NAVIGATION SYSTEM ENABLING VISUALLY IMPAIRED PEOPLE FOR BOARDING PUBLIC BUSES

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ABSTRACT:

Blind people are desperately in need of special requirements when they use public transport like bus, train etc. The main objective of the project is to design and develop a navigational system to ease their travelling and movement of blind people. Some of the conventional methods used by visually impaired people/challenged people to reach their destination are talking sign, guide cans, echolocation etc. The proposed system consists of stick section ,bus section, and android section .According to the proposed idea, user will have a Bluetooth device in their stick section and zigbee module is placed in bus section .The stick section consist of microcontroller which stores all the bus route information of the arriving buses. When the user wants to find a bus, he needs to give his input via phone. Then the microcontroller in the stick section will compare the current information with that of already stored one, if it matches it will inform the user via headset that "the required bus has arrived". Once user got the information he can safely board the bus using IRDA TX and RX and ultrasonic sensor. This IRDA TX and RX facilitate them to find the correct direction to reach the bus .Additionally ultra sonic sensors will detect if any obstacles present on the way to board the bus

Keywords: zigbee, Android, IRDA TX and RX, microcontroller, Ultrasonic sensor and Bluetooth.

I. INTRODUCTION

Buses play an important role for the transportation system. To a majority of people, public transportation is the easy mobility option to seek social connectivity and is also flexible system to reach all destinations by road within the country. Especially for visually impaired people, the outdoor pedestrian mobility is very difficult and often dangerous. So generally they depend on walking stick, a cane, or guide dog to navigate outside environment. Particularly if they want to travel long distance they will prefer public transport like bus, train etc. In the case of bus they cannot identify which bus they want to go. So ultimately they need others help .Sometimes the bus they were in travel might not which they preferred one. So to help them we are proposing this project. It will help them to find their required bus and instruct them to get into the bus. For their comfort zone we are making our idea within the walking stick. The visually impaired people will tell their destination point using android phone and this will transmit to stick section which consists of PIC16F877A at the same time the bus section transmit the bus information through zigbee transmitter. Then the stick section compares the input given by blind with bus transmitted information. If it matches then it send the message to the blind like "your bus has been arrived" through headphone, it also direct them

to get into the bus by avoiding obstacles in their path. With the help of IRDA transceiver they safely board into the bus. Two IRDA TX fixed at the front and rear end of the bus indicating the entrance of the bus. So they can able to board the bus safely.

II. RELATED WORK

Several systems had been proposed for guiding blind people. Here, we will just mention the most related ones to the theme of our system. [1] This paper describes a bus detection system using RFID technology that aims to ease the traveling and movement of blind people. The proposed system has two main parts. First part is blind people recognition. Another part is communication between a bus and bus station. Blind people recognition part is of simple device and system. This part decides existing or non-existing of the blind at bus station. And then if pre-process recognize blind people, the bus station will communicate with the bus. They make up the announcement system about arrived bus information for the blind people using these parts. This announcement about arrived bus is to alert the blind people for taking the bus.[2]The aim of this project is to design and develop a RFID based bus identification system assisted with voice information for visually impaired persons. Blind people are desperately in need of special requirements and services including the public transportation. Their proposed system consists of two detection subsystems; one on the buses and the other on the bus stations, in the bus detection subsystem, the nearby stations will be easily detected and then announced through a voice message inside the bus. Moreover, any existing blind person in the surrounding area of the station will be detected by the bus subsystem to alert the bus driver about the number of blind persons. [3]Their work is on bus detection system using RFID technology that aims to ease the traveling and movement of blind people. Their proposed system consists of two detection subsystems; one on the buses and the other on the bus stations. In the bus detection subsystem, the nearby stations will be easily detected and then announced through a voice message inside the bus. Moreover, any existing blind person in the surrounding area of the station will be detected by the bus subsystem to alert the bus driver about the number of blind persons. In the bus station subsystem, the arriving buses will be detected and then announced in the station in order to alert the blind people. [4]According to their proposed idea, an RF unit is placed at the bus stop where the visually impaired are waiting and this unit is recognized by another unit in the bus. By using an RFID tag the visually impaired will give the input about his/her presence at the bus stop. The signals are generated by ARM-7 and these signals are sent by the ARM controller to the bus via RF module. A voice synthesizer APR9600 is used to convert the bus routes into an audio output. The visually impaired are alerted using a buzzer which will be turned ON as soon as the bus enter the bus stop. According to the wish of the visually impaired individual to aboard a specific route bus, this is notified to him/her with the help of voice synthesizer system. The bus routes from the bus are sent through the RF transceiver to the transceiver with the visually impaired and the announcement about the bus routes are made through the speaker to the visually impaired individual.

