LiFi Based Information Broadcast of an Object within Limited Area

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ABSTRACT

There are various informative places in the cities. There are certain attractions in each object. Many people try to collect information about that particular attraction together. Result is the Rush and many of the people must go ahead without complete information. To resolve this issue we need to display information about that particular object directly on the mobile phone of that user. We use LiFi technology to broadcast the data about a particular thing only for the people around that thing. The Lifi Transmitter will be already attached on the ceiling and a Lifi receiver will be connected to the mobile phone of each user. The information transmitted from the transmitter will be received by the receiver and will be displayed on the screen. By use of this technology, though there is rush each and every person can collect every piece of information.

1.INTRODUCTION

Professor Harald Haas, the Chair of Mobile Communications at the University of Edinburgh, is recognized as the founder of Li-Fi. He coined the term Li-Fi and is the co-founder of pure Li-Fi. He gave a demonstration of a Li-Fi prototype at the TED Global conference in Edinburgh on 12th July 2011. He used a table lamp with an LED bulb to transmit a video of a blooming flower that was then projected onto a screen. During the talk, he periodically blocked the light from the lamp with his hand to show that the lamp was indeed the source of the video data. Li-Fi can be regarded as light-based Wi-Fi, i.e. instead of radio waves it uses light to transmit data. In place of Wi-Fi modems, Li-Fi would use transceivers fitted with LED lamps that could light a room as well as transmit and receive information. It makes use of the visible portion of the electromagnetic spectrum which is underutilized. Li-Fi can be considered better than Wi-Fi because there are some limitations in Wi-Fi. Wi-Fi 2.4–5 GHz radio frequencies to deliver wireless internet access and its bandwidth is limited to 50-100 Mbps. With the increase in the number of Wi-Fi hotspots and volume of Wi-Fi traffic, the reliability of signals is bound to suffer. Security and speed are also important concerns. Wi-Fi communication is vulnerable to hackers as it penetrates easily through walls.

In his TED talk, Professor Haas highlighted the following key problems of Wi-Fi that need to be overcome in the near future:

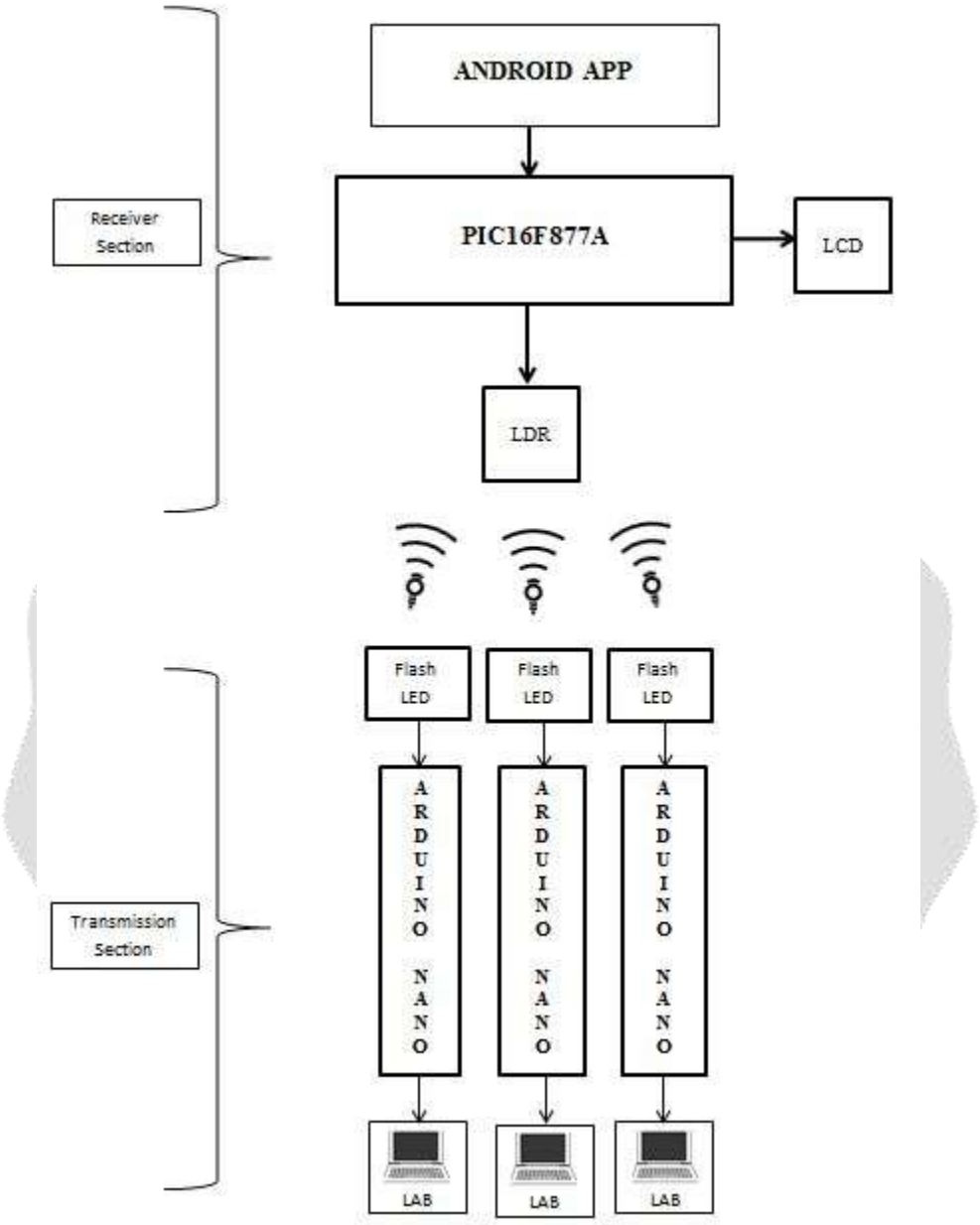
a) Capacity: The radio waves used by Wi-Fi to transmit data are limited as well as expensive. With the development of 3G and 4G technologies, the amount of available spectrum is running out.

