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RFID Based Blind People Navigation for Easy Transportation

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ABSTRACT: Unfortunately, public transportation is not an easy mean to use and access by blind people in many countries. In case of buses, blind people have difficulty in recognizing and estimating the arrival of buses at the bus stations. In this paper a bus system using Radio Frequency Identification (RFID) is used. The blind people in the bus station are provided with the RFID reader which is recognized by the RFID tag in the bus. Then the blind people get the information about the arrival of the bus. The indication is made in the bus that the blind people is present in the station to the driver with the help of RF transmitter and RF receiver. So the bus stops at the particular station.

KEYWORDS: Radio Frequency Identification (RFID), RF transmitter and RF receiver, RFID reader, RFID tag.

1 INTRODUCTION

According to the report of World Health Organization about 285 million are estimated to be visually impaired worldwide published in 2014, there are about 39 million people blind and 249 million people have low vision. About 95% of the visually impaired people live in the developing countries. Each visually impaired people face many problems according to their levels of vision. With the support of various organizations, more visually impaired people have been given opportunity to education and many other mean. But still the issues of navigation for the blind are very complex and troublesome especially during public transportation. For the blind people it is difficult to read the traffic signal and street signs. In order to overcome these difficulties a visually impaired person might use cane, guide dog. As these alternatives are also helpful to the blind person as assistive devices but it is not so effective. Eventhough guide dogs and walking cane are also helpful but they are restricted to certain environment.

Radio Frequency Identification (RFID) is a feasible, cost effective and emerging technology in recent years. The application of RFID technology has been numerous and the usage of this technology has led to many applications that are being used today in many applications. RFID technology has been widely used in logistics, manufacturing, environment, agriculture, retail aviation and information technology [2]. It is method of storing and remotely retrieving data via radio frequency transmission by using devices called RFID tag and RFID reader.

The software part is Embedded C with Keil for programming the controller.Keil software is the leading vendor for 8/16- bit development tools (ranked at first position in the 2004 Embedded Market Study of the Embedded Systems and EE Times magazine).

2 PROPOSED SYSTEM

The RFID technology is used to identify the buses for the blind people. Each buses have individual tag for individual route. When the tag is read by the reader then the intimation voice will be sent to the blind people through headphone. And also

the RF transmitter is used to communicate with the RF receiver to alert the driver, that there are blind people nearer with the bus. There are two sections in this proposed system namely blind people section, bus section.

3 OVERVIEW OF RFID TECHNOLOGY

RFID system consists of three components namely transponder (tag), interrogator (reader) and computer containing the database, as shown in Fig. 1. The interrogator reads the tag data and transmits it to the computer for authentication. The information is processed and upon verification, access is granted. The system offers diverse frequency band ranging from low frequencies to microwave frequencies.RFID system operates in four ranges if frequency spectrum low, high, ultra high and microwave. Low frequency RFID system operate at 125 KHz and have a read range of less than 0.5m .High frequency system operates at 13.56MHz and provide a read range of approximately 1m.Similarly ultrahigh and microwave frequency system operate at 860MHz and 2.4GHz and provide read range of 3m and 1m respectively [2]. RFID technology uses a RFID tags and RFID readers to monitor objects in physical world. It can store some information (including a unique ID) and can communicate with a reader through a wireless channel. Depending upon the source of electrical energy, RFID tags are classified as either active or passive. The active tags use a battery for powering the circuit on the tag and transmit the tag information upon the reader request. However, these tags are very expensive and seldom used. On the other hands, passive tags get energy from the reader to power their circuit. These tags are very cost-effective and hence most of the applications use them. A comparison of these tags highlighting important features is shown in Table I [2].

Table 1.Comparison of active and passive tags

SPECIFICATION	ACTIVE TAGS	PASSIVE TAGS
Power Supply	Battery operated	No internal power
Communication Range	Long range (100m+)	Short range (3m)
Range Data Storage	Large read/write data (128kb)	Small read/write data (128b)
Required Signal Strength	Low	High
Application	auto manufacturing, hospitals – asset tracking, construction, mining, laboratories, remote monitoring,	libraries/bookstores, pharmaceuticals, passports, electronic tolls, item level tracking

