // clear LCD display                    // Clear the display
    lcd.setCursor(0, 0);                                 // Set LCD cursor position
(column, row)
     lcd.print("--WAITING--");   // Print text to LCD
  }
```


Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

CHAPTER 5

HARDWARE DESCRIPTION

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website.

Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega328 on the Arduino Uno comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology,
Hyderabad-500075

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12 V
Input Voltage (limit)	6-20 V
Digital I/O Pins	14 (of which 6 provide PWM Output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega 328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega 328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Table 5.1: Ardino UNO Specifications

PINS

General Pin functions

- LED: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- VIN: The input voltage to the Arduino/Genuine board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- 3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND: Ground pins.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

- IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.
- Reset: Typically used to add a reset button to shields which block the one on the board.

SPECIAL PIN FUNCTIONS

Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, using pin Mode (), digital Write (), and digital Read () functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function.

5.1. Transformer

A transformer is an electrical gadget this is connected to interchange over electrical power starting with one electric circuit then onto the accompanying without substitute in repeat.

Transformers trade over air con power starting with one voltage then onto the consequent with little absence of vitality. Transformers works of art earnestly with air con and that is one reason why mains vitality is air con. Advance up transformers increase in yield voltage, upgrade down transformers decrease in yield voltage.

Most vitality substances utilize a certificate down transformer to reduce the dangerously radical mains voltage to an additional quiet low voltage. The measurements circle is alluded to as the vital and the yield twist is alluded to as the assistant.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

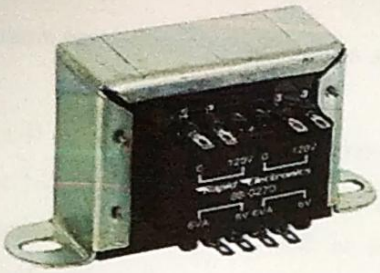


Fig 5.1 : An Electrical Transformer

5.2. Rectifier

A circuit, which is used to convert a.c to dc, is known as RECTIFIER. The process of conversion a.c to d.c is called "rectification".

- Half waveRectifier.
- Full waverectifier.

1. Center tap full waverectifier.
2. Bridge type full bridgerectifier.

5.3. LIQUID CRYSTAL DISPLAY:

Fluid gem shows (LCDs) have substances, which join the homes of every refreshment and gems. Instead of having a liquefying part, they have a temperature assortment inside which the atoms are nearly as versatile as they is presumably in a fluid, anyway are assembled together in an arranged frame like a precious stone.

A LCD comprises of glass boards, with the fluid precious stone texture sand witched in among them. The inward ground of the glass plates are fixed with straightforward terminals which characterize the man or lady, images or styles to be shown polymeric layers are seen in a large number of the anodes and the fluid gem, which sorts the particles to hold a characterized introduction disposition.

One each polarizer's are stuck outside the two glass boards. These spellbinds

should pivot the light beams passing completed them to an exact mentality, in a chose way.

At the point when the LCD is in the off nation, moderate beams are pivoted by means of method for the two polarizer and the fluid precious stone, to such an extent that the slight beams fly out of the LCD with no introduction, and in this manner the LCD seems self-evident.