III. EXISTING MODEL

The existing system consists of two detection subsystems; one on the bus and the other on the bus stations. In the bus detection system the nearest bus stop are detected and then announced as a voice message .The blind person in the surrounding area of the station will be detected in order to alert the bus driver about the number of blind persons. In the bus station subsystem, the arriving bus number will be detected and then announced through speaker in the station in order to alert the blind people. In

this system it is difficult to identify the correct bus when many buses simultaneously arrive at the same time. The existing system fails to provide an accurate mapping to the blind people. The blind people obstacle indication system is only provided by this system. This fails to provide efficiency while routing the blind person to the bus.

In the case simultaneous arrival of the bus create confusion among visually impaired people. In day to day life bus will not exactly stand at the bus instead it may stand back and forth to the stop. This system fails to navigate the blind people to the bus.

IV. PROPOSED SYSTEM

The proposed system consists of three sections one section is the android section in Fig 1. The stick section consists of microcontroller, Bluetooth, zigbee receiver and IRDA receiver. The bus section consists of IRDA transmitter and zigbee transmitter. The android section is used to convert the speech format to text format. The converted text is transmitted to the next section (stick).

Fig 1: Android Section

The next section is the stick section in Fig 2. The stick section receives the data transmitted by the android via Bluetooth and the received data is stored in microcontroller. A Zigbee receiver is used in the stick section to receive the data from the bus section. The bus section transmits the bus details which are received by the stick section. The stick section compares the data's received by the android section and the bus section. Whenever the data is matched, then the voice signal alerts the blind people indicating the bus is arrived.

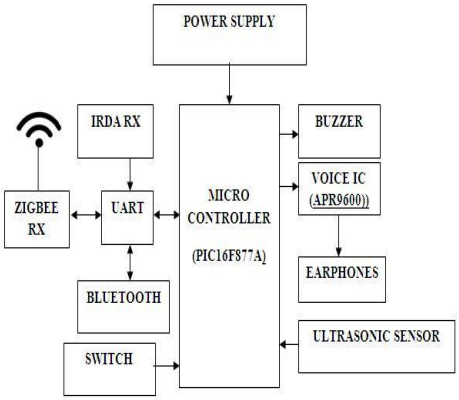

Fig 2: Functional Block Diagram of Stick Section

Two IRDA's with each one placed in the front and rear end of the bus. The IRDA receiver in the stick section detects the range and routes the user to the bus entrance by sending voice command signals to the blind people. An ultrasonic sensor is used to detect the obstacle in their way to board the bus. And also a switch is provided to the blind people to indicate the people boarding bus about the presence of blind to board the bus. A buzzer switch is also placed in the stick section to let the surrounding people to know about the presence of blind people. This provides indication to both the people boarding the bus and the bus driver about their entry in the bus.

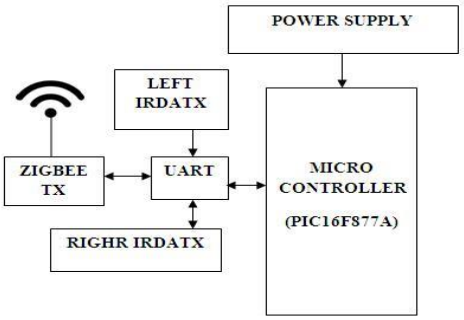

Fig: 3 Functional Block Diagram of Bus Section

V. HARDWARE DESCRIPTION

1. MICROCONTROLLER (PIC16F877A):

The term PIC, or Peripheral Interface Controller in Fig 4, is the name given by Microchip Technologies to its single – chip microcontrollers. PIC micros have grown to become the most widely used microcontrollersinthe 8-bit microcontroller segment. The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatiblewith the PIC16C5x, PIC12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, self 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

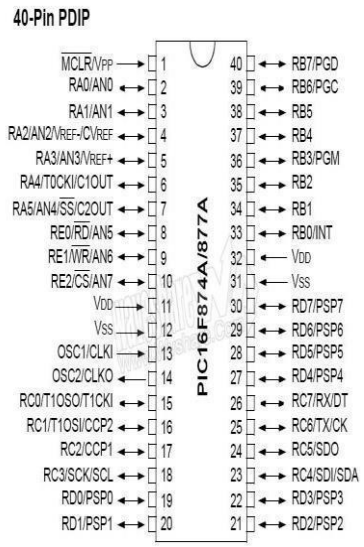

Figure: 4 Pin Diagram of PIC16F877A

Special Microcontroller Features:

Flash Memory: 14.3 Kbytes (8192 words)

Data SRAM: 368 bytes

Data EEPROM: 256 bytes

Self-reprogrammable under software control

In-Circuit Serial Programming via two pins (5V)

Watchdog Timer with on-chip RC oscillator

Programmable code protection

Power-saving Sleep mode

In-Circuit Debug via two pins

10-bit, 8-channel A/D Converter

Brown-Out Reset

Analog Comparator module

2. ZIGBEE:

ZigBee is a technological standard designed for control and sensor networks. Based on the IEEE 802.15.4 (in Fig 5) Standard Created by the ZigBee Alliance. It Operates in Personal Area Networks (PAN's) and device-to-device networks Connectivity between small packet devices Control of lights, switches, thermostats, appliances, etc. Development started 1998, when many engineers realized that Wi-Fi and Bluetooth were going to be unsuitable for many applications. IEEE 802.15.4 standards were completed in May 2003. Organization defining global standards for reliable, cost-effective, low power wireless applications. A consortium of end users and solution providers,

primarily responsible for the development of the 802.15.4 standard.