b) Efficiency: There are 1.4 million cellular radio masts worldwide. These masts consume massive amounts of energy, most of which is used for cooling the station rather than transmission of radio waves. In fact, the efficiency of such stations is only 5%.

c) Availability: Radio waves cannot be used in all environments, particularly in airplanes, chemical and power plants and in hospitals.

d) Security: Radio waves can penetrate through walls. This leads to many security concerns as they can be easily intercepted.

2.WORKING PRINCIPLE



This project comprises of two sections, one is the transmitter and second is the receiver. The data is provided through a smartphone via USB cable by USB terminal Software. The data is processed by then the PIC 16F877A and provided to LCD display and to the LED arrays. The project works on the principle of VISIBLE LIGHT COMMUNICATION**.** Visible light communications (VLC) works by switching the current to the LEDs off and on at a very high rate. So the LEDs flickers at high rate and the light is captured by the LDR or photodiode on the receiver side. The receiver comprises of ARDUINO NANO which processes the data in the form of light intensity and data is displayed onto the smartphone via USB cable using the software USB terminal. The data is transmitted at a rate of 9600bps.There are multiple receivers at the other end and for communication to take place transmitter and receiver should be in the LINE OF SIGHT (LOS) .The maximum distance between them is normally 3-4 feet. The data transmitted can be a letter, an alphanumeric key, a number, a symbol etc. There are certain commands used for communication. The baud rate should be fixed at both the ends at 9600bps.The receivers are given like a mobile phone.

3.COMPONENT LIST:

3.1PIC 16F877A

The PIC microcontroller PIC16f877a is one of the most renowned microcontrollers in the industry. This controller is very 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 use FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output.

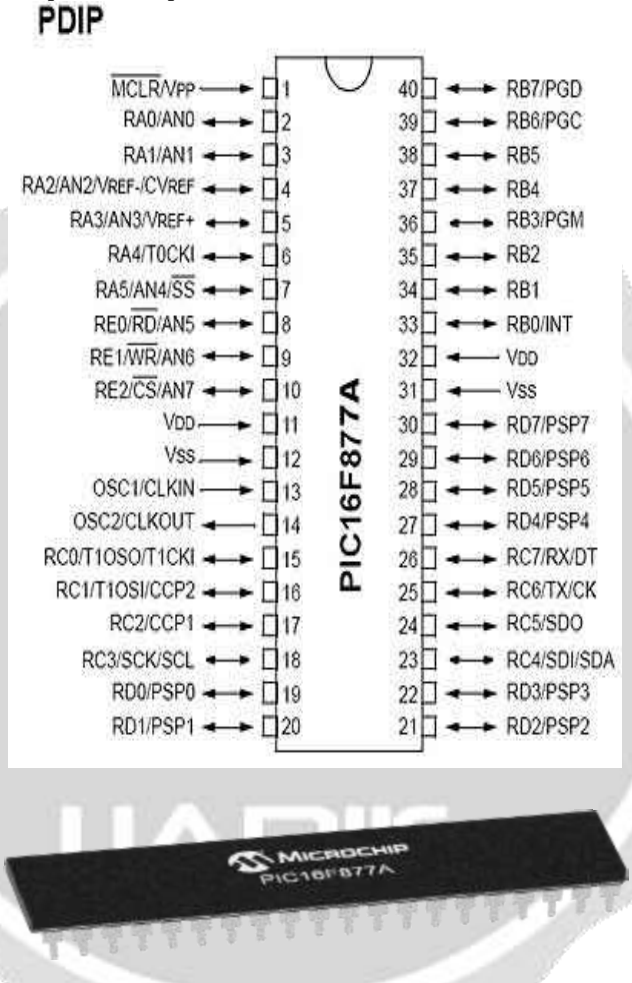


fig.1 PIC 16F877A

Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the

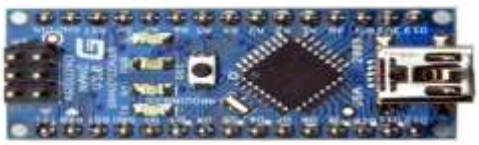


Fig2: Arduino Nano

highest voltage source. The Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX).

