Bus Identification Module For Visually Impaired

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Abstract:
Talking signs, guide cane, echolocations are all useful in navigating the visually challenged people to reach their destination, but the main objective is not reached that it fails to join them with traffic. In this project we propose a bus system using wireless sensor networks (WSNs). The blind people in the bus station is provided with a ZigBee unit which is recognized by the ZigBee in the bus and the indication is made in the bus that the blind people is present in the station. So the bus stops at the particular station. The desired bus that the blind want to take is notified to him as he presses a button on the user module. The blind presses the query button to search for nearby buses and if he hears the required bus number he presses the Ok button. The input is then analyzed by the microcontroller which signals the voice record and playback IC to announce the bus number received from the bus module. The ZigBee transceiver in the bus sends the bus number to the transceiver with the blind and the bus number is announced to the blind through the speaker. The blind takes the right bus parked in front of him as the driver is also intimated about the presence of a visually impaired person at the stop. This project is also aimed at helping the elder people for independent navigation.

Keywords— Bus Identification Module; Controller; Zigbee Communication; Visually Impaired.

I. INTRODUCTION

Out the 6.7 billion people that populate the world, 161 million are visually impaired. Each visually impaired individual faces different challenges based on their specific level of vision. With the rise of various support-based organizations, more visually impaired people have been given the opportunity to education and many other means. But still the issues of navigation for the blind are very complex and troublesome especially when they walked down in street and also navigate to distant places by public transport system. For a visually impaired person, doing things such as reading traffic signals and street signs can be extremely challenging, if not it is impossible to do. In order to overcome these challenges, a visually impaired person might use waking cane, guide dog, and sighted guide.

These alternatives also called as assistive devices can be helpful to the blind but not so effective. The sighted guide can be immensely effective, as well provide social comfort, but it restricts the independence of the blind individual. Guide dogs and walking canes allow for a more independent means of travelling, but they are limited in unfamiliar environments. RFID is feasible and cost effective but it is more suitable for indoor communication only. Also it provides only one way communication and a very short range of identification. A system with an augmented walking cane, a pair of augmented glasses and identifiable items tagged with semacode/data matrix tags is used for outdoor navigation of blind people. If a man has to take the bus, he walks along the pavement and his walking cane recognizes a tag. But the image quality of the web camera is fairly poor. Tag recognition in darkness or in bad lightning conditions might be a problem. Another issue is that camera needs a visual, so if a tag is hidden behind a person or another object, then the camera cannot detect it. Tags on all environments will properly contaminate the environment and meet resistance from many citizens.

To overcome the drawbacks of currently available assistive devices, we propose a Wireless sensor network system with ZigBee for blind identification by the bus and embedded system for providing the bus number. Wireless sensor network (WSNs) consists of sensors that continuously monitors the environmental conditions and send their data to the main network. ZigBee is an embedded device for use in a WSN which is tiny in size. These nodes have processing and computational capability and generally consist of an RF transceiver, memory, on board sensors/actuators and a power source. ZigBee have CC2420 which is a true single-chip 2.4GHz IEEE 802.15.4 compliant RF (Radio Frequency) transceiver designed for low-power and low-voltage wireless applications so we can send or receive useful information through using this chip. The number of the bus parked in front of the blind is send to the ZigBee in the blind system. Another function of ZigBee is identification of blind in the
bus station. If both the numbers match the buzzer in the bus unit alarms and indicates the driver that there is blind in the bus station.

II. MATERIALS AND METHODS

A. INPUT SWITCHING UNIT

A switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch may be operated directly by a human operator to control a circuit (for example, a light switch or a keyboard button), may be operated by a moving object such as a door-operated switch, or may be operated by some sensing element for pressure, temperature or flow.

A push switch is a momentary or non-latching switch which causes a temporary change in the state of an electrical circuit only while the switch is physically actuated. An automatic mechanism (i.e. a spring) returns the switch to its default position immediately afterwards, restoring the initial circuit condition. In this project we use two switches namely 1. Query switch and 2. Selection switch. When the query switch is pressed the module searches for the nearby buses available and intimates the user. The selection switch is pressed by the user if the heard bus number is of his choice.

