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Bus Detection System for Blind People to Track The Path Using RFID

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Abstract- A bus detection system using RFID technology that aims to ease the traveling and movement of blind people. The proposed system consists of two detection subsystems; one on the buses and the other on the bus stations. Each visually impaired individual faces a unique and different set of challenges based on their specific level of vision. RFID has the potential to be a useful aid with further standardization of RFID tags and improvement of current RFID readers. 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.

Keywords: RFID; blind; detection

I. INTRODUCTION

Blind people are desperately in need of 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.

One of the requirements for ease and comfort in enjoying life is the ability to move independently from one place to another using different transportation means such as cars, metro ...etc. However, not everybody can simply depend on his own in travelling like some categories of disabled people.

One of these categories is blind people who face many problems in mobility from place to another. For example, 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. Unfortunately, public transportation is not an easy mean to use and 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. Unlike normal people who travel independently, blind people need support in guiding them continuously to avoid accidents as well as the unacceptable lateness in their appointments and meetings which may affect their performance as active members in the society. Furthermore, the difficulty of using the public transportation by blind people will make them more isolated and unable to live their normal life. There are systems that had been engineered for assisting blind and visually impaired people such as those presented

A 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.

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. One of these systems is a central announcement system based on Bluetooth technology [5]. 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 to assist the blind is described in [6]. Here, each bus has RFID tag which contains information about the bus number and the coming destinations. Likewise, each blind person should have a portable device. The portable device contains RFID reader, headset, and control subsystem. The main idea of this system is that the RFID reader of the portable device will detect the approaching buses to retrieve the bus information from their tags. The bus information will be used to generate an individual audio message about the arrived buses for each blind person through the headset. Un-

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fortunately, in this proposed system the driver has no idea about the blind people existence in a station.

An assistive system which uses Wireless Sensor Network (WSN) is described in [7]. This WSN-based system operates in two phases: the discovery of blind people and the interaction between the bus and the bus station. The bus station is divided into two areas, one for the normal passengers and the other for blind people. The blind people area has two sticks in the door in order to link a switch to show if someone is there. When the system detects blind people in the station, the station will announce that to any existing bus in the radio frequency range. Once the bus detects the message, it will announce its number using microphone before a few meters of the station. Moreover, the bus has a light system to indicate the existence of the blind people in the station. If the light is red, a blind exists and if it is blue, no blind is there. One disadvantage of using this WSN system is the difficulty of recognizing if the person within the blind people zone is blind or not; people may sit in the wrong specified area. Moreover, the sensor cannot detect when a blind person leaves the specified place, which will be a waste use of the system from the point view of unnecessary computation and power consumption. In addition, the system provides only the bus number information which is not enough to give a clear idea about the next stations[7]. In our proposed system, there is no need to have a special area for the blind persons.

Another assistive system is an android application called On-The Bus [8] which helps people with special needs in mobility using voice notifications and can be used by all the passengers. This application depends basically on the GPS system and it can use the compass of the smartphone and 3G network. It has two modes; one for normal people and the other for people with special needs. Blind people can interact with the application through voice commands.

Then, the application will list the available pathways to the destination and the user can choose the suitable one. From the application, the user can know the nearest station to the present place and then the time required for the bus to arrive. After boarding the bus, the application will tell the user the number of bus stations ahead before reaching the required destination.

A disadvantage of this system is that it needs initial setup phase to accommodate the needs of the blind. However, if there were a malfunction, the blind will have difficulty in resetting the application. In our proposed approach, the blind does not need to go through any setup phase. He simply needs to carry an RFID-based ticket.

III. EXECUTION AND WORKING OF RFID IN BLIND AID

RFID Tag

The tag has a sequence of metal pins or a bar code strip made of a magnetic material (differ 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 makes use of the Radio frequency interference technique, radio frequency helps in decoding the information.

RFID Reader

The radio frequency used to decode the data in the RFID tag is produced by the RFID reader. When a radio frequency wave interacts with an RFID tag, the pins or the bar code energizes 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 defers from each tag). This identified tag when attached to a real object (example: table) will be the reference to that object.

