

Navigation System for Blind People

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Abstract:

The main objective of this paper is helping the blind/old and illiterate people as well as pedestrian people using Wireless Sensor Networks (WSN). Two units namely the passenger unit and the bus unit consisting of different modules like the PIC controller, voice synthesizer, speech recognition system, ZIGBEE is used. With the help of the ZIGBEE module in both the units the passenger identifies the bus it has to board. The microcontroller controls the Speech recognizer that is used for tracking the location and knowing the desired location given by the passenger respectively. If the location matches, the voice synthesizer will notify the passenger via earphones connected to the passenger unit to get down at the desired location.

This project is also aimed at helping the elder people for independent navigation. Guide cane, echo locations 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)-(ZIGBEE). The blind people in the bus station is provided with a ZIGBEE unit which is recognized by the ZIGBEE in the bus. The blind gives the input about the place he has to reach using microphones and the voice recognition system this input is then analyzed by the ARM-7 which generates the bus numbers corresponding to the location provided by the blind. These bus numbers are converted into audio output using the voice synthesizer APR9600.

Whenever bus has entered into bus stop buzzer will be ON to indicate the blind person. The desired bus that the blind want to take is notified to him with the help of speech recognition system. The ZIGBEE transceiver in the bus sends the bus name to the transceiver with the blind and the bus number is announced to the blind through the headphones. This project is also aimed at helping the elder people for independent navigation.

Keywords:

Lpc2148 Microcontroller, ZIGBEE Trans Receiver, LCD Display, Bluetooth Module, Buzzer, Voice synthesizer IC, Hm12, Speaker, Switches.

I. INTRODUCTION:

Helping Hands for the Blind was founded to address the concerns, and as a vital resource for the blind. Helping Hands for the Blind is an organization of blind people who want to help other blind people. It is a problem solving organization. It is a guide that blind people can turn to in times of need. Helping a blind person through all the paperwork can literally be a life saver. Another important form of assistance is to provide a Mobility Instructor. When a blind person is new to an area, it is important that they be shown how to get around by a trained and knowledgeable instructor. There is a large and growing demand for this service. The project aims in designing a system which is capable of alerting the user if his destination is reached. The explosion in wireless technology has seen the emergence of many standards, especially in the industrial, scientific and medical (ISM) radio band.

There have been a multitude of proprietary protocols for control applications, which bottlenecked interfacing. Need for a widely accepted standard for communication between sensors in low data rate wireless networks was felt. ZIGBEE is a low power spin off of WIFI. It is a specification for small, low power radios based on IEEE 802.15.4 – 2003 Wireless Personal Area Networks standard. The specification was accepted and ratified by the ZIGBEE alliance in December 2004. ZIGBEE alliance is a group of more than 300 companies including industry majors like Philips, Mitsubishi Electric, Epson, Atmel, Texas Instruments etc. which are committed towards developing and promoting this standard. The APR9600 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.

II. PROBLEM STATEMENT:

- Talking signs, guide cane, echolocations are all useful in navigating the visually challenged people to reach their destination
- In this project we propose a bus system using wireless sensor networks (WSNs).
- The blind people in the bus station are 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.

III. OBJECTIVES:

- To design a system this is capable of alerting the user, if his destination is reached.
- To design system this is very useful for blind, older and pedestrian people for easy navigation using ZIGBEE module.

- To provide helping hand to blind people.
- To implement easy navigation system for Blind.

IV. EXISTING SYSTEM:

Buses are provided by the Government as a public service, quality of which will directly determine the convenience of public travel. It is an important criterion for quality of service standards that bus reaches the station on time and reports which station it is located accurately. Presently at the original station and terminal station, punctuality can be guaranteed because of dedicated staffs on duty there. However, for most of the middle stations, punctuality cannot be guaranteed and also, it is difficult to be assessed. It might be a good idea using the GPS system for monitoring the bus when moving, but to expand the scope of GPS usage is actually difficult due to the high cost of GPS system. For the time being, reporting bus station is to rely on driver's manual operation, so making a mistake and misleading passengers is inevitable when driving the bus. In existing system the bus system must need the manual power to do the process. So there is chance for occurring of human error so we go for the proposed system to overcome the disadvantage.

