International Journal Of Advanced Research In Engineering Technology & Sciences
ISSN: 2394-2819
Email: editor@ijarets.org March- 2015 Volume 2, Issue-3 www.ijarets.org

LI-FI BASED LIGHT COMMUNICATION

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ABSTRACT:-
Li-Fi is a VLC, visible light communication. Li-Fi is now part of the visible light communication (VLC). Li-Fi typically implemented using white LED light bulbs. These are normally used for illumination by applying a constant current through the LED.
In our project we are using the technology of Li-Fi to transmit data through LED which is detected by Photo detector wirelessly. We are also transmitting audio signal through LED and receiving at speaker. Both action are through light.

We have divided our project in two segments:-

- Numeric data based device control system
- Wireless voice transmission trough light

Li-Fi is similar to Wi-Fi. Wi-Fi uses radio waves for transmission whereas Li-Fi uses visible light spectrum. In Wi-Fi as the user increases rate at which the data flows decreases which is not the case in Li-Fi.
Keywords: LI-FI , LED .

INTRODUCTION:-
Whether you are using wireless internet in a coffee shop, stealing it for the guy next door or competing for bandwidth at a conference, you have probably got frustrated of the slow speed you face when more than one device is tapped into the network. As more and more people and their many devices access wireless internet, clogged airways are going to make it increasing difficult to latch on to reliable signal. But radio waves are just one part of the spectrum that can carry our data. What if we could use other waves to surf the internet?
One German physicist, doctor Harald Hass has come up with a solution. He calls " Data Through Illumination" taking the fiber out of the fiber optics by sending through LED light bulb that varies in intensity faster than human eye can flow. It is the same idea behind infrared remote controls, but far more powerful. This concept is better known as LI-FI, light fidelity.
LI-FI uses visible light spectrum for transfer data it can support n number of users. Increasing the number of users does not affect the transmission of data. Keeping this in mind we used the concept of LI-FI to transmit data through light as well as audio signal through light.
The aim of this project is to is to provide green information technology and in it can be used for security purpose.

AIM:-
This project aims to use light to transmit data wirelessly. The rate at which data is transmitted is very high. The increasing demand for higher bandwidths, faster and more secure data transmission as well as environmental and

undoubtedly human friendly technology heralds the start of a major shift in wireless technology, a shift from RF to optical technologies.
This technology can be used for security purpose as light don't penetrate through the walls.

FEATURES:-

1. Green information technology
2. Free from frequency bandwidth problem
3. Increases communication safety
4. Multi user communication

ADVANTAGES :-

1. It can be used in hospitals and aircraft
2. Cheaper than wifi
3. Multi user communication
4. Used in under water without radio interference
5. Less risk of data leaking

DISADVANTAGES:-

The new technology Li-Fi is currently attracting a great deal of interest of researchers because it may offer a great and very efficient alternative to radio based wireless. One of the shortcomings is that it can only work in direct line of sight.