Pin No	Symbol	Level	Description
1	Vss	0 V	Ground
2	V_{DD}	5.0V	Supply voltage for logic
3	V o	variable	Operating voltagefor LCD
4	RS	H/L	H data/L instruction code
5	R/W	H/L	H/Read (MPU-module) L/write (MPU-module)
6	E	H, H-L	Chip enable signal
7	DB0	H/L	Data bit 0
8	DB1	H/L	Data bit 1
9	DB2	H/L	Data bit 2
10	DB3	H/L	Data bit 3
11	DB4	H/L	Data bit 4
12	DB5	H/L	Data bit 5
13	DB6	H/L	Data bit 6
14	DB 7	H/L	Data bit 7
15	A		Power supply for LED backlight (+)
16	K		Power supply for LED backlight (-)

Table 5.2 : Pin Description For LCD

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

LCD INTERFACING

Sending commands and data to LCDs with a time delay:

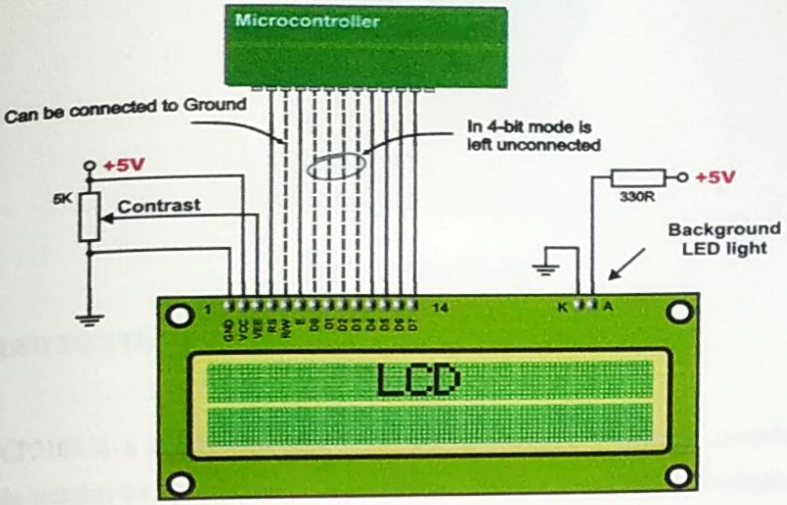


Fig 5.2: Interfacing of LCD to a micro controller

- To send any facility from table 2 to the LCD, make pin RS=0.
- For data, make RS=1.Then sends a high –to-low pulse to the E pin to enable the internal latch of the LCD.

5.4. Relay Switch

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.

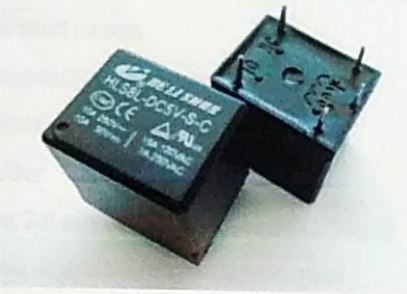


Fig 5.2 : Relay Module

5.5. USB TO TTL:

The CP2102 is a highly-integrated USB-to-UART Bridge Controller providing a simple solution for updating RS-232 designs to USB using a minimum of components and PCB space. The CP2102 includes a USB 2.0 full-speed function controller, USB transceiver, oscillator, EEPROM, and asynchronous serial data bus (UART) with full modem control signals in a compact 5 x 5 mm MLP-28 package. No other external USB components are required.

However because of its small size, and it is also an MLP, a certain degree of technical difficulty welding. So we designed of this compact USB-UART module, leads to the interface including 5V, TXD, RXD, GND, CTS, RTS, which TXD, RXD can directly connected to the MCU serial port, RXD to MCU-TXD, TXD to MCU-RXD , it can also be connected to the Bluetooth module, GPS and other serial devices, CTS and RTS handshake signals as for special occasions, usually you needless, it easy for the initial product debugging. LED mounted on the drive after the often shiny. The module uses USB male seat, can be connected directly to PC USB seat can also be connected to a USB extension line.

FEATURES:

- Single-Chip USB to UART Data Transfer
  - Integrated USB transceiver; no external resistors required
  - Integrated clock; no external crystal required

- Integrated 1024-Byte EEPROM for vendor ID, product ID, serial number, power descriptor, release number, and product description strings
- **On-chip power-on reset circuit**
- On-chip voltage regulator: 3.3 V output
- 100% pin and software compatible with CP2101

- USB Function Controller
  - **USB Specification 2.0 compliant; full-speed (12 Mbps)**
  - USB suspend states supported via SUSPEND pins
- Virtual COM Port Device Drivers
  - Works with existing COM Port PC applications
  - **Royalty-free distribution license**
  - Windows 98 SE/2000/XP
  - MAC OS-9
  - MAC OS-X
  - **Linux 2.40 and greater**

Fig 5.3 : USB to TTL

5.6. LIFI:

Over the past few years there has been a rapid growth in the utilization of the RF region of the electromagnetic spectrum. This is because of the huge growth in the number of mobile phones subscriptions in recent times. This has been causing a rapid reduction in free spectrum for future devices. Light-fidelity (*Li-Fi*) operates in the visible light spectrum of the electromagnetic spectrum i.e. it uses visible light as a medium of transmission rather than the traditional radio waves.