Figure :5 Zigbee Module

Developing applications and network capability utilizing the 802.15.4 packet delivery mechanism.

Characteristics:

Low cost
Low power consumption
Low data rate
Relatively short transmission range
Scalability
Reliability
Flexible protocol design
suitable for many applications

3. BLUETOOTH:

Bluetooth is a de facto standard and specification for small-form factor, low-cost, short range radio links between mobile PCs, mobile phones and other portable devices. The technology allows users to form wireless connections between various communication devices, in order to transmit real-time voice and data communications. The Bluetooth radio is built into a small microchip and operates in the 2.4 GHz band, a globally available frequency band ensuring communication compatibility worldwide. It uses frequency hopping spread spectrum, which changes its signal 1600 times per second which helps to avoid interception by unauthorized parties. In addition software controls and identity coding built into each microchip ensure that only those units preset by their owners can communicate. The specification has two power levels defined; a lower power level that covers the shorter personal area within a room, and a higher power level that can cover a medium range, such as within a home. It supports both point-to-point and point-to-multipoint connections and provides up to 720 Kbps data transfer within a range of 10 meters (up to 100 meters with a power boost). The technology uses Omni directional radio waves that can transmit through walls and other non-metal barriers.

4. VOICE IC-APR9600:

The APR9600 in Fig 6 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly simplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications. PLUS integrated achieves these high levels of storage capability by using its proprietary analog/multilevel storage technology implemented in an advanced Flash non-volatile memory process, where each memory cell can store 256 voltage levels.

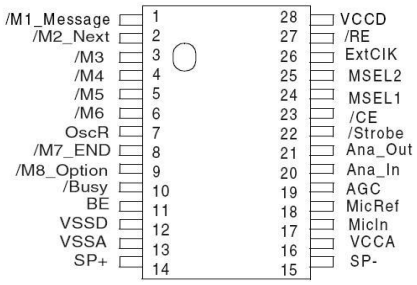

Figure 6: Pin Diagram of VOICE IC-APR9600

This technology enables the APR9600 device to reproduce voice signals in their natural form. It eliminates the need for encoding and compression, which often introduce distortion.

FEATURES:

- Single-chip, high-quality voice recording & playback solution
- No external ICs required
- Minimum external components
- Non-volatile Flash memory technology
- No battery backup required
- User-Selectable messaging options
- Random access of multiple fixed-duration messages
- Sequential access of multiple variable-duration message
- User-friendly, easy-to-use operation
- Programming & development systems not required
- Level-activated recording & edge-activated play back switches
- Low power consumption
- Operating current: 25 mA typical
- Standby current: 1 uA typical
- Automatic power-down
- Chip Enable pin for simple message expansion

5. IRDA TX AND RX:

The **Infrared Data Association** (**IrDA**) is an industry-driven interest group that was founded in 1993 by around 50 companies. IrDA provides specifications for a complete set of protocols for wireless infrared communications, and the name "IrDA" also refers to that set of protocols. The main reason for using IrDA had been wireless data transfer over the "last one meter" using point-and-shoot principles. Thus, it has been implemented in portable devices such as mobile telephones, laptops, cameras, printers, and medical devices. Main characteristics of this kind of wireless optical communication is physically secure data transfer, line-of-sight (LOS) and very low bit error rate (BER) that makes it very efficient.

VI. WORKING PRINCIPLE

The user transmits the destination using Mobile phone. The Data is received by the stick using Bluetooth receiver module. The Bus section transmits its destination using Zigbee. The bus signal is received by the stick section using Zigbee at the stick section. If the data received by Bluetooth and Zigbee is matched then it is indicated to the user using Voice IC through earphone. The IRDA receiver receives data from the Bus section. The Left IRDA and Right IRDA transmit a signal based on the IRDA signal received, the respective voice signal is provided to the user. Then based on the signal, the left or right command is passed to the user using Voice IC. The ultrasonic sensor is used to detect the obstacle. If the obstacle is detected, then the user is navigated using Voice Signal using Voice IC. Thus the user is navigated using Voice IC to reach the Bus. While navigating, the user presses a switch. When the switch is pressed, then a buzzer is alerted indicating that the user is boarding the Bus. Whenever the Buzzer is released, then it is known that the blind has boarded the bus.

VII. CONCLUSION

An interactive wireless communication aid system for the visually impaired to use city buses was developed in this project. Related works carried out in the existing system mainly focused on the announcement of bus arrival either in bus stop or in the entrance of bus. In the proposed system we provided safe navigational assistance by means of handheld device. Result of this project indicates that this system could help users to successfully board their desired buses. Our design is promising in terms of its performance and functionality. The proposed model can also be used by aged people, illiterates and physically challenged people.

VIII. REFERENCES

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