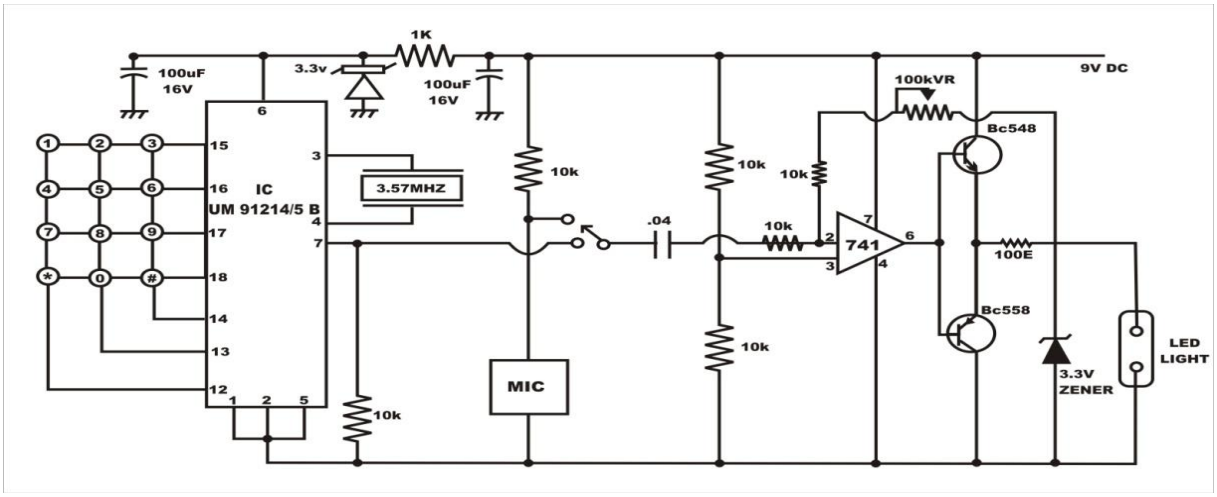
APPLICATIONS:-

1. Hospitals and health care centers
2. Aircraft and submarines
3. Traffic light can be used as hotspot

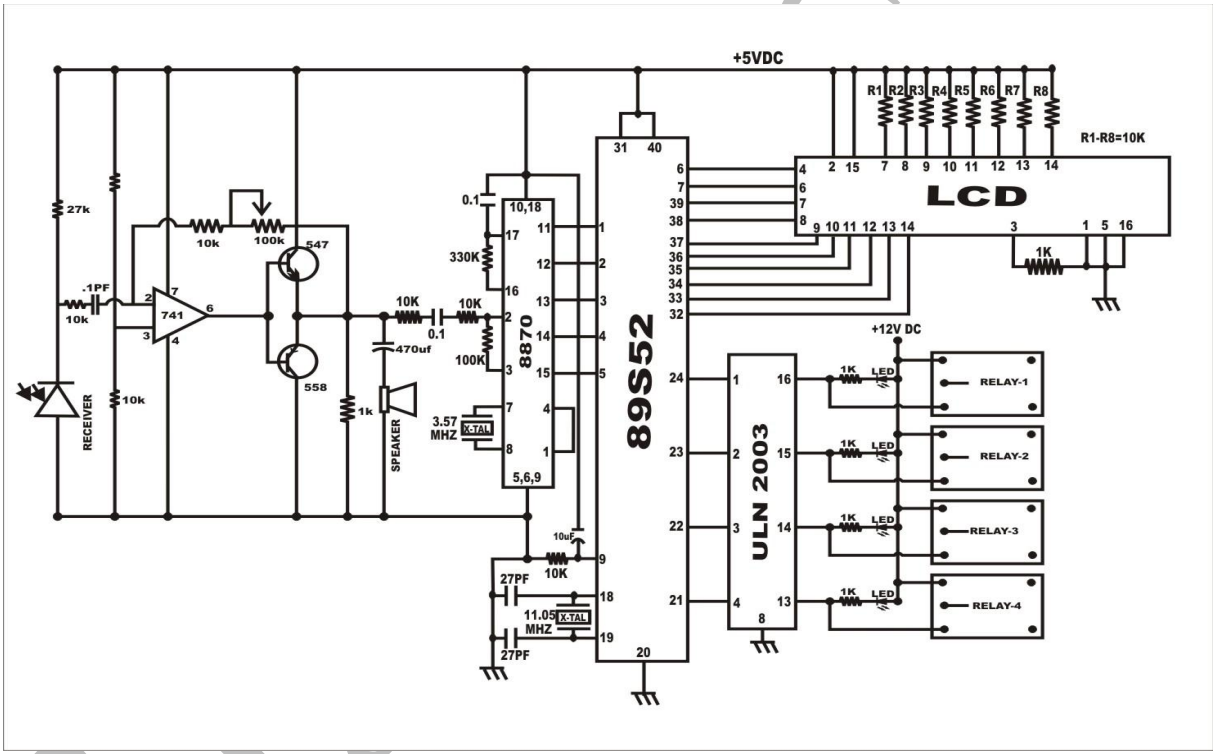
DESIGN EQUIPMENTS:-

1. DTMF IC
   a) DTMF encoder IC UM91214B
   b) DTMF decoder IC MT8870
2. Microcontroller 8051 AT89C52
3. Relay Driver IC ULN2003
4. Liquid crystal display (LCD) (16*2)
5. OP AMP IC 741
6. Resistor
7. Capacitor
8. Push Pull Amplifier

ARCHITECTURE:-



Circuit diagram of transmitter



Circuit diagram of receiver

WORKING:-

We are dividing our project's working in two segments:-

1. Numeric data based device control system
2. Wireless Voice transmission through light.

Numeric data based device control system

Transmitter section

In transmitter section we give input as 12 V of DC power supply. This unit consists of telephone set which is present in the remote place. This may be our workspace (office / school) phone or mobile phone or a phone in PCO. Signals are sent through this telephone. The figure (E) shows the circuit diagram of the DTMF encoder which resembles the telephone set. It uses DTMF encoder integrated circuit, Chip UM 91214B. This IC produces DTMF signals. It contains four row frequencies & three column frequencies. The pins of IC 91214 B from 12 to 14 produces high frequency column group and pins from 15 to 18 produces the low frequency row group. By pressing any key in the keyboard corresponding DTMF signal is available in its output pin at pin no.7. For producing the appropriate signals it is necessary that a crystal oscillator of 3.58MHz is connected across its pins 3 & 4 so that it makes a part of its internal oscillator. By pressing the number 5 in the key pad the output tone is produced which is the resultant of addition of two frequencies, at pin no. 13 & pin no.16 of the IC and respective tone which represents number '5' in key pad is produced at pin no.7 of the IC . This signal is sent to the local control system through telephone line via exchange.

In our project it send signal through high glow led.

Receiver section

In this section we use 8870 decoder IC, this IC is directly connected microcontroller to operate devices by using ULN 2003 IC

The MT-8870 is a full DTMF Receiver that integrates both band split filter and decoder functions into a single 18-pin DIP. Its filter section uses switched capacitor technology for both the high and low group filters and for dial tone rejection. Its decoder uses digital counting techniques to detect and decode all 16 DTMF tone pairs into a 4-bit code. External component count is minimized by provision of an on-chip differential input amplifier, clock generator, and latched tri-state interface bus. Minimal external components required include a low-cost 3.579545 MHz crystal, a timing resistor, and a timing capacitor. The MT-8870-02 can also inhibit the decoding of fourth column digits.