Li-Fi stands for Light-Fidelity. *Li-Fi* is transmission of data using visible light by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. If the LED is on, the photo detector registers a binary one; otherwise it"s a binary zero. The idea of *Li-Fi* was introduced by a German physicist, Harald Hass, which he also referred to as "Data through Illumination". The term *Li-Fi* was first used by Haas in his TED Global talk on Visible Light Communication. According to Hass, the light, which he referred to as „DLight", can be used to produce data rates higher than 1 Giga bits per second which is much faster than our average broadband connection.

The high speed achievement of *Li-Fi* can be explained using frequency spectrum of Electromagnetic Radiations. From the electromagnetic spectrum we can see that the frequency Band of the visible light is in between 430THz to 770THz and that of Radio Frequency Band is in between 1Hz to 3THz, Hence the Frequency Bandwidth of the visible light is about 400 Times greater than the Radio Frequency Bandwidth. So more Number of bits can be transferred through this Bandwidth than in the radio frequency bandwidth. Hence Data rate will be higher in the *Li- Fi* and higher speed can be achieved. Using *Li-Fi* we can transmit any data that can be transferred using conventional *Wi-Fi* network. That can be Images, Audio, Video, Internet connectivity, etc.. but the advantages over the *Wi-Fi* Network are High speed, Increased Security, More Number of Connected Devices, and Less cost. In coming years number of devices that support *Li-Fi* will hit the Market. It is estimated that the compound annual growth of *Li-Fi* market will be of 82%

from 2015 to 2018 and to be worth over $6 billion per year by 2018.

2. Architecture of Li-Fi system

Li-Fi which can be the future of data communication appears to be a fast and cheap optical version of Wi-Fi. Being a Visible Light Communication (VLC). Li-Fi uses visible light of electromagnetic spectrum between 400 THz and 800 THz as optical carrier for data transmission and illumination. It uses fast pulses of light to transmit information in wireless medium. The main components of a basic Li-Fi system may contain the following:

a) A high brightness white LED which acts as transmission source.

b) A silicon photodiode with good response to visible light as the receiving element.

Switching the LEDs on and off can make them generate digital strings with different combination of 1s and 0s. To generate a new data stream, data can be encoded in the light by varying the flickering rate of the LED. In this way, the LEDs work as a sender by modulating the light with the data signal. The LED output appears constant to the human because they are made to flicker at a phenomenal speed (millions of times per second) and it's impossible for human eye to detect this frequency. Communication rate more than 100 Mbps can be achieved by using high speed LEDs with the help of various multiplexing techniques. And this VLC data rate can be further increased to as high as 10 Gbps via parallel data transmission using an array of LED lights with each LED transmitting a different data stream.