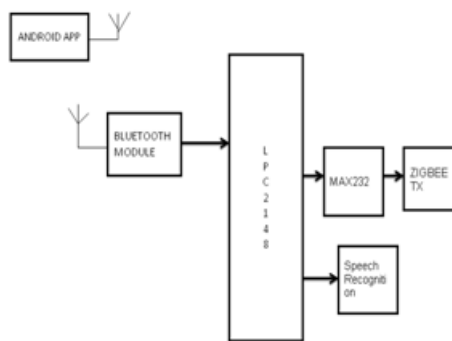
V. PROPOSED SYSTEM:

We purpose system which eliminates problems of existing system. They develop a system of bus monitoring and management based on ZIGBEE and GPRS technology. ZIGBEE wireless communication technology is an emerging technology with low-power, low-data-rate, lowcost, low-complexity. we proposed System will be designed based on the characteristics of ZIGBEE network technology solve the problem of monitoring the time of bus's arrival on and leaving station and the problem of automatically reporting bus station accurately. We are providing android App to blind person. Blind person have to speak bus where he want to Reached. Suppose he announce KATARAJ. ZIGBEE continuously capture signal for KATARAJ Bus.

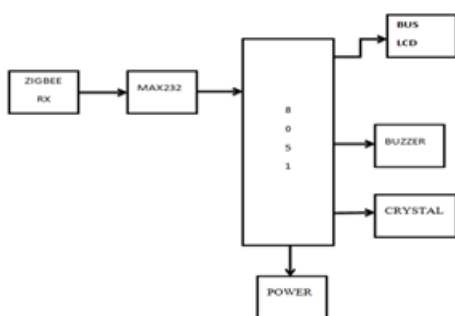
When KATARAJ Bus in contact with blind. ZIGBEE placed on bus give signal to Blind person ZIGBEE. We give indication through speaker to Blind as bus available. Since each station and each bus has its own identification ZIGBEE, no error will occur. Since then, the station monitor continuously detects the intensity of wireless signal sent from that bus. If the signal intensity decreases to a certain extent, we consider the situation as that the car has left this station, and then the station monitor will send information to monitoring center. Thus, the monitoring center could accurately grasp the operation of each bus to assess the punctuality.

A.BLOCK DIAGRAM :

1. Blind Unit-



2. Bus Unit-



Block diagram description

- In both 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 carried by the blind people which consists of ZIGBEE unit for the corresponding bus parked in front of them, Speech recognition system (HM2007) for identifying the

location provided as voice input by the user and the ARM7 for analyzing the input and providing the corresponding bus number of the location specified by the blind as audio output through voice synthesizer (APR9600).

- In this project we have developed android app. We have to install android app in our android mobile. Name of this app is “BUS ANNOUNCEMENT”. After installing app in our mobile we have to pair this app using Bluetooth. When app is connected to Bluetooth module which is inserted in hardware it will show connected.
- Input command (voice command) is given through ANDROID APP and output is heard by the blind through the speaker.
- We are providing two Bus unit here to show two different Buses availability.
- This project uses two power supplies, one is regulated 5V for modules and other one is 3.3V for LPC2148. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

B.HARDWARE REQUIREMENTS:

I. LPC2148 CONTROLLER

The LPC2141/42/44/46/48 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 KB up to 40 KB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power.

II. LCD (LIQUID CRYSTAL DISPLAY)

Display

These components are “specialized” for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.

III. BUZZER

Piezobuzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezoelectric materials. Piezo electric materials are either naturally available or manmade. Piezo ceramic is class of manmade material, which poses piezoelectric effect and is widely used to make disc, the heart of piezo buzzer. When subjected to an alternating electric field they stretch or compress, in accordance with the frequency of the signal thereby producing sound.

IV. ZIGBEE

ZIGBEE is a IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios. The technology defined by the ZIGBEE specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer. Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. It supports two-way communication. It is based on IEEE 802.15.4 standard for WPANs.

Application of ZIGBEE is low data rate, long battery life and secures networking. It operates at 2.4GHz. ZIGBEE devices can form networks with Mesh, Star and Generic Mesh topologies among themselves. The network can be expanded as a cluster of smaller networks.

V. BLUETOOTH MODULE(HC-05)

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle. HC-05 embedded Bluetooth serial communication module (can be short for module) has two work modes: order-response work mode and automatic connection work mode. And there are three work roles (Master, Slave and Loopback) at the automatic connection work mode. When the module is at the automatic connection work mode, it will follow the default way set lastly to transmit the data automatically. When the module is at the order-response work mode, user can send the AT command to the module to set the control parameters and sent control order.

