A Survey of Indoor Travel Assistance Systems for Blind and Visually Impaired People Using Li-Fi

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ABSTRCT-I proposed an indoor navigation system that utilizes visible light communication technology, which employs LED lights and a geomagnetic correction method, aimed at supporting visually impaired people who travel indoors.To verify the effectiveness of this system, I conducted an experiment targeting visually impaired people.Although acquiring accurate positional information and detecting directions indoors is difficult.I have confirmed that using this system, accurate positional information and travel direction can be obtained utilizing visible light communication technology, which employs LED lights, and correcting the values of the sensors integrated in system.

I. INTRODUCTION

In this system, I have Arduino UNO microcontroller which acts as brain of our system, hence, the entire system program is stored in it.

Here, every room enabled with Light transmitter that transmits unique data, while, blind people has one unit that consists of receiver unit that consists microcontroller along with APR module that plays preloaded voice messages. Owing to power limitations and hardware constraints of the Internet of Things (IoT) device, it requires simple, low power, low complex, energy-efficient communication technology. In contrast, LiFi users require high data rates and reliable connectivity. Motivated by the diverse requirements of these heterogeneous users, this paper proposes novel green communication schemes that can be used for the coexistence of LiFi users and light communication (LC) enabled IoT devices under a common LiFi access point.

LI-FI:

Li-Fi (also written as LiFi) is a wireless communication technology which utilizes light to transmit data and position between devices. The term was first introduced by Harald Haas during a 2011TEDGlobal talk in Edinburgh.Li-Fi is a light communication system that is capable of transmitting data at high speeds over the visible light, ultraviolet, and infrared spectrums. In its present state, only LED lamps can be used for the transmission of data in visible light. In terms of its end user, the technology is similar to Wi-Fi — the key technical difference being that Wi-Fi uses radio frequency to induce a voltage in an antenna to transmit data, whereas Li-Fi uses the modulation of light intensity to transmit data. Li-Fi is able to function in areas otherwise susceptible to electromagnetic interference (e.g. aircraft cabins, hospitals, or the military).

Bg-Fi is a Li-Fi system consisting of an application for a mobile device, and a simple consumer product, like an IoT (Internet of Things) device, with color sensor, microcontroller, and embedded software. Light from the mobile device display communicates to the color sensor on the consumer product, which converts the light into digital information. Light-emitting diodes enable the consumer product to communicate synchronously with the mobile device.

ULTRASONIC SENSOR:

The transmitter that can emits up to 8 bursts of adirectional 40KHz ultrasonic wave when it istriggered and then starts the timer. Thus theultrasonic pulses travel outward until theyencounters an object. The object that causes thewave that should be reflected back towards theunit. The ultrasonic receiver would detect

thereflected wave and stops the timer. 340m/sec is thevelocity of the ultrasonic burst in air. Based on thenumber of counts by the timer, the distance can becalculated between the object and transmitter. TheTRD Measurement formula is expressed as: $D = CX T$ which is known as the time/rate/distancemeasurement formula ,where D is the measured distance, and R is the propagation velocity.

Digital image processing has a broad spectrum of applications, such as remote sensing via satellites and other spacecraft's, image transmission and storage for business applications, medical processing, radar, sonar and acoustic image processing, robotics and automated inspection of industrial parts.expressed in (Rate) in air (speed of sound) and Twhich represents time. In this application T isdivided by 2 as T is double the time value fromtransmitter to object back to receiver.The features of the ultrasonic sensor are, it have the close range of 2 centimetres. Then it should havethe stable performance. Ultrasonic sensors aremeasure the accurate distance between the obstacle and other disturbances. These sensors have the high density SMD board.
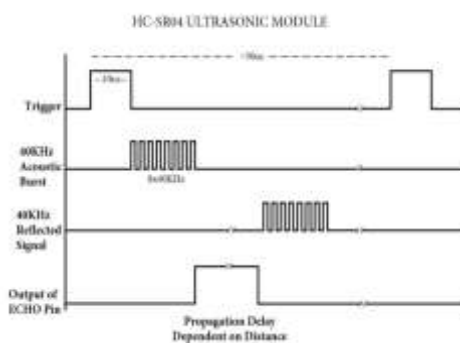

Fig3. Image of Ultrasonic sensor

Fig 4. Graph of a ultrasonic module

ARDUINO UNO:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010. 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 I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery. It is 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.

