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Campus Navigation by Li-Fi Technology to Guide Visually Impaired Person

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ABSTRACT

This paper presents an idea about a new system to guide blind people with LI-FI technology in a cost efficient manner. This application is an innovative and cost effective guide system for blind people this system is based on Li-Fi technology and it is designed to try to solve the difficulties of acquiring the necessity information which may make the blind people to face problems. This navigation system identifies the current location and provides the audio output to the user, which will make the blind person capable of moving freely inside a campus without the help of others. They can also move safely without hitting any obstacles with the help of sensor. The concept of this paper is that navigation can be done with the use of light in the indoors.

1. INTRODUCTION

Navigation is indispensable for the visually impaired. Visually impaired people cannot get guidance all the time and they find it difficult to walk in an indoor campus. Guide dogs are also not permitted in many places and they cannot predict what the person wants to know. This paper introduces the Li-Fi concept for navigation. Li-Fi technology can transfer the data through LED. 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. Li-Fi stands for Light Fidelity. The term Li-Fi was coined by Professor Harald Haas, at a Ted Global Talk back in 2011 where he demonstrated Li-Fi for the first time.

The term Li-Fi is similar to the concept of Wi-Fi except the fact of the use of light source. Li-Fi complies with the IEEE standard IEEE 802.15.7. The IEEE 802.15.7 is a high-speed, and fully networked wireless communication technology. Moreover, the modulation process of the light is much faster that even the human eye doesn't notice. It provides additional security since Li-Fi cannot penetrate through walls and will be confined within an area.

2. EXISTING SYSTEM

The existing system makes use of GPS system. It navigates you to the nearest place in the outdoors. GIS is a computer program that is utilized to view and handle data about locations. It is a more complex mapping technology that is connected to a particular database. The Global Positioning System (GPS) is a space-based satellite navigation system, where there is an unobstructed line of sight to more GPS satellites.

It is freely accessible by anyone with a GPS receiver. The user has to give the information about the destination by an audio input. This is an uncertain factor that if the audio output does not matches then the system may not recognize and this may lead the person to face difficulties over time. The mapping system is also more complex and it is difficult to use in the indoor campus navigation. It does not contain the system to alert the person when he is facing an obstacle on the way.

3. PROPOSED SYSTEM

We are proposing a navigation system for the Visually Impaired people by using Li-Fi module. Li-Fi is a transmission of data through illumination. If a user wants to find the current location or the nearest location within the college, then the user will be provided with the receiver. The transmitter sends data through LED light bulbs. The number of LED bulbs can be implemented as per the requirement. So as when the light is transmitted then the system is able to detect it and gather the address from the transmitter and provide an audio output with the reception of the light source. LED lights emit visible light with location data and an embedded system receiver, receives the data. This data is transmitted through Li-Fi transmitter. This data is received by the user through Li-Fi receiver. The embedded system calculates the designation and speaks to the visually impaired through a headphone. When the light is made to glow, then the light starts transmitting the data. The receiver will receive the data in the form of light. The address of each location will be send to the receiver as he moves on. The current location and the nearest location will be provide to the user by the pre-recorded voice. Modifications are made possible if necessary. Ultrasonic sensor is implemented to sense the obstacles on the way. The obstacle will be detected and it provides the information to the user to turn to right or left direction so as to avoid hitting the object on the way. The vibrator motor will alert the user by providing vibration to it so as to provide the immediate response.