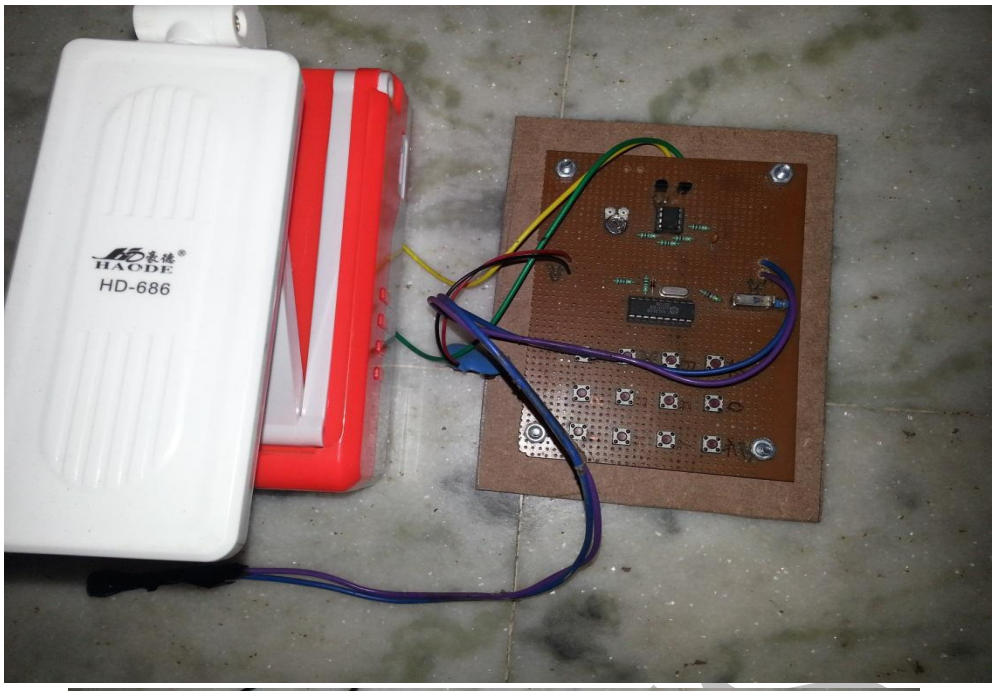
Wireless Voice transmission through light

Transmitter

In our project we use voice transmitter to transmit voice signal through a microphone. Tracing a signal through the transmitter circuit starts with the microphone. Here any acoustic vibrations near the microphone are sensed and produce an electrical AC signal proportional in strength and frequency to that of the acoustic signal. This AC signal is coupled through the blocking capacitor to the LM741 audio amplifier. The LM741 amplifies the signal and drives the light LED. The output of the LED is infrared light with a DC component and AC Signal superimposed upon it from the LM741.

Receiver

The receiver circuit functions, photo detector, amplifier, adjustable volume control and miscellaneous electronics. Following a signal as it exits from the light, in the form of light. The circuit is basically an amplifier. The IR signals are picked up by the photodiode and converted into electrical variations which are amplified by the op-amp (operational Amplifier) IC-741 used in the inverting mode with a single supply using divider network of resistors. The gain of IC can be set by varying the feedback through VR1 resistance (can place a 2.2. M variable). Here the output of IC is further amplified by the push pull amplifier using transistors pair. The output of the amplifier is taken from emitter of two transistors, with a filter capacitor from speaker



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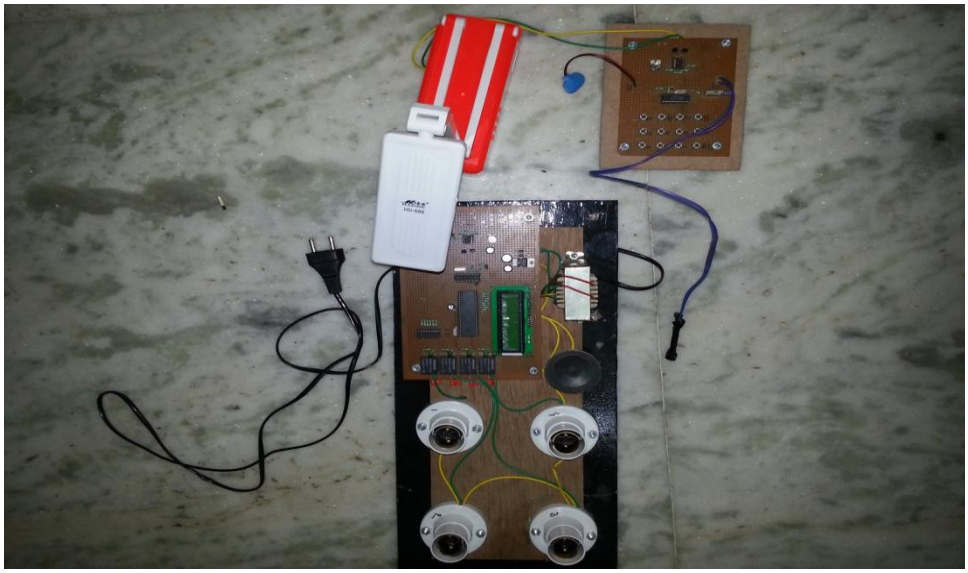