The word "uno" means "one" in Italian and was chosen to mark a major redesign of the Arduino hardware and software. The Uno board was the successor of the Duemilanove release and was the 9th version in a series of USB-based Arduino boards.Version 1.0 of the Arduino IDE for the Arduino Uno board has now evolved to newer releases. The ATmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.

While the Uno communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use a FTDI USB-to-UART serial chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

LI-FI TRANSMITTER:

The LiFi Transmitter is a custom-design front-end for visible light communications (VLC). It has a wide bandwith (25 MHz) to support even the most demanding video streaming applications. The transmitter has a powerful 5000K 186 lumen LED with an interchangeable lens mechanism.LiFi technology uses led's for transmitting data. It is derivative of optical wireless communication technology using light from Led to deliver high speed communication. Visible light communication works by switching the Led off and on at very high

speed, it can''t noticed by the human eye.

LI-FI RECEIVER:

LiFi Receiver is a custom-design front-end for visible light communications (VLC). It has a wide bandwith (20 MHz) to support even the most demanding video streaming applications. The receiver features a photodetector with a field-of-view of 170° enabling a robust performance in non line-of-sight conditions.

ARDUINO SOFTWARE IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.
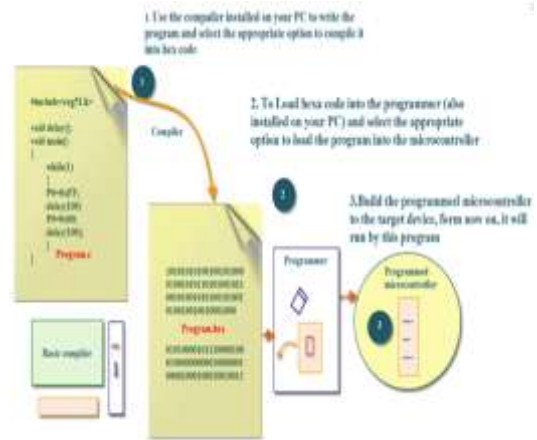

EMBEDDED C:

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software.

Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

Let's see the block diagram representation of embedded system programming:

The Embedded C code written in above block diagram is used for blinking the LED connected with Port0 of microcontroller.
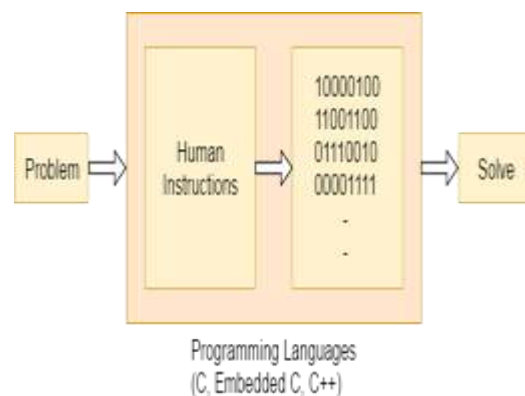
In embedded system programming C code is preferred over other language. Due to the following reasons:

- Easy to understand
- High Reliability
- Portability
- Scalability

EMBEDDED SYSTEM PROGRAMMING:

Basic Declaration

Let's see the block diagram of Embedded C Programming development:

Programming Languages
(C, Embedded C, C++)

Function is a collection of statements that is used for performing a specific task and a collection of one or more functions is called a programming language. Every language is consisting of basic elements and grammatical rules. The C language programming is designed for function with variables, character set, data types, keywords, expression and so on are used for writing a C program.