LED

A **light-emitting diode** (**LED**) is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the colour of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

Figure 3: LED

LEDs have many advantages over incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signals, camera flashes, and lighted wallpaper.

LDR

A **Light Dependent Resistor** (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. There are many different symbols used to indicate a **LDR**, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits.

Fig4: LDR

CONCLUSION

1. The use of Arduino has provided us with open source platform for programming leading to simple interfacing of components.

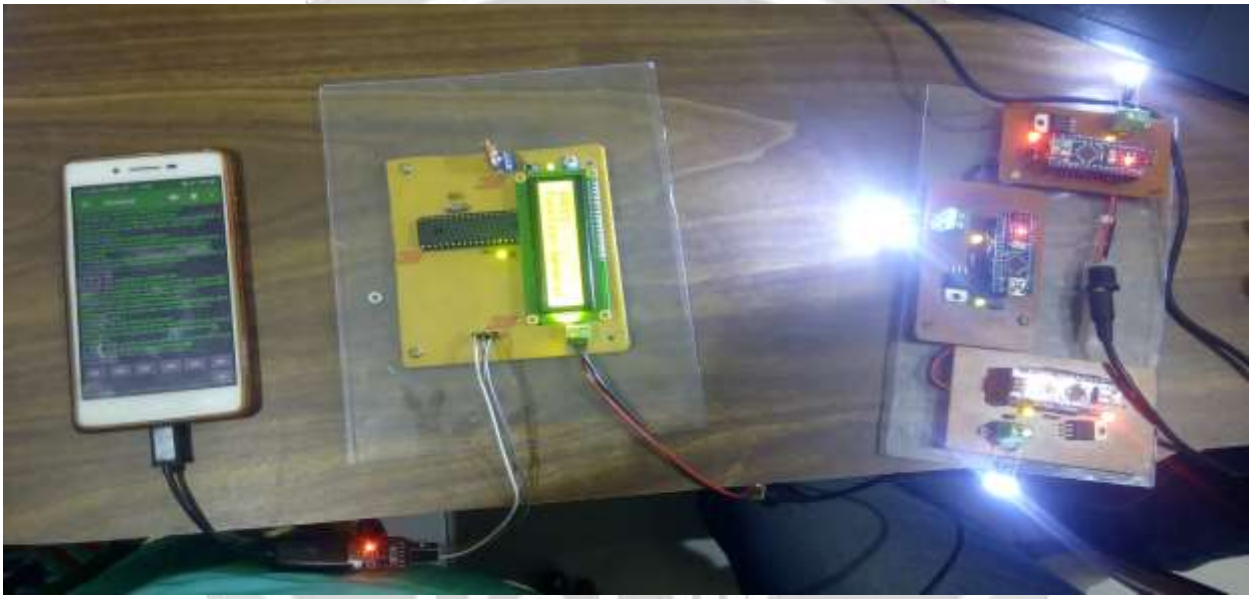
2. By using white LED's data rates up to 500 Mbps can be achieved.

3. Thus, if we use Li-Fi technology every LED bulb can be used as an alternative Wi-Fi hotspot.

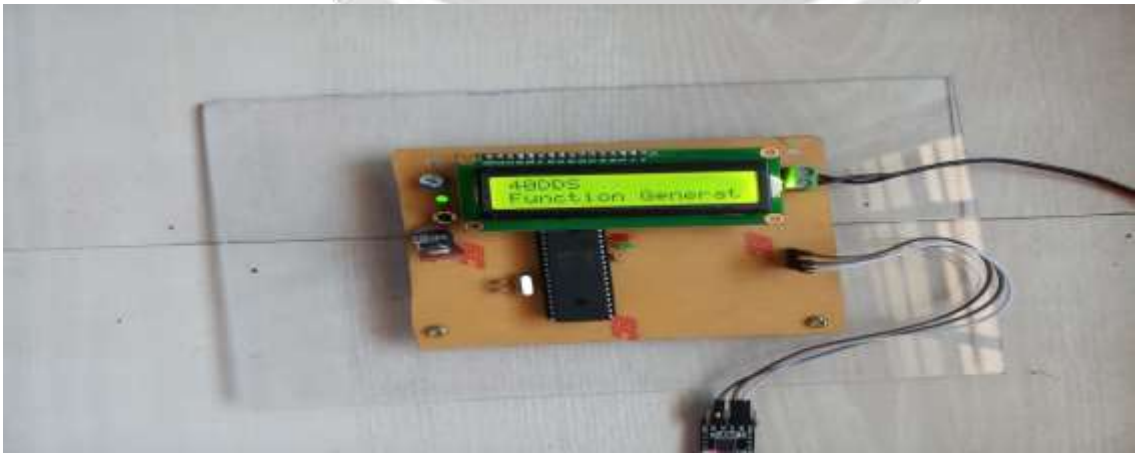
4. Li-Fi provides us with simple, efficient, faster and radiation-less wireless data communication.

5. Li-Fi Technology will make us proceed towards greener, safer and brighter future.

Result



Output



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