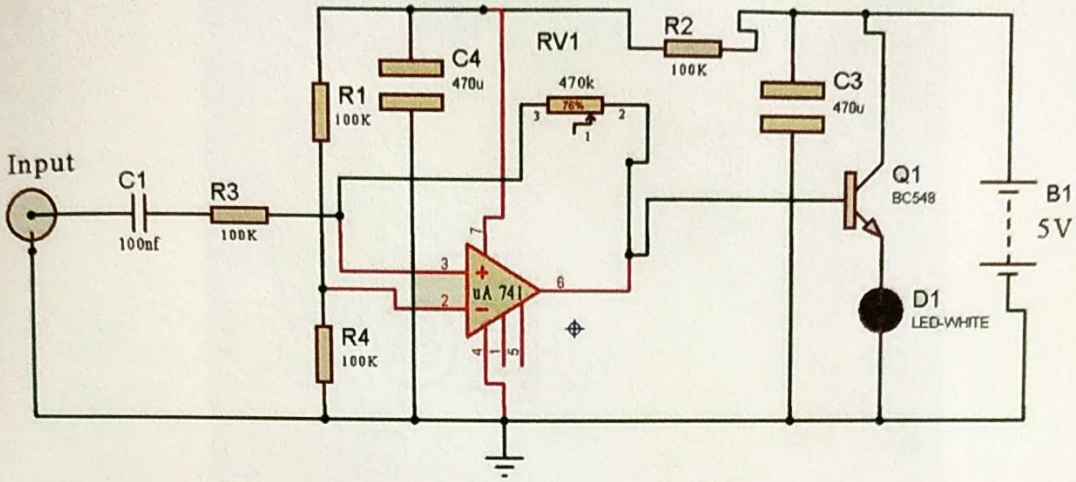


Fig 5.4 : transmitter circuit of LiFi

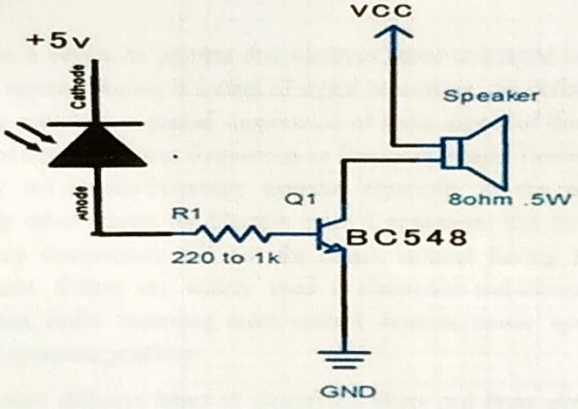


Fig 5.5: Receiver Circuit

Head of the Department
Department of Electronics and Communication Engg
Vidya Jyothi Institute of Technology
Hyderabad-500075

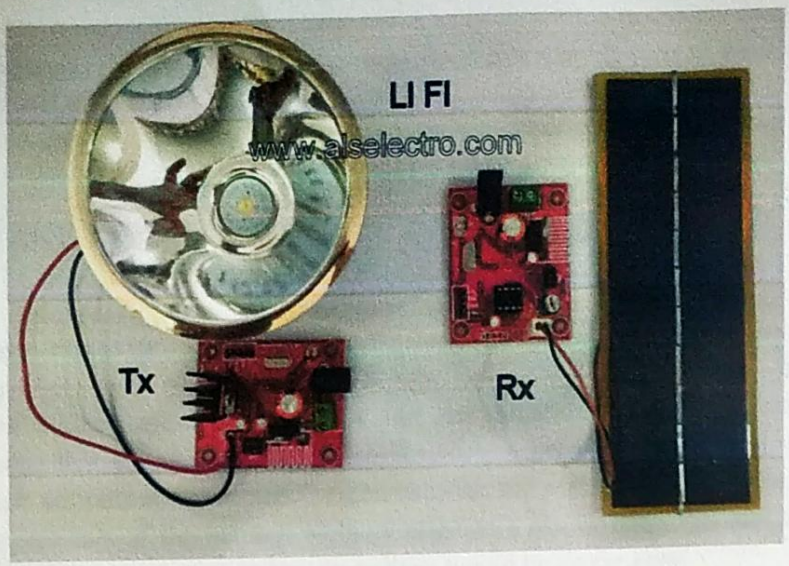


Fig 5.6 LiFi Transmitter And Receiver

5.7. FILTER

A filter is a device or process that removes some unwanted components or features from a signal. Filtering is a class of signal processing, the defining feature of filters being the complete or partial suppression of some aspect of the signal. Most often, this means removing some frequencies or frequency bands. However, filters do not exclusively act in the frequency domain; especially in the field of image processing many other targets for filtering exist. Correlations can be removed for certain frequency components and not for others without having to act in the frequency domain. Filters are widely used in electronics and telecommunication, in radio, television, audio recording, radar, control systems, music synthesis, image processing, and computer graphics.