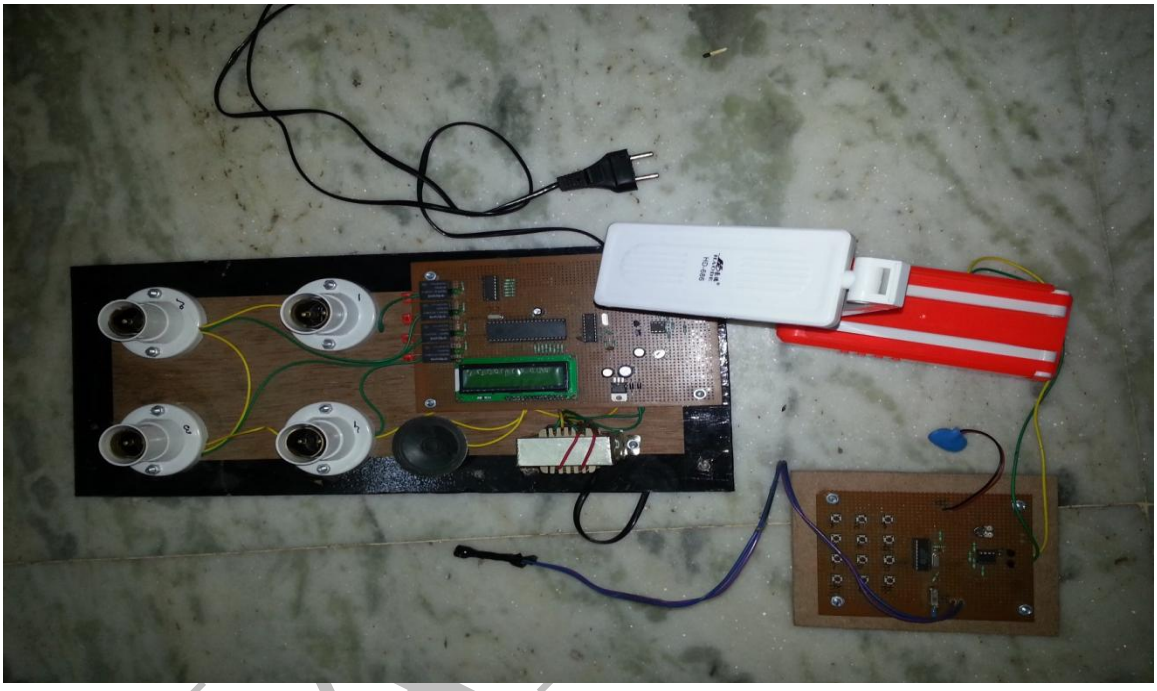

REFERENCES

1. Y. Tanaka, T. Komin, S. Haruyamaand, and M. Nakagawa, "Indoor Visible communication Utilizing Plural White LEDs as Lighting," in Proceedings of the 12th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2001), San Diego,CA, September 2001, pp. F81–F85.
2. Jia-yuan WANG, Nian-yu ZOU, Dong WANG, Kentaro IRIE, Zensei IHA, Yoshinori NAMIHIRA," Experimental study on visible light communication based on LED", The Journal of China Universities of Posts and Telecommunication,vol. 19, Supplement 2, October 2012.
3. Tsonev, D. ;Sinanovic, S. ; Haas, Harald (15 September 2013). "Complete Modeling of Nonlinear Distortion in OFDM-Based Optical Wireless Communication". IEEE Journal of Lightwave Technology 31 (18): 3064– 3076. doi:10. 1109/JLT. 2013. 2278675