The extension in C language is known as embedded C programming language. As compared

to above the embedded programming in C is also have some additional features like data types, keywords and header file etc is represented by #include<microcontroller name.h>.

HARDWARESPECIFICATIONS
POWER SUPPLY
ARDUINO UNO
LCD
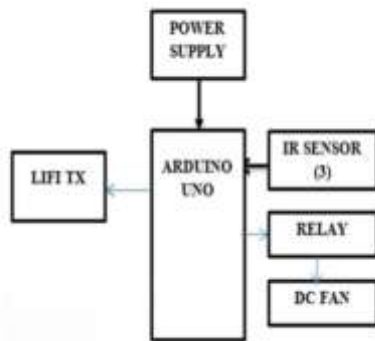IR SENSOR

BlockDiagram
TRANSMITTER SECTION:
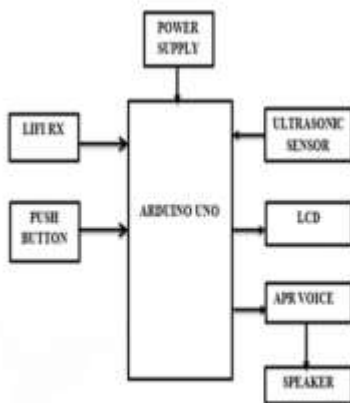

Fig: Transmitter sectionBlockDiagram

RECEIVER SECTION:

Fig : Receiver sectionBlock Diagram

System Design:
The proposed system which overcomes the existing system is given as,

ULTRASONIC SENSOR
APR VOICE MODULE
SPEAKER
RELAY
DC FAN
LI-FI TX&RX

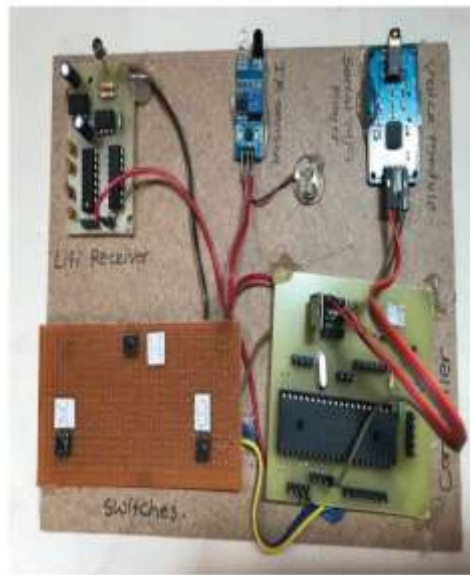**SOFTWARE SPECIFICATIONS**
ARDUINO IDE
EMBEDDED C LANGUAGE

Fig . The hardware configuration of proposed li-fi device

II.   CONCLUSION:
For the first time, this paper explores the coexistence of LiFi users and LC enabled IoT devices under a common LiFi AP for green DL and UL communication. The proposed coexistence schemes one for DL and another for UL communication utilize the amalgamation of WDM, OFDMA, DCO-OFDMH, NDCE, DHT precoding, interleaved subcarrier mapping and MDS to achieve concurrent interference-free, low complex and reliable communication. The proposed and conventional DCO-OFDMH based coexistence schemes have been extensively analyzed with respect to seven performance metrics as iterated in order of preference, viz. system complexity, PAPR, ESE, the maximum number of IoT devices (Km), power saving with respect to QAM-DCO-OFDMH, EH, and SNR. The results suggest that *PAMUp-MDS-P-DCO-OFDMH provides the least computational complexity (against rest schemes analyzed in this work) of $O(1)$ and $O(Q)$ at the LC enabled IoT and LiFi user's terminal, therefore is most suitable for DL scenarios with massive IoT

devices and few LiFi users. The derived analytical results are in good agreement with the simulated results.

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