There are many different bases of classifying filters and these overlap in many different ways; there is no simple hierarchical classification. Filters may be:

- non-linear or linear
- time-variant or time-invariant , also known as shift invariance. If the filter operates in a spatial domain then the characterization is space invariance.
- causal or not-causal: A filter is non-causal if its present output depends on future input. Filters processing time-domain signals in real time must be causal, but not filters acting on spatial domain signals or deferred-time processing of time-domain signals.
- analog or digital
- discrete-time (sampled) or continuous-time
- passive or active type of continuous-time filter

- infinite impulse response (IIR) or finite impulse response (FIR) type of discrete-time or digital filter.

5.8. VOLTAGE REGULATOR

Voltage regulator, any electrical or electronic device that maintains the voltage of a power source within acceptable limits. The voltage regulator is needed to keep voltages within the prescribed range that can be tolerated by the electrical equipment using that voltage. Such a device is widely used in motor vehicles of all types to match the output voltage of the generator to the electrical load and to the charging requirements of the battery. Voltage regulators also are used in electronic equipment in which excessive variations in voltage would be detrimental.
In motor vehicles, voltage regulators rapidly switch from one to another of three circuit states by means of a spring-loaded, double-pole switch. At low speeds, some current from the generator is used to boost the generator's magnetic field, thereby increasing voltage output. At higher speeds, resistance is inserted into the generator-field circuit so that its voltage and current are moderated. At still higher speeds, the circuit is switched off, lowering the magnetic field. The regulator switching rate is usually 50 to 200 times per second.

Electronic voltage regulators utilize solid-state semiconductor devices to smooth out variations in the flow of current. In most cases, they operate as variable resistances: that is, resistance decreases when the electrical load is heavy and increases when the load is lighter.

Voltage regulators perform the same function in large-scale power-distribution systems as they do in motor vehicles and other machines; they minimize variations in voltage in order to protect the equipment using the electricity. In power-distribution systems the regulators are either in the substations or on the feeder lines themselves. Two types of regulators are used: step regulators, in which switches regulate the current supply, and induction regulators, in which an induction motor supplies a secondary, continually adjusted voltage to even out current variations in the feeder line.

A voltage regulator plays an important role in the as it gives a fixed voltage that is a line of voltage so that all the devices may not get damaged due to voltage fluctuations.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

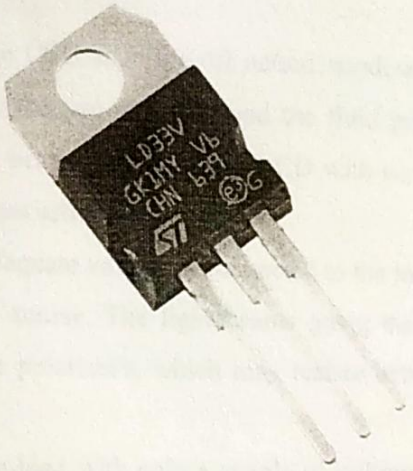


Fig 5.7 : A Voltage Regulator

Voltage regulators perform the same function in large-scale power-distribution systems as they do in motor vehicles and other machines; they minimize variations in voltage in order to protect the equipment using the electricity. In power-distribution systems the regulators are either in the substations or on the feeder lines themselves. Two types of regulators are used: step regulators, in which switches regulate the current supply, and induction regulators, in which an induction motor supplies a secondary, continually adjusted voltage to even out current variations in the feeder line.

LIQUID CRYSTAL DISPLAY

Fluid gem shows (LCDs) have substances, which join the homes of every refreshment and gems. Instead of having a liquefying part, they have a temperature assortment inside which the atoms are nearly as versatile as they is presumably in a fluid, anyway are assembled together in an arranged frame like a precious stone.

A LCD comprises of glass boards, with the fluid precious stone texture sand witched in among them. The inward ground of the glass plates are fixed with straightforward terminals which characterize the man or lady, images or styles to be shown polymeric layers are seen in a large number of the anodes and the fluid gem, which sorts the particles to hold a characterized introduction disposition.

