Voice Guidance System for Blind in Traffic Signal, Bus Monitoring and Obstacle Identification by using Ultrasonic Sensor

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Abstract—*A Survey is Conducted by WHO (World Health Organization) in 2014 on Disability, 269 million visually impaired as well as 49 million blind People found worldwide. Now-a -days there are more facilities available for visually impaired people. The features are done based on the recent technological development in automation. Recent technologies are based on either sensor based or vision based. In most of the system the device use to receive the reflected waves and produces the vibration or audio in order to detect the Obstacles, but here the Voice Guidance System will clearly denotes about monitoring the traffic signal, Obstacle Identification and Bus Route Monitoring for Visually Impaired and Challenged People. Ultrasonic Sensor is used to do all the things for challenged people. Ultrasonic sensors are based on the measurement of the properties of acoustic waves with frequencies above the human audible range often at roughly 40 kHz.*

Keywords—Ultrasonic Sensors, Voice Guidance system, Visually impared, sensor based, automation

1. INTRODUCTION

Despite over a decade of intensive research and development, the problem of delivering an effective outdoor navigation system to blind or vision impaired persons remains largely unsolved. In each case, an ultrasonic sound wave is created, received, and evaluated. The three methods above make use of different physical principles, but they all employ the same measuring procedure. Ultrasonic Sensor is used to do all the things for challenged people. Ultrasonic sensors are based on the measurement of the properties of acoustic waves with frequencies above the human audible range often at roughly 40 kHz. This work provides a new technique of easy navigation system for the visually challenged people who are finding it difficult to navigate in correct path and in need of neighbor support for travelling in bus, while crossing the road. The system is provided with the help of voice recording to deliver the status of user transportation path, voice based announcement of bus arrival with the information of bus in detail through RFID technology in which bus contains RFID tag which contains the information of bus, using RFID reader user can get the details. And while crossing the road in heavy traffic road, traffic signal details are delivered to user through RF technology while crossing the road, obstacle identification whether stationary or moving is announced to the visually challenged people.

2. RELATED WORK

The auditory navigation system is available to help for the Blind People [1]. In all the Things, object is detected with the means of acoustic detection, for the betterment of blind People in the field of Navigation [2]. The Navigation system for the Blind People is all basically depends on Communication, all the communication is processed with some statistical analysis, combining Techniques is the key to succeed that communication [3][7][9]. The basics of all the blind navigation system uses mostly the Bluetooth with the necessary sensors. The sensor use to detect the things, when it is detect and gives back the information to corresponding navigator within the particular distance. All the navigation system is worked with certain limitations only.[4][5].

3. THE PROPOSED SYSTEM

Working module consists of a blind people module and a traffic signal module. The traffic signal module consists of a power supply, RFID reader, ultrasonic sensor, Pic microcontroller, LCD display and a voice playback module.

A. Components of the sysytem

1. Voltage regulator: The power supply mainly consists of a voltage regulator which converts a supply voltage of 12v to 5v.

2. RFID: The RFID reader reads the RFID tag which is placed across thebus so that the bus can be monitored by the blind user which can be informed to him by using a voice playback module. The RFID tag will contains the all the information about the bus. That means, the bus number and bus root ect. The frequency range of the RFID system is available in low, high, ultra and micro frequency range. From This system we are using low frequency range. The frequency range is 125 KHz-134 KHz.

3. Ultrasonic Sensor: An ultrasonic sensor which normally generates sound waves is used for obstacle identification to the user .The frequency range of the ultrasonic signal is 40 KHz to 400 KHz. When there is any obstacle whether it is stationary or moving which can be detected by the sensor, normally the sensor generates a sound signal that travels to the destination and provides the echo of that signal and the information is conveyed whether there is any object by using a voice board.

4. Traffic Signal Module: At the traffic signal module there is a timer so that the signal changes for every 60 seconds and the process is performed by using a microcontroller. The blind traffic module contains a RF receiver which uses RF waves to convey the information to the user using a zigbee module as the received signal is transmitted to the Rf transmitter which is placed across the blind people module.

5. PIC Microcontroller: The PIC16F877 is one of the latest products from Microchip. It features all the components which modern microcontrollers normally have. For its low price, wide range of application, high quality and easy availability, it is an ideal solution in applications

6. LCD Display and Voice Playback: LCD display module of 2 rows and 16 columns. This is the working principle of voice guidance system for blind people. From the zigbeetechnology ,the operating frequency range is 2.4GHZ.so we can able to transmit over 50 meters. Each and every information will be pass to the blind people by using voice board.

B. Objective of the System

The main objective of this system is to

- Design an electronic navigation system for detection of obstacle to help the visually challenged person to walk without a stick.
- Provide security for visually challenged person.
- To provide the system without any basic training and in low cost

C. System Module

The system mainly consists of User's Module which contains Power Supply, RFID Reader, Ultrasonic Sensor, RF Receiver,LCD and Voice Board, Bus Tag and Voice Tag (Traffic Module).