4. BLOCK DIAGRAM

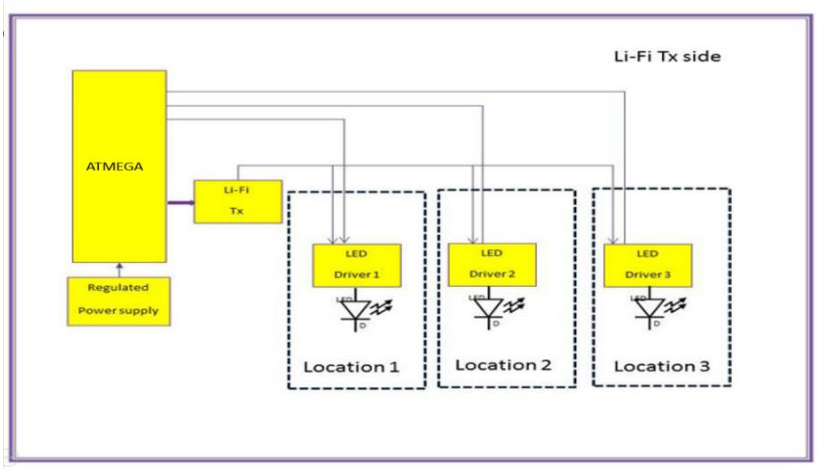

Figure.1 Li-Fi Transmitter Unit

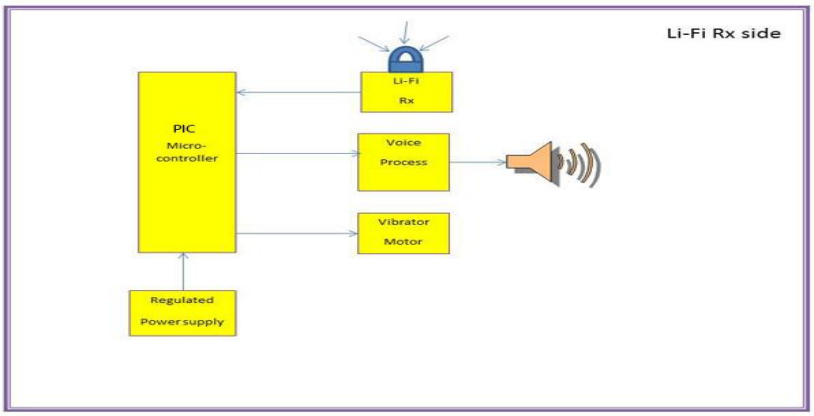

Figure. 2Li-Fi Receiver Unit

Two blocks are present in the system, the transmitter and the receiver block. The transmitter and receiver blocks are shown in the figure 1 and 2.

5. CIRCUIT DIAGRAM

The overall circuit diagram is represented in Figure 3 and 4. Atmega 8 controller is used in transmitter side and PIC microcontroller is used in the receiver side.

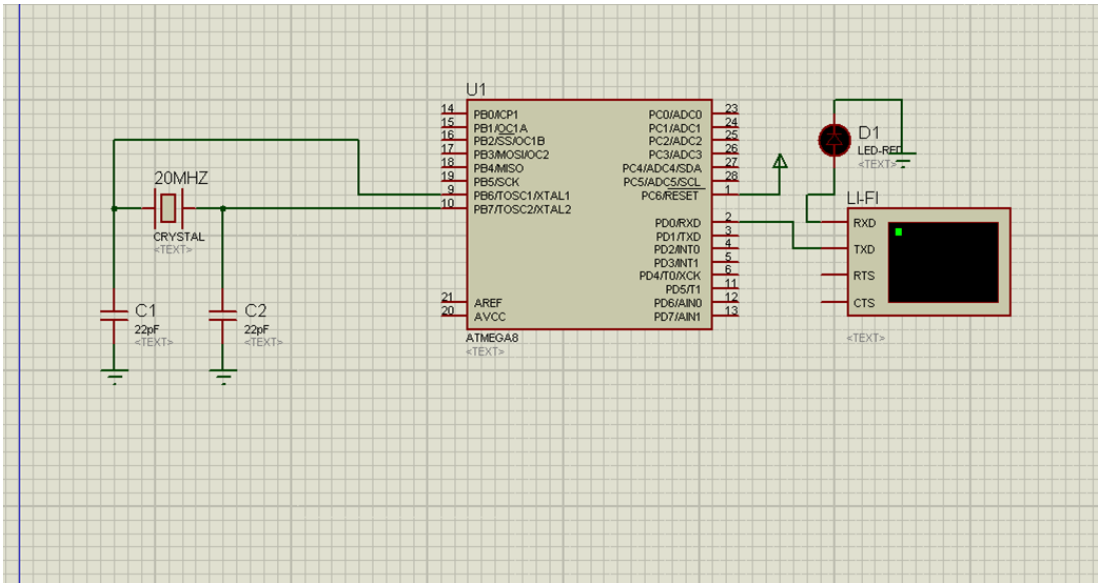

Figure.3 Li-Fi Transmitter

6. SYSTEM ARCHITECTURE

The overall hardware part of is shown in the Fig.5. By applying some minimum amount of voltage each and every module is tested. After testing each module is connected to the desired pins of the microcontroller.