The information on RFID tag usually contains a unique ID. When the RFID reader transmits a signal to the tag as shown in fig 1, tag communicates its identity to the reader. In the present work, passive RFID tags have been used. A passive RFID tag transmits information to the reader when it comes in the vicinity of electromagnetic field generated by the reader. The phenomenon is based on Faraday's law of electromagnetic induction. The current flowing through the coil of interrogator produces a magnetic field which links to the transponder coil thereby producing a current in the transponder coil. The transponder coil then varies this current by changing the load on its antenna [3]. This variation is actually the modulated signal (scheme is known as load modulation) which is received by the interrogator coil through mutual induction between the coils. The interrogator coil decodes this signal and passes to the computer for further processing. The reader has an antenna that emits radio waves; the tag responds by sending back its data. An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. Over the past decade, RFID technology has enjoyed the significant growth. With six billion tags sold in 2013, RFID technology has by now impacted application ranging from inventory control, supply chain management to people tracking.

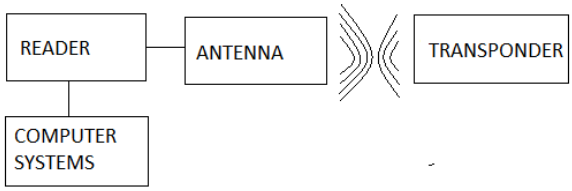

Fig 1. Basic RFID System

4 SYSTEM COMPONENTS

4.1 RFID TAG

RFID tag is a microchip combined with an antenna in a compact package.The packaging is structured to allow the RFID tag to be attached to an object to be tracked. The tag's antenna picks up a signals from an RFID reader or scanner and then returns the signal, with some additional data [5].

4.2 RFID READER

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radiowaves; the tag responds by sending back its data [5].

4.3 POWER SUPPLY

A power supply is an electronic device that supplies electric energy to an electrical load.

4.4 MICROCONTROLLER

AT 89C51 is a low power, high performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable flash memory. The device is manufactured using Atmel's high–density non- volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. It has 8K bytes of flash,256 bytes of RAM,32 I/O lines, watchdog timer, two data pointer, three 16 –bit timer/counter, a six –vectored two level interrupt architecture, a full duplex serial port, on chip oscillator, and clock circuitry[4].

4.5 BATTERY

A battery is a device that converts chemical energy directly to electrical energy.

4.6 LCD

A 16x2 is used to display 16 characters per line and there are two such lines.When the RFID reader senses the RFID tag then the information in the RFID tag is displayed in LCD screen.

Fig:2 Liquid Crystal Display unit

4.7 RF TRANSMITTER

The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls.

The HT-640 IC encodes 12-bits of information and serially transmits this data on receipt of a Transmit Enable and a low signal on pin-14/TE.

4.8 RF RECEIVER

The receiver also operates at 433.92MHz, and has a sensitivity of 3µV.The TWS -434 receiver operates from 4.5 to 5.5V-DC, and has both linear and digital output. The 212 series of decoder is capable of decoding information that consist of N bits of address and 12_N bits of data.

5 SYSTEM OPERATION

The blind people section consists of RFID reader,AT89C51microcontroller,powersupply,voice synthesizer,headset,RF transmitter as shown in fig 4.The 230 V ac voltage is given to a step down transformer,which steps the ac voltage down to the 6V ac output.Then the 6V ac is fed as input to the rectifier.The rectifier converts the ac to dc voltage.The resulting dc voltage usually as some ripples or ac voltage variation.To avoid the ac ripples the low pass filter is used.IC 7805 voltage regulator is used to convert the 12V dc to 5V dc.The 5V dc is given to operate the microcontroller.The RFID tag or transponder has a sequence of metal pins or barcode strip made of a magnetic material(different from tags).The sequence of the metal pins or the bar code has a digital meaning behind it and it is unique to the particular tag.When the tag is interpreted or decoded,the sequence is displayed as numbers unique to the tag.Since it make use of the Radio frequency interference technique,Radio frequency helps in decoding the information.Each RFID tag has its own identification number(Electronic Code Number).RFID tag can store more than just a tag ID.This additional memory on the tag is of Electrically Erasable Programmable Read Only(EEPROM) memory type.Data on RFID tag can be updated through local processing.The radio frequency used to decode the data in the RFID tag is produced by the RFID reader.When a signal from radio frequency interacts with an RFID tag, the pins or the barcode energizes(only in passive tag) and produces its own magnetic field which has a unique interference pattern which when read by the RFID reader would obtain the unique number designated to the corresponding RFID tag.Thus the RFID reader obtains the address of the desired RFID tag(the address differs from each tag).This identified tag when attached to the real object (bus)will be the reference to that object.Thus the object is indirectly detected.Then the RS 232 is used to transmit the serial information to the microcontroller.Microcontroller is the heart of the device. This device is designed to provide a voice based announcement for the user. so that the user gets the voice which pronounces the destination location.APR9600 device offers true single chip voice recording, non-volatile storage and play back capability for 40-60 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. Then the information in the voice IC is heard in the headset.