One each polarizer's are stuck outside the two glass boards. These spellbinds should pivot the light beams passing completed them to arrange mentality, in a

chose way.

At the point when the LCD is in the off nation, moderate beams are pivoted by means of method for the two polarizer and the fluid precious stone, to such an extent that the slight beams fly out of the LCD with no introduction, and in this manner the LCD seems self-evident.

At the point when adequate voltage is connected to the terminals, particles may be adjusted in a chose course. The light beams going through the LCD could be hovered through the polarizer's, which may realize actuating/featuring the ideal characters.

The LCD's are light-load with only a couple of millimeters thickness. Since the LCD's eat less quality, they'll be very much coordinated with low power computerized circuits, and can be controlled for protracted lengths.

The LCD's don't produce light thus gentle is needed to look at the presentation. By the utilization of backdrop illumination, perusing is possible in obscurity. The LCD's have delayed ways of life and a broad working temperature run.

Changing the showcase length or the format length is especially simple which makes the LCD's more customer's kind.

The LCDs connected totally in watches, including machines and evaluating gadgets are the basic seven-area appears, having a controlled measure of numeric actualities. The greatest current advances in age have come to fruition inside the LCDs being outstandingly utilized in media communications and enjoyment hardware. The LCDs have even begun supplanting the cathode beam tubes (CRTs) utilized for the presentation of content and pictures, and moreover in little TV applications.

This portion depicts the task methods of LCD's at that point portrays how to program and interface a LCD to 8051 the utilization of Assembly and C.

LCD task:

In present day years the LCD is discovering monster utilize evolving LEDs (seven-stage LEDs or phenomenal multi fragment LEDs).This is because of the resulting intentions:

1. The declining costs of LCDs.
2. The ability to uncover numbers, characters and pix. This is in settlement to LEDs, which compartment be confined to numbers and a few characters.
3. Incorporation of a spotless controller into the LCD, there by diminishing calming

the CPU of the endeavor of cleans the LCD. In the appraisal, the LED should be revived through the CPU to safeguard demonstrating the actualities.

4. Simplicity of programming for characters and pictures.

Transistor (BC-547)

A BC547 transistor is a negative-positive-negative (NPN) transistor that is used for many purposes. Together with other electronic components, such as resistors, coils, and capacitors, it can be used as the active component for switches and amplifiers. Transistors has an emitter terminal, a base or control terminal, and a collector terminal. In a typical configuration, the current flowing from the base to the emitter controls the collector current. A short vertical line, which is the base, can indicate the transistor schematic for an NPN transistor, and the emitter, which is a diagonal line connecting to the base, is an arrowhead pointing away from the base.

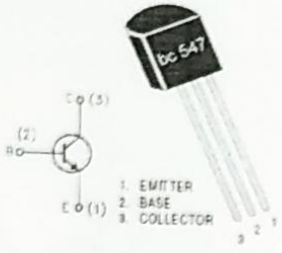


Fig 5.8 : BC-547 NPN Transistor

Diode (IN4007)

In electronics, a diode is a two-terminal electronic component that conducts primarily in one direction (asymmetric conductance), it has low (ideally zero) resistance to the flow of current in one direction, and high (ideally infinite) resistance in the other. A semiconductor diode is a crystalline piece of semiconductor material with a p–n junction connected to two electrical terminals.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology
Aziznagar, Hyderabad-500075

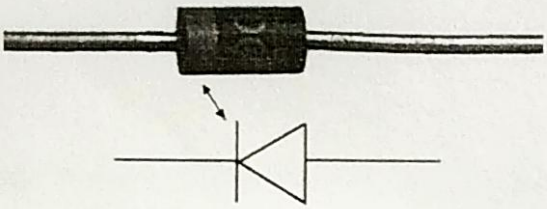


Fig 5.9: Diode IN4007

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

CHAPTER 6
ADVANTAGES&DISADVANTAGES

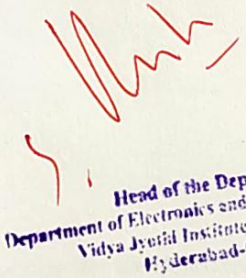
Advantages

Li-Fi technology is based on LEDs or other light source for the transfer of data. The transfer of the data can be with the help of all kinds of light, no matter the part of the spectrum that they belong. That is, the light can belong to the invisible, ultraviolet or the visible part of the spectrum. Also, the speed of the communication is more than sufficient for downloading movies, games, music and all in very less time. Also, Li-Fi removes the limitations that have been put on the user by the Wi-Fi.