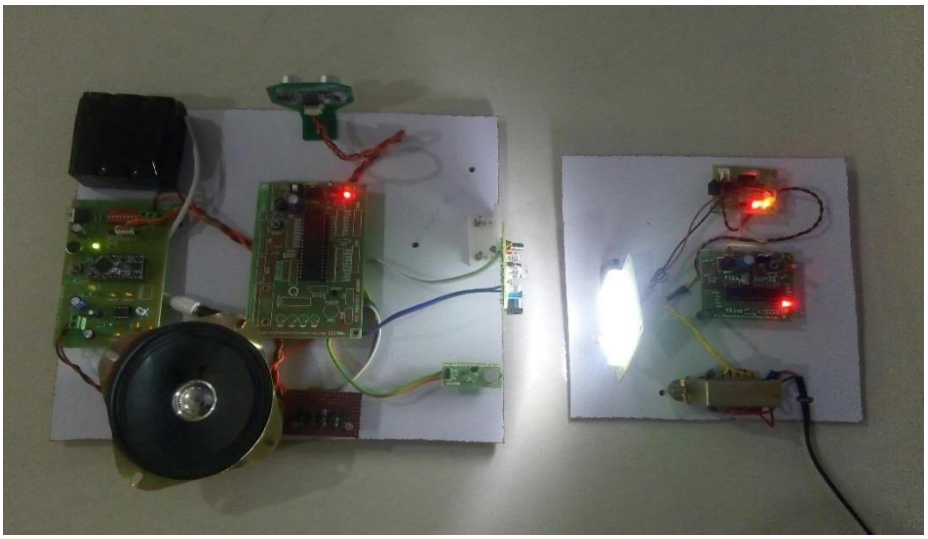

Figure.4 Li-Fi Receiver

The main microcontroller of our project is PIC16F877A and ATMEGA 8.In this project, we used Proteus software to design the circuit diagram of our system. We have used MPLAB for program coding in our system in order to find any errors in the program. Then the program is executed by MPLAB software and the errors are debugged. Then the coding is then dumped into the IC. The circuit is designed using Proteus 8 software. The functioning of the entire system can be seen clearly after the simulation is done in Proteus.

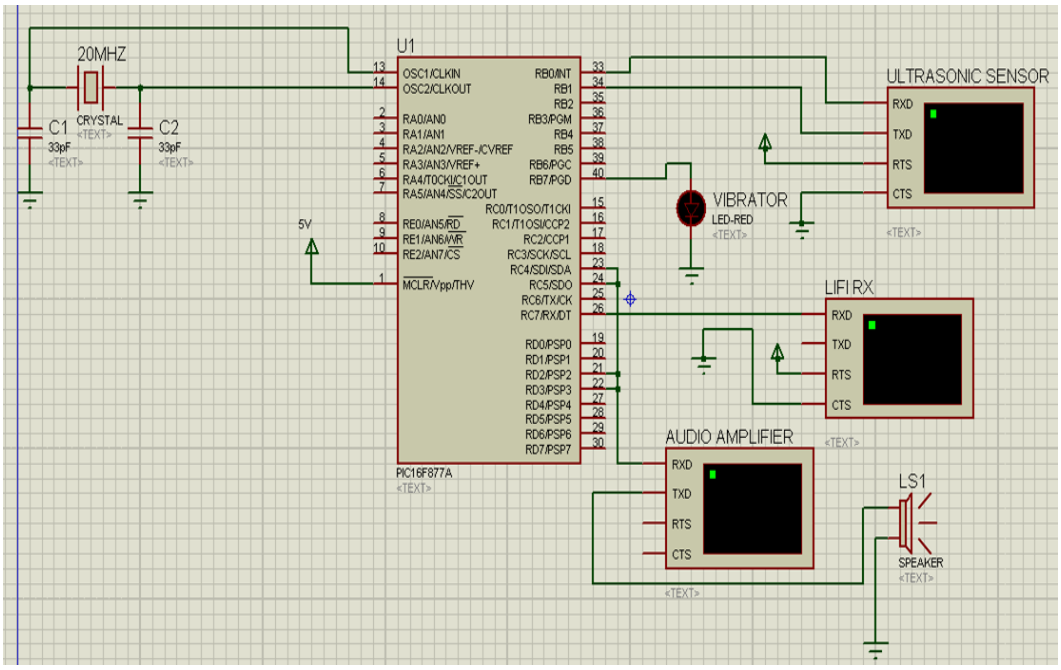

Figure.5 Working of the circuit

7. RESULT

The PIC microcontroller takes the responsibility of the receiver end of the circuit and receives the signal from the transmitter through the ATMEGA 8, and the output is provided as soon as the light is sensed, when there is an obstacle is found, the ultrasonic senor senses the obstacle and alerts the blind persons. The blind person is navigated by the Li-Fi light that sends the address to the receiver section that was held by the blind person.

8. CONCLUSION

This device is useful in many ways for the blind persons and can be implemented in many places where visually impaired persons find it difficult to move with other human beings. There is no need for the person to give voice input to the device. Whenever the person comes near the location, the voice signal will be given to the person who is holding the receiver. This device holds many advantages that are more beneficial to the blind and visually impaired person. There is no harmful radiation that affects the human body. Only the LED light is giving the information about the location. And also the person is alerted, when he/she is going to collide with the obstacles. This device can be modified into a new product that can be used in daily life.

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