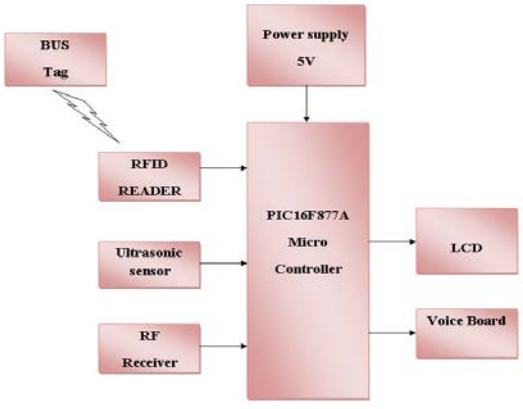

Fig. 1. User's Module.

The main Components which is present in the System areas follows:

1. PIC Microcontroller: The PIC16F877 is one of the latest products from Microchip. It features all the components which modern microcontrollers normally have. For its low price, wide range of application, high quality and easy availability, it is an ideal solution in applications such as: the control of different processes in industry, machine control devices, measurement of different values etc.

2. *Memory:* This microcontroller has three types of memory- ROM, RAM and EEPROM. All of them will be separately discussed since each has specific functions, features and organization.

3. *ROM Memory:* ROM memory is used to permanently save the program being executed. This is why it is often called "program memory". The PIC16F887 has 8Kb of ROM (in total of 8192 locations). Since this ROM is made with FLASH technology, its contents can be changed by providing a special programming voltage (13V).Anyway, there is no need to explain it in detail because it is automatically performed by means of a special program on the PC and a simple electronic device called the Programmer.

4. *EEPROM Memory:*Similar to program memory, the contents of EEPROM is permanently saved, even the power goes off. However, unlike ROM, the contents of the EEPROM can be changed during operation of the microcontroller. That is why this memory (256 locations) is a perfect one for permanently saving results created and used during the operation.

5. *RAM Memory:* This is the third and the most complex part of microcontroller memory. In this case, it consists of two parts: general-purpose registers and special-function registers (SFR).Even though both groups of registers are cleared when power goes off and even though they are manufactured in the same way and act in the similar way, their functions do not have many things in common.

6. *Interrupt System:* The first thing that the microcontroller does when an interrupt request arrives is to execute the current instruction and then stop regular program execution. Immediately after that, the current program memory address is automatically pushed onto the stack and the default address (predefined by the manufacturer) is written to the program counter. That location from where the program continues execution is called the interrupt vector. For the PIC16F887 microcontroller, this address is 0004h.

7. *I/O Ports:* One of the most important features of the microcontroller is a number of input/output pins used for connection with peripherals. In this case, there are in total of thirty-five general purpose I/O pins available, which is quite enough for the most applications.

8. Ultrasonic Sensor: Ultrasonic sensors are based on measuring the properties of sound waves with frequency above the human audible range. They are based on three physical principles: time of flight, the Doppler Effect, and the attenuation of sound waves. Ultrasonic sensors are non-intrusive in that they do not require physical contact with their target, and can detect certain clear or shiny targets otherwise obscured to some vision-based sensors. On the other hand, their measurements are very sensitive to temperature and to the angle of the target.

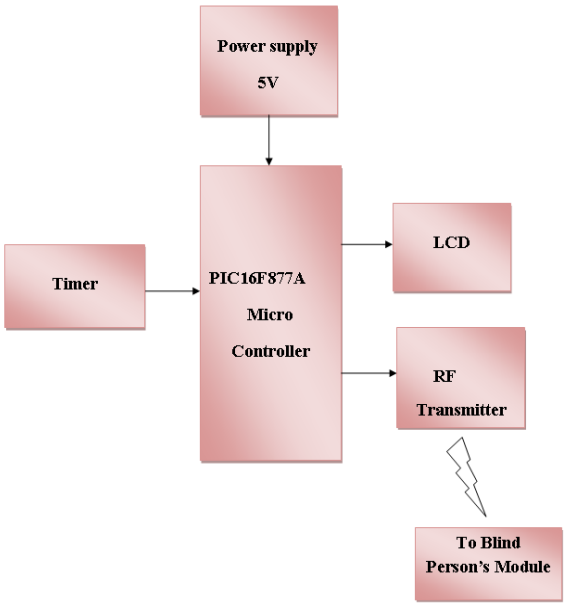

Fig. 2. Block Diagram of Traffic Module

D. System Software Tool

1. *MPLAB IDE:* MPLAB Integrated Development Environment (IDE) is a FREE, integrated toolset for the development of embedded applications employing Microchip's PIC and ds PIC microcontrollers.MPLAB IDE runs as a 32-bit application on MS Windows, is easy to use and includes a host of free software components for fast application development and super-charged debugging.

2. *HI-TECH C Compiler:* HI-TECH Software is a world class provider of development tools for embedded systems, offering compilers featuring Omniscient Code Generation, whole-program compilation technology, and an Eclipse-based IDE (HI-TIDE) for 8-, 16-, and 32-bit microcontroller and DSC chip architectures.