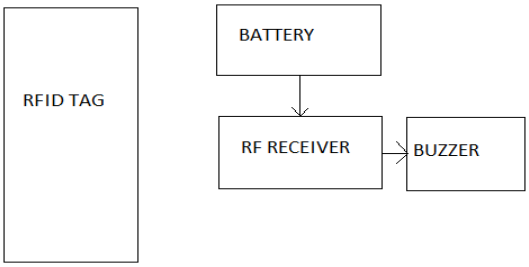

Fig 3. Functional Block Diagram Of Bus Unit

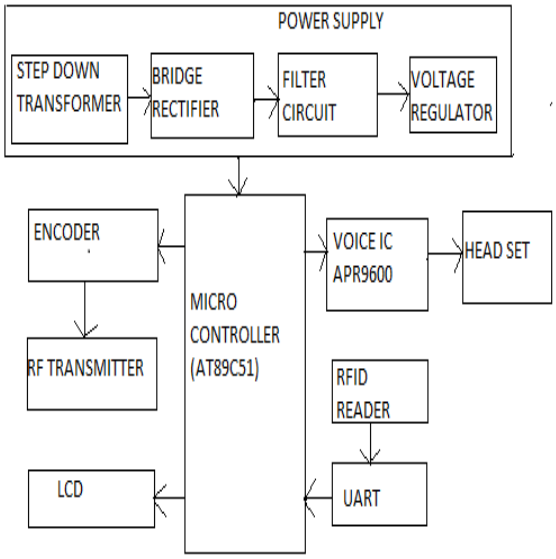

Fig 4. Functional Block Diagram Of Blind Unit

The bus section consist of RFID tag,RF receiver, buzzer and battery as shown in fig 3. The first step of application is to intimate the bus driver about the bus stopso that the driver can provide the special attention at him/her while he/she is boarding bus. To implement which we can consider important advantages as a form of wireless communication of transmitters and receivers nature of RF protocols using TWS 434 and RWS 434.

The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of encoder is connected to the DATA_IN pin of RF Transmitter and then the RF Transmitter transmits the data to the receiver. The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The TWS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of RF Transmitter is connected to the DATA_IN pin of DECODER and then the data is processed by the decoder. The receiver which has the 12V battery receives the radiowave from the transmitter whichactivates the buzzer. The buzzer is used to indicate the presence of blind to the driver.The complete set up is shown in fig 5.

6 RESULTS AND DISCUSSION

When the person reaches the bus station, he can find the buses that pass through a particular location with the help of 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 RF transceiver unit both in the bus unit and blind unit.

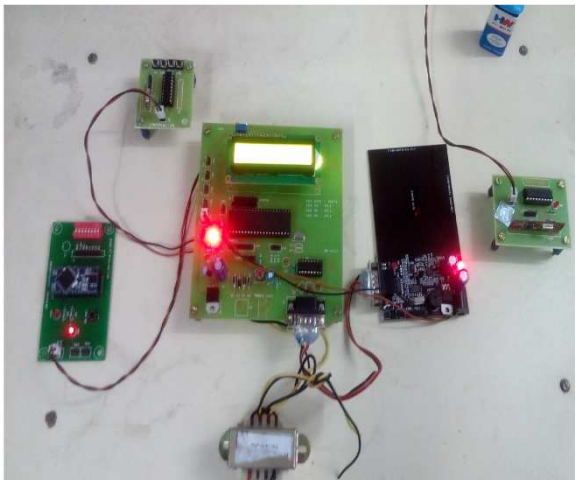

Fig 5.Prototype of the Proposed System

7 CONCLUSION

An interactive wireless communication aid system for the visually impaired to use city buses was developed in this study. Using the ultra-high frequency radio waves, this paper shows implementing a system that uses RFID tag and reader set up along with customized program that will help the blind in identifying exact bus. Thus this system shows the possibility of using the RFID technology to help the blind.

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