Disadvantages

Nothing in this world is perfect and so does LIFI.

- These signals cannot penetrate walls. So the person needs wired bulb in that room also.
- Only works if there is direct line of sight between source and receiver.
- Used for broadcast and it is difficult to uplink.



CHAPTER 7
APPLICATIONS

APPLICATIONS

There is a wide necessity for data transfer and by the end of the day every field involves the use of technologies. One such technology is Li-Fi which can have its applications extended in areas where the Wi-Fi tech- nology lack its presence like medical technology, powerplants and various other areas where Li-Fi proved it excellence of the undersea awesomeness.

At present its applications ate beyond imagination but still if to think about few then they are :

- 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 cats 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.

Future applications

Education systems

As with the advancement of science the latest technology is the LIFI which is the fastest speed internet access service. so this will leads to the replacement of WIFI at institutions and at companies so that all the peo- ple can make use of LIFI with same speed intended in a particular area.

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

Extends our life span

As operation theatres do not allow WIFI due to radiation concerns. Usage of WIFI at hospitals interferes with the mobile and pc which blocks the signals for monitoring equipments. Therefore the replacement for this WIFI is Li-Fi as Hass has mentioned in his TED TALK that LIFI has 10,000 times the spectrum of WIFI. Because the lights are not only allowed in operation theatres but also the most dazzling fixtures in the room.

Reduction in accident numbers

At traffic signals, we can use LIFI in order to communicate with LED lights of the cars by the number of accidents can be reduced. Data can be easily transferred by making use of LIFI lamps with the street lamps.

Replacement for others technologies:

This technology doesn't deal with radio waves, so it can easily be used in the places where Bluetooth, infrared, WIFI and Internet are banned. In this way, it will be most helpful transferring medium for us. It includes other benefits like:

- A very wide spectrum over visible wave length range Extremely high colour fidelity.
- Instant start time.
- Easy terminal Management.
- Dynamic dark i.e. brightness Modulation of lamp output to enhance video contrast.
- Trouble-free integration into existing light engine platform

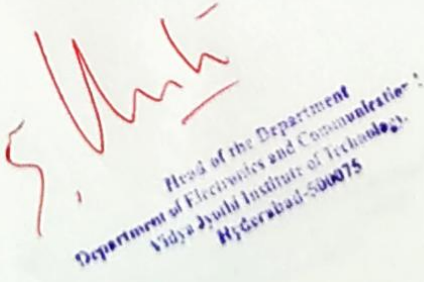
Li-Fi is the upcoming and on growing technology acting as competent for various other developing and already invented technologies. Since light is d major source for transmission in this technology it is very advantageous and implementable in various fields that can't be done with the Wi-Fi and other technologies.

