



RFID BASED ASSISTANCE FOR BUS TRAVEL FOR THE BLIND

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ABSTRACT

The estimated number of blind people over the world is between 40 to 45 million, special services should be provided to them in order to give them the right to live as others do. Unlike people with normal vision, it is difficult for the visually challenged persons to locate the bus stations, read the information displayed at the bus stations and also to identify the destination of the buses that arrive at the bus stations. In order to assist them to overcome all the above difficulty a solution based on RFID technology has been proposed in this present work. The proposed system consists of two important modules viz. the bus sub system and the bus station subsystem and makes use of a PIC Microcontroller for its functioning. Three different RFID tags are needed one for each bus, one for each bus station and one for each blind person. The proposed system has been developed and tested. Its performance is satisfactory and could help users to successfully board their desired buses, using the interactive communication modules. This idea also incidentally provides a potential and viable assistance even to the people with hearing impairment, by way of including suitable low cost displays in the various modules.

Key words: RFID, Bus detection, Blind, Microcontroller, Travel information, Bus route.

INTRODUCTION

Blind people desperately need special requirements and services including the public transportation to give them the rights and ability to move smoothly and independently from one place to another. Blindness limits the type of transportation a person can use and hence, the blind may suffer additional delay compared to a normal person because of the limited transportation choices. The most used transport means for blind people is the public transportation, which is considered as one of the important means for travelling in many countries. In New York, for ex-ample, the percentage of people who use the public transportation is 55%^{1,4}. Unfortunately, public transportation is not an easy mean to use and

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access by blind people in many countries. For example, in the case of buses, blind people have difficulty in recognizing and estimating the arrival of buses at the bus stations. Moreover, they cannot read the bus number to identify the correct bus to board. There are systems that had been engineered for assisting blind and visually impaired people such as those presented in^{1,8-10}. However, existing assistive systems for mobility of the visually impaired and blind people in public transport are not satisfactory, which is the motivation behind this work.

This paper demonstrates a bus detection system to help blind people to travel smoothly and independently from one place to another by providing complete and clear information about the following: the existence of blind people at the bus station to alert the bus driver, the approaching bus station, and the buses arrival and their routes at a bus station. Radio Frequency Identification (RFID) has been an emerging technology in recent years. In the recent few years there have been a lot of advancements in the field of RFID. The application of RFID technology have been numerous and the usage of this technology has led to many application specific designs and models that are today being used in many control system. The purpose of this paper will be to develop a design and propose a plan to implement RFID technology that will help the blind people navigate in outdoor environment.

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. One of these systems is a central announcement system based on Bluetooth technology⁷. In this system, Bluetooth devices are installed in both the bus and the bus station which are connected to a processing subsystem. When a bus approaches the station, the two Bluetooth devices of the bus and the station will connect to each other. After that, the bus Bluetooth device will transmit a message containing bus information to the station's processing subsystem.

The transmitted message will be read by a text to speech converter which is interfaced with the processing subsystem in the bus station. Then, an announcement message that contains the bus information will be generated through a speaker. But there are two disadvantages in this system: it allows connection of only two devices at once and the connection between devices may be lost under certain conditions. An RFID based system is presented Noor, M. Z. H., Shah A.; Ismail, I.; Saaid, M. F.⁶ A model based on Wireless Sensor Network (WSN) is described in⁵. In another work, an android application called On-TheBus³, which helps people with special needs in mobility using voice notifications has been proposed.

System overview

Block diagram describing the overview of the proposed system is given in Fig. 1 below:

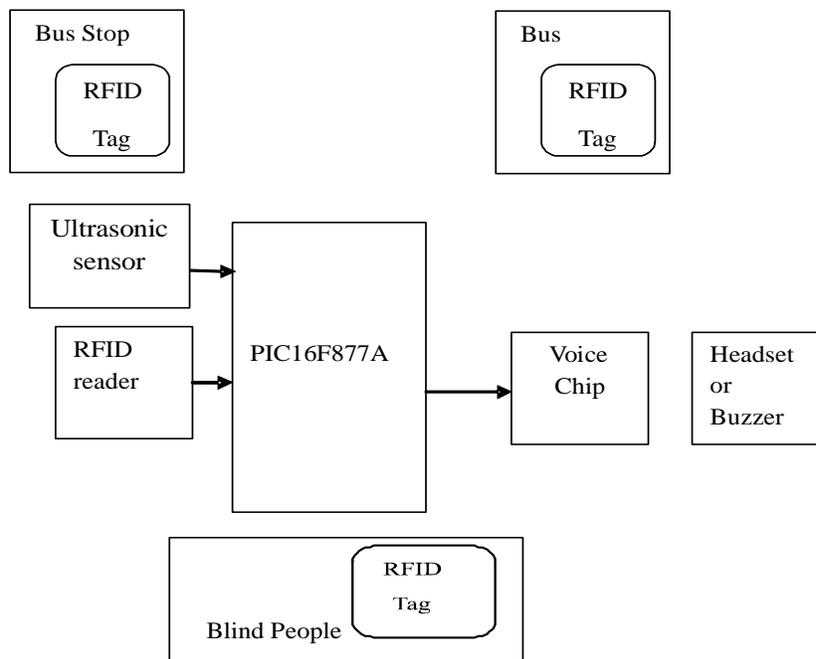


Fig. 1: Block diagram of proposed system

In the proposed system can be visualized as three subsystems viz. the bus module, the bus station module and the passenger module.

A. Bus station subsystem

With the help of the RFID reader the bus station subsystem captures the identification of the buses entering with the help of the RFID tag attached to each bus, and fetches all details about the destination and route of the bus from a common server. The information so fetched is transferred to all the passenger modules and also displayed at the bus station. An announcement is also made at the bus station and also in the individual passenger modules to alert the blind passengers.

B. Bus subsystem

The RFID reader in the bus subsystem could read the identification of the RFID tag at each bus stop and fetches the details of the bus station where the bus is going to stop next,

and displays the information of the stop in the bus for the benefit of the passengers. An announcement is also made simultaneously to help the blind to alight at their preferred destinations without difficulty. It also obtains information about blind people waiting for a particular bus, to its bus driver, by reading the information from the RFID tag of the passengers at the bus station.

C. Passenger module

The RFID reader in the passenger module provides the information about the bus station and the buses arriving at the bus station, to the blind passenger, by way of announcement and alerts. This enables the disabled passengers to locate their buses without difficulty.

Hardware implementation and results

Various Modules use PIC microcontroller PIC16F877A, in addition to the RFID tags and RFID readers. Communication between various modules is implemented using universal asynchronous receiver/transmitter (UART).

RFID technology satisfies the safety requirement since its radiation is within the standard safe frequency range (3 kHz-300 GHz) as recommended by IEEE C95.1 2005².

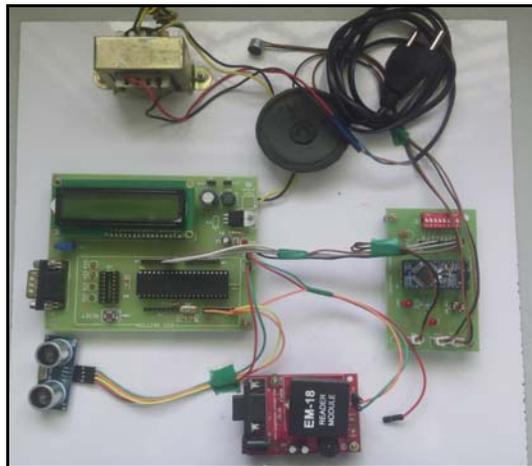


Fig. 2: Photograph of the implemented hardware

The photograph of the module implemented is shown in Fig. 2 above. The module has been tested for samples of all types RFID tags viz. the bus tag, bus station tag and passenger tag. The information from the passenger can be captured at the time of ticketing

itself, and the information can be given to the bus driver in advance if the ticketing system is integrated with this module.

CONCLUSION

A feasible system to assist the blind people to have a safe and normal travel by public transport system has been proposed and the prototype has been tested for different sample RFID tags. The performance of the system is satisfactory and promises to eliminate the difficulties faced by the blind people for their day to day travel requirements in availing public transport systems.

As an extension to this work, the information from the passenger can be captured at the time of ticketing itself, and the information can be given to the bus driver in advance if the ticketing system is integrated with this module.

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