B. RECORD AND PLAYBACK UNIT

The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

The aPR33A series C2.0 is specially designed for simple key trigger, user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switch, It is suitable in simple interface or need to limit the length of single message, e.g. toys, leave messages system, answering machine etc. Meanwhile, this mode provides the power-management system. Users can let the chip enter power-down mode when unused. It can effectively reduce electric current consuming to 15uA and increase the using time in any projects powered by batteries. During the /REC pin drove to VIL, chip in the record mode. The message playback will continue until message pin drove from VIH to VIL again or end of this message. The following fig. showed a typical playback circuit for 8-message mode. We connected a slide-switch between /REC and VSS, and connected 8 tact-switches between M0 ~ M7 and VSS. When the slide-switch fixed in float side and any tact-switch will be pressed, chip will start message playback and until the user pressed the tact-switch again or end of message. The aPR33A series supported single channel voice input by microphone or line-in.

Bus unit consists of a ZigBee transceiver with a microcontroller which helps to find the availability of blind in the bus station and displays it. The blind unit is a mobile unit carried by the blind people which consists of ZigBee unit for identifying the corresponding bus parked in front of them, Speech recognition system for identifying the input and providing the corresponding bus number of the location specified by the blind as audio output.

C. MICROCONTROLLER

The 8051 is a well-known microcontroller device which is widely used. It is very comfortable to use and easy to operate. It has many advantages. It has 20 I/O ports. It supports digital inputs. The internal memory (Random Access Memory) is 4kb (Kilo Bytes). The external memory of 8051 is 128 bytes.

Most microcontrollers have several different systems for serial communication built in as standard equipment. One of the most important things concerning serial communication is the Protocol which should be strictly observed. It is a set of rules which must be applied in order that devices can correctly interpret data they mutually exchange. Fortunately,
the microcontrollers automatically take care of this, so the work of the programmer/user is reduced to a simple write (data to be sent) and read (received data). One of its advantages is that nothing is missing and nothing is too much. In other words, it is created exactly in accordance to the average user’s taste and needs. Other advantages are RAM organization, the operation of Central Processor Unit (CPU) and ports which completely use all resources and enable further upgrade.

The ATmega48PA/88PA/168PA/328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega48PA/88PA/168PA/328P achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The device is manufactured using Atmel’s high density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional non-volatile memory programmer, or by an On-chip Boot program running on the AVR core. Today the ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models. Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world.

D. WORKING

As soon as the user or the visually impaired person reaches the bus stop he presses the query button on the user module. The zigbee on the module then searches for the nearby zigbee devices and if they are available it gives voice output using the arduino and the voice recording and play back IC. If the user hears the required bus number he presses the selection button which will indicate the respective bus driver on the bus which is selected with the help of an LED and the bus module also gives a voice output that a visually impaired person is available at the bus stop. The user can follow the voice output from the bus and reach the bus. The driver will also slow down as he is aware that a person is waiting at the stop ready to board the bus. The whole process is carried out with the help of Zigbee, Arduino at the user end and a Zigbee and microcontroller at the bus end. Once the query switch is pressed the zigbee continuously transmits a symbol with the help of the micro controller. As soon as any bus reaches the Bus stop the zigbee receives another signal from the bus module and sends it to the controller to give out the voice output. If the bus is the required bus then as soon as the selection switch is pressed the controller sends a signal to the controller on the other end using zigbee communication and the bus module gives an indication using an LED and voice output is played as soon as the voice IC receives signal from the microcontroller.

E. TRANSMISSION UNIT

ZigBee is wireless technology developed by IEEE 802.15.4 - 2003 standard for low cost, low power, wireless sensor networks that is used for Low-Rate Wireless Personal Area Network (LR- WPANs). The standard takes full advantage of IEEE 802.15.4 physical radio specification that requires a low data rate, long battery life and secure networking. ZigBee is present with the blind people and in the bus which is the used instead of RFID.
than RFID tag and RFID reader. Secondly, it has two-way communication that is to send and receive signal at higher speed without interfering other signals like radio waves.

F. RESULTS AND DISCUSSION

When the person reaches the bus station, he can find the bus numbers and select the required bus number. When the bus approaches the bus station, there is an indication in the bus by the beep sound of a buzzer that there is a blind person available in the bus station.

This is achieved with the help of ZigBee unit both in the bus unit and blind unit. Finally when the bus reaches the station the bus number is announced to the blind through headphones. There are currently available systems for the outdoor navigation but they will not assist in travelling to unfamiliar areas. Some systems use PDA which is not so economic and cannot be afforded by all. In most of the systems RFID tags are used which are required in 1000s of numbers for tracking of route. Also it provides only one way communication. The system we use is a mobile unit, weightless and economically feasible.

III. CONCLUSION

The design of the proposed Zigbee system and controllers for the aid of visually challenged has been presented in this paper. The design presented here would be effective in providing an improved life for the vision deprived people.

REFERENCES