CHAPTER 8
CONCLUSION

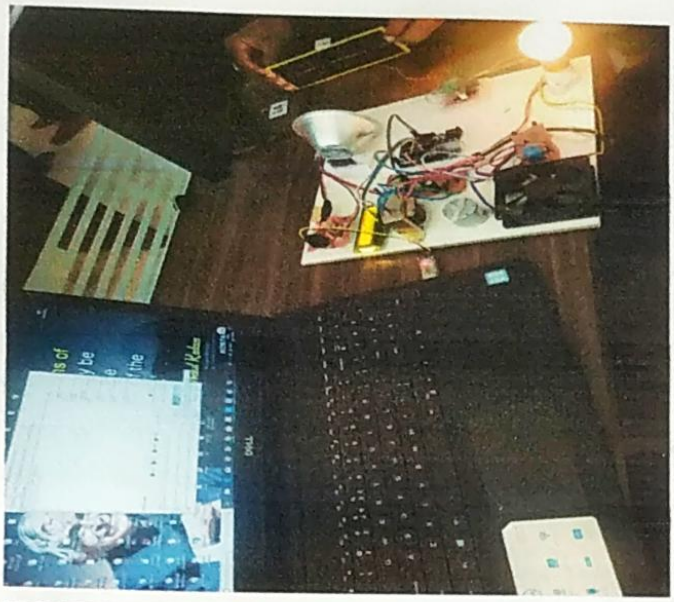
The possibilities are numerous and can be explored further. If his technology can be put into practical use, every bulb can be used something like a Wi-Fi hotspot to transmit wireless data and we will proceed toward the cleaner, greener, safer and brighter future. The concept of Li-Fi is currently attracting a great deal of interest, not least because it may offer a genuine and very efficient alternative to radio-based wireless. As a growing number of people and their many devices access wireless internet, the airwaves are becoming increasingly clogged, making it more and more difficult to get a reliable, high-speed signal. This may solve issues such as the shortage of radio-frequency bandwidth and also allow internet where traditional radio based wireless isn"t allowed such as aircraft or hospitals. The main shortcoming however is that it only work in direct line of sight.

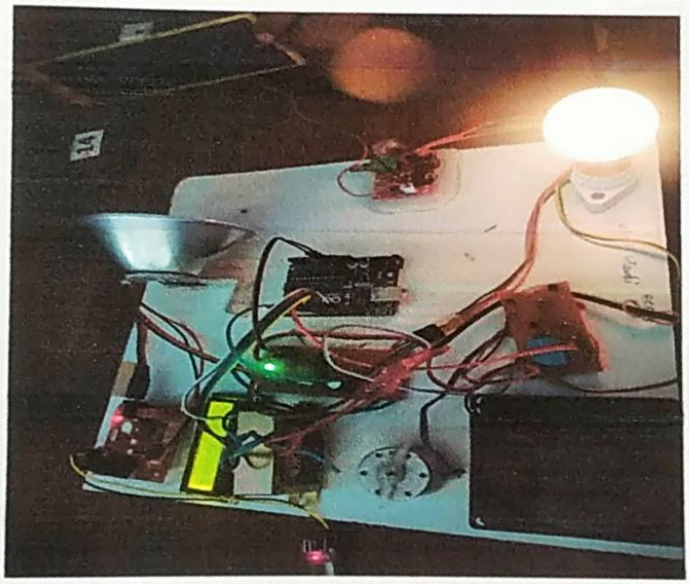
FUTURE SCOPE:

By using *Li-Fi* we can have Energy saving Parallelism. With growing number of people and their many devices access wireless internet, on one way data transfer at high speed and at cheap cost. In future we can have LED array beside a motorway helping to light the road, displaying the latest traffic updates and transmitting internet information to wirelessly to passengers Laptops. Notebooks and Smart phones. This is the kind of extra ordinary, energy saving parallelism that is believed to deliver by this pioneering technology.



OUTPUT





Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075

REFERENCES

[1] http://en.wikipedia.org/wiki/*Li-Fi*

[2] www.YouTube.com – TED Talk by Harald Hass on *Li-Fi*

[3] "*Li-Fi* (Light Fidelity)-The future technology In Wireless communication?" by Jyoti Rani. "Journal from International Journal of Applied Engineering Research" (IJAER); ISSN 0973-4562 Vol.7 No.11 (2012)

[4] www.lificonsortium.org/

[5] Priyanka Dixit and Kunal Lala – *Li-Fi* the Latest Technology in Wireless; ISBN 978817515738

Head of the Department
Department of Electronics and Communication Engg.
Vidya Jyothi Institute of Technology.
Hyderabad-500075