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# LI-FI BASED INDOOR POSITIONING SYSTEM

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***Abstract*** **:**

*While visiting new buildings people are generally unaware of a buildings architecture and in large ones, also find themselves lost. The idea of using Li-Fi technology to assist people in finding their exact position in any building is proposed. A prototype is developed based on Light-Fidelity (Li-Fi) transmitter and receiver and Arduino Uno as the microcontroller unit to control these. Finite state machine is used to decode the received sequence. This system is tested under variable ambient light as well as average speed of mobility of possible users. The location update was found to be instant and precise. This system can thus, be handy in getting an exact location update by means of the buildings lighting fixtures inside any building in which it is installed. This be helpful while visiting places where directions are either not displayed or are illegible to the visitor for some reason.*

## I. Introduction:

The Li-Fi technology can transfer the data through LEDs. It is a high speed and low cost wireless communication system, compared to Wi-Fi. It can provide high security, large bandwidth, and low cost. Li-Fi uses common household LED (light emitting diodes) light bulbs to enable data transfer, boasting speeds of up to 224 gigabits per second Light Fidelity (Li-Fi) is a bidirectional, high speed and fully networked wireless communication technology similar to Wi-Fi. The term was coined by Harald Haas and is a form of visible light communication and a subset of optical wireless communications (OWC) and could be a complement to RF communication (Wi-Fi or Cellular network), or even a replacement in contexts of data broadcasting Li-Fi can be considered better than Wi-Fi because there are some limitations in Wi-Fi. Wi-Fi uses 2.4 – 5 GHz radio frequencies to deliver wireless internet access and its bandwidth is limited to 50-100 MBPS .This technology has been proposed as a solution to the RF bandwidth limitations. Indoor navigation is convenient to everyone and it is especially indispensable for the visually impaired. Li-Fi makes use of a free, unlicensed spectrum and is not affected by RF noise. Moreover, most indoor locations would have a sufficient amount of light sources and provide additional security since Li-Fi cannot penetrate through walls the system uses Li-Fi transmitters installed in buildings lighting fixtures as beacons that communicate their location to a portable user-held Li-Fi receiver unit. Due to Li-Fi technologies inherent short range and inability to pass through opaque objects, it can be used conveniently to pin-point exact locations inside a building. This can have tremendous applications in the tourism sector for making portable tour- guiding systems which can work with Li-Fi receiver chip- containing mobile phones and in assisting blind people in moving about a building when interfaced with a voice-based application. This can also be used to provide a buildings positioning system in those buildings in which directions are either not given or are not legible to all its visitors for some reason thus, reducing peoples dependence on human aide

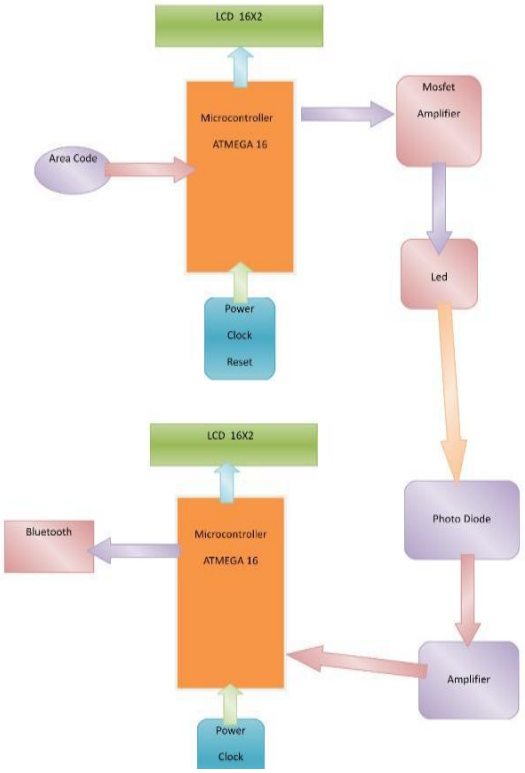
## II. Literature Survey:

1) It was July,2011 Dr. Harald Hass, Prof, mobile communication, university of Edinburgh, publicly demonstrated, li-fi for the first time, a method of visible light communication (VLC) technology

.2) Further researcher at Heinrich Hertz Institute in Berlin, Germany have reached data rates of over 500mbps using a standard white light LED, DR. Harald Hass setup a spin of firm to sell a VLC transmitter even more sophisticated an advance techniques are undergoing development at the university of oxford and the university of Edinburgh teams from university of oxford an Edinburgh are focusing on parallel data transmission using arrays of LED, where each LED transmit a different data streams while others groups are mixtures of red green and blue LEDs to alter the light frequency, with each frequency encoding a data channel.