E. Working of the Module:

The working module consists of a blind people module and a traffic signal module. The traffic signal module consists of a power supply, RFID reader, ultrasonic sensor, Pic microcontroller, LCD display and a voice playback module. The power supply mainly consists of a voltage regulator which converts a supply voltage of 12v to 5v. The RFID reader reads the RFID tag which is placed across thebus so that the bus can be monitored by the blind user which can be informed to him by using a voice playback module. The RFID tag will contains the all the information about the bus. That means the bus number and bus root etc. The frequency range of the RFID system is available in low, high, ultra and micro frequency range. From This system we are using low frequency range. The frequency range is 125 KHz-134 KHz.

An ultrasonic sensor which normally generates sound waves is used for obstacle identification to the user.The frequency range of the ultrasonic signal is 40 KHz to 400 KHz. When there is any obstacle whether it is stationary or moving which can be detected by the sensor, normally the sensor generates a sound signal that travels to the destination and provides the echo of that signal and the information is conveyed whether there is any object by using a voice board. At the traffic signal module there is a timer so that the signal changes for every 60 seconds and the process is performed by using a microcontroller. The blind traffic module contains a RF receiver which uses RF waves to convey the information to the user using a zigbee module as the received signal is transmitted to the Rf transmitter which is placed across the blind people module. Thus the following process is displayed on the LCD display module of 2 rows and 16 columns. This is the working principle of voice guidance system for blind people.From the Zigbee technology, the operating frequency range is 2.4GHZ.so we can able to transmit over 50 meters. Each and every information will be passing to the blind people by using voice board.

4. Tests and Experiments

The tests have been done after all the modules got ready. The following pictures showed the each module denoting the system.

Fig. 3. Block Diagram of RFID Reader

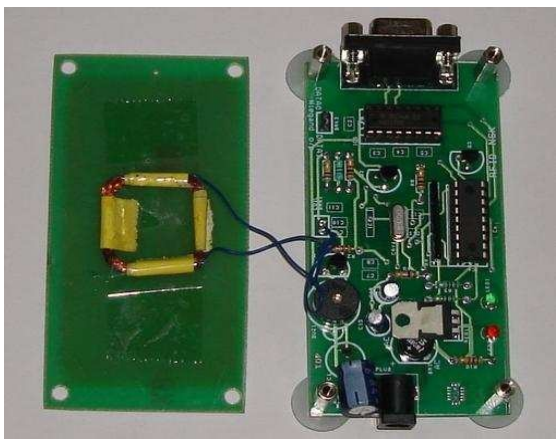

Fig. 4. Block Diagram RFID Tag

The diagram which is shown above is RFID reader and tag, which is used in the bus and user's module to track the bus as mentioned above. When the user is having the reader

the tag will be present in the bus, so that the user can easily read the tag in the bus using RFID reader.

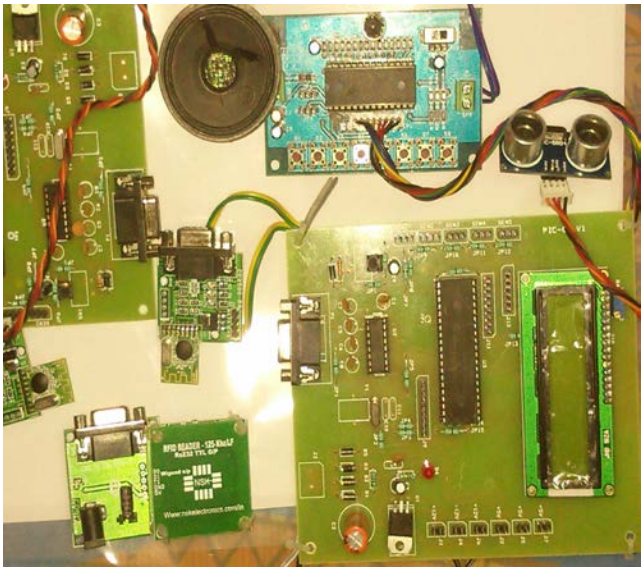

Fig. 5. Hardware module

For demonstration we are using application and voice software to convey message to the person. The working principle consists of a blind people module and a traffic signal module. The traffic signal module consists of a power supply, RFID reader, ultrasonic sensor, Pic microcontroller, LCD display and a voice playback module.The power supply mainly consists of a voltage regulator which converts a supply voltage of 12v to 5v. The RFID reader reads the RFID tag which is placed across t the bus so that the bus can be monitored by the blind user which can be informed to him by using a voice playback module. The RFID tag will contains the all the information about the bus. That means, the bus number and bus root ect. The frequency range of the RFID system is available in low, high, ultra and micro frequency range. From This system we are using low frequency range. The frequency range is 125 KHz-134 KHz.

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5. CONCLUSION

considering the expectation and requirement of the visuallychallenged person ,this system offers a low cost ,reliable , portable , lowPower and robust solution for smooth navigation .Meanwhile less trainingtime is required to use this system .with rigorous training , system can beused for outdoor navigation.

Further wearable aspect of this system can be improved using wireless connectivity between system components.Recognition of obstacles ,bus monitoring and traffic signal monitoring.

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