VI. MICROCONTROLLER 8051

Microprocessors and microcontrollers are widely used in embedded systems products. Microcontroller is a programmable device. A microcontroller has a CPU in addition to a fixed amount of RAM, ROM, I/O ports and a timer embedded all on a single chip. The fixed amount of on-chip ROM, RAM and number of I/O ports in microcontrollers makes them ideal for many applications in which cost and space are critical. The Intel 8051 is Harvard architecture, single chip microcontroller (μC) which was developed by Intel in 1980 for use in embedded systems.

It was popular in the 1980s and early 1990s, but today it has largely been superseded by a vast range of enhanced devices with 8052-compatible processor cores that are manufactured by more than 20 independent manufacturers including Atmel, Infineon Technologies and Maxim Integrated Products. 8052 is an 8-bit processor, meaning that the CPU can work on only 8 bits of data at a time. Data larger than 8 bits has to be broken into 8-bit pieces to be processed by the CPU. 8052 is available in different memory types such as UV-EPROM, Flash and NV-RAM. The present project is implemented on KeilVision. In order to program the device, proload tool has been used to burn the program onto the microcontroller.

VII. ANDROID APP

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touch screen mobile devices such as smart phones and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input. In addition to touch screen devices, Google has further developed Android TV for televisions, Android Auto for cars, and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on notebooks, game consoles, digital cameras, and other electronics. The wireless-networking standard technology called Bluetooth has quietly become a common way to replace the wires on short distances. With a gadget such as a smart phone or a tablet featured with a Bluetooth module, a wireless connection is the easiest way to send and receive information. And because this technology spread in the prototyping culture, it's often used to control things wirelessly. An Android device has Java support, built-in Bluetooth module and a large variety of sensors. All of these features classify an Android smart phone or tablet as the perfect tool to control a robot over a Bluetooth connection remotely.

VIII. VOICE SYNTHESIZER (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. APR9600 is no longer manufactured and entered the obsolete parts list. APR9600 was a low cost high performance sound record/play IC widely used by embedded system practitioners, students, hobbyists. The APR9600 provided all the necessary features for recording and playing the audio with very fewer external components at a very low cost. May be many of you are aware that the APR9600 audio recorder and playback IC is no longer manufactured.. The chip was manufactured by a Taiwan based company called APLUS Integrated Circuits Inc. I have searched for it in retail shops all across SP road Bangalore but the vendors said that the chip is no longer manufactured.

IX. SPEECH RECOGNITION SYSTEM (HM12)

The HM12 is the chip that uses a single CMOS transistor that analyzes the analog signal obtained from the microphone. Speech signals are captured with a microphone which are then filtered and converted into a digital signal by an analog filter. The speech signal must be filtered to remove any frequencies outside the range of normal speech. Filtering certain frequencies also reduces the bandwidth of the speech signal resulting in less required computation power. Depending on the operation of the HM12(training or recognition mode), data is either written to or read from the SRAM. The SRAM is divided into data banks where each data bank has its own unique 8 bit binary value. If the HM12 is in recognition mode, the HM12 will attempt to match the speech signal with the entries in the SRAM and return the corresponding data bank's 8 bit binary value on its data bus.

A. SOFTWARE DESCRIPTION:

- I. Keil IDE
- II. Proteus
- III. Flash Magic

B. ADVANTAGES:

- Easy navigation
- Less maintenance
- Reliable
- All the modules are very easy to handle.
- Convenient to the users.

C. APPLICATIONS:

- Automotive
- Security
- Transportation
- Easy navigation of blind.
- Independent navigation of senior citizen/illiterate people.
- Public transport system.

D. CONCLUSION:

The project "PASSENGER BUS ALERT SYSTEM FOR EASY NAVIGATION OF BLIND" is successfully implemented and verified. When the person reaches the bus station, he can find the buses that pass through a particular location with the help of voice recognition system and voice synthesizer. 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 headphone.

E. FUTURE SCOPE:

- In future to enhance present system we add information like bus name, bus route, bus number.
- This system can further be improved by using GSM to provide communication between blind and his/her relatives in case of any emergency about more realistic location of his arrival and destination.
- We provide RFID tag to blind person so bus unit can easily recognize blind person availability.

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