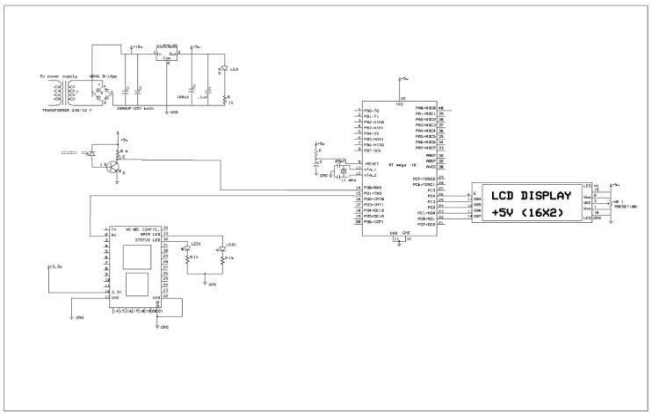
3) Today Researchers working for its feasibility and designing the hardware equipment required for making the technology robust and usable .Li-fi technology has higher potential .it is very much possible to transmit the data via light by changing the flicker rate that provide different string of 1s and 0 and its intensity is modulated to quickly that the human eye cannot notice .there are around 19 billion light emits worldwide. which in terms may be replaced by LED

## III. Research Methodology:

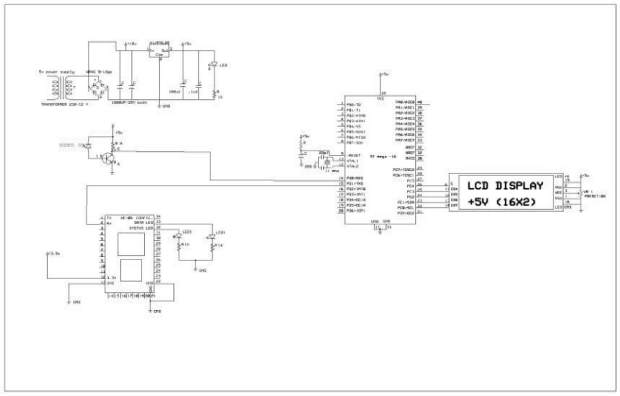



## IV. Experimental setup:

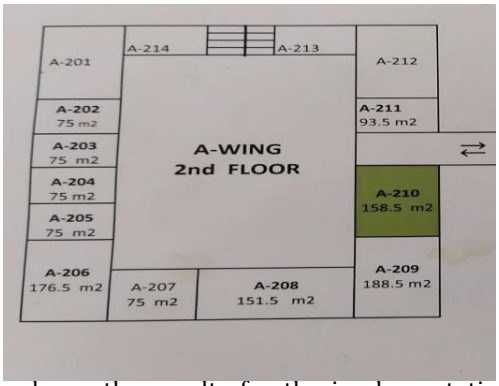
- **Transmitter module:**




- **Reciever Module:**




## V. Experimental Result:




Figures shows the results for the implementation of the indoor navigation system using Li-Fi system. Figs. shows the serial communication performed by using Flash utility by loading the code into the microcontroller Atmega 16 shows the implementation of the transmitter circuitry. Shows the light detection at the receiver end by the photodetector.

A baud rate of 9600 is achieved during the transmission of the data. The location message is successfully transmitted over the LED's that is received by the receiver to provide audio message to the user thus helping in indoor navigation.

## VI. Conclusion:

The LI-FI based indoor positioning system has been designed and implemented .The result obtained have proven the feasibility and effectiveness of the design location updates were obtained in the system instantaneously and with good accuracy. The project will emerge as a promising technology in upcoming era by providing the navigation for visually impaired using li-fi. This consists of a Li-Fi based lighting fixture and a portable Li-Fi receiver module and shows how the system will work by establishing a communication link between the receiver and the light transmitters every time the receiver enters a transmitter's cone of light and communicates the unique identity of the location The effect of the background noise from natural, artificial and stray sources on the systems performance was studied and conclusion reached that adaptive threshold controllers could be installed to enhance the performance of the system in an indoor space in which background light varies tremendously over short distances. It is suggested that this system be refined to enable navigation and guidance within an indoor space which would be very useful in aiding blind people in particular, and visitors in general, to move around in an unknown space. This system can be improved further to support data speeds and accuracy to meet IoT requirements indoor.

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