A. Station subsystem description

Station subsystem consists of a detection subsystem (RFID Reader), and RFID tag. In our system, each blind person will be given a RFID tag which is linked to the information about the required bus number and the required destination via the system database. This information is inserted in the database when the tag is issued to the blind person. If bus ID tag is read, the control subsystem will retrieve the bus number and its route from the database. Then, the station control subsystem will check if this bus is going to stop in this station or not. If yes, the bus number and its route will then be announced in the station using a voice announcement. The same scenario is repeated again when a new bus approaches the station.

B. Bus subsystem description

It consists of a detection subsystem (RFID reader), a display subsystem, an announcement subsystem and RFID tag. While the bus is approaching the station, the operation starts by detecting tags' IDs of the station and blind people in the station. Depending on the RFID tag detected (if any), the system reacts for each case as follows:

C. Blind person tag is detected

Based on the information stored in the system database regarding the tag, the system can determine if the blind person requires the bus or not. If yes the number of blind people that requires the bus and their destinations will be

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shown on a display positioned next to the driver so that he will be aware about the number of blind people and their destinations.

D. Station tag is detected

The bus subsystem will first check if the station is in the bus route or not. If yes, a voice announcement will be generated inside the bus about the coming station name.

LCD (LIQUID CRYSTAL DISPLAY)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

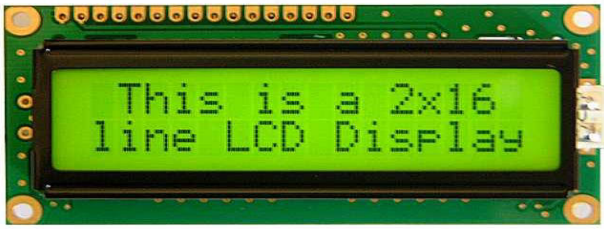

FIG. 1 LCD DISPLAY

A fig 1 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD, The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

IV. PROPOSED METHOD

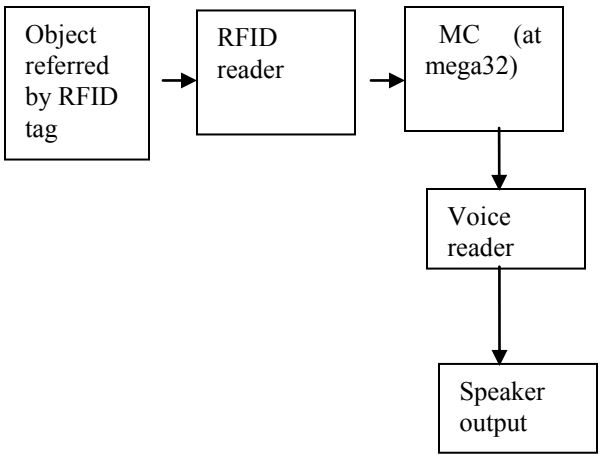

FIG. 2: BLOCK DIAGRAM

The basic block diagram of the proposed model is shown in Fig. 2. It consists of 5 main blocks, (a) Object referred by RFID tag (b) RFID Reader (c) Microcontroller (d) Voice Recorder (e) Speaker.

The reliability of the RFID reader is often put to debate. On analysis, it was found that the readers reliability/consistency. However on further progression, the sensitivity of each reader to the angle at which it was applied to the tag when scanning was relatively inconsistent, which is not surprising given the nature of wireless technology in general. Despite this, there were generally few failed scanning attempts making the RFID technology for the development of Blind Aid a reality.

RFID WORKING

1. The processor controlling RFID sending/ receiving.
2. The antenna sending high frequency electromagnetic waves out.
3. The transponder or tag which converts the waves into an electric current.
4. The tag responding with its own unique radio wave.
5. The reader unit receiving the tag's wave, which is then processed to retrieve information.

READ-ONLY;READ/WRITE DEVICE

For the read only device, the information that is in the memory can't be changed by RF command once it has been written. Read only devices are programmed as follows:

(a) In the factory as a part of manufacturing process,

(b) Contactless programmed one time after the manufacturing (MCRF200 and MCRF250)

(c) Can be programmed and also reprogrammed in contact mode (MCRF355 and MCRF360).

A device with memory cells that can be reprogrammed by RF commands is called read/write device. The information in the memory can be reprogrammed by Interrogator command.

Memory in today's RFID device is made of (a) CMOS or (b) FRAM array. The CMOS memory cell needs higher voltage for writing than reading.

In the passive read/write device, the programming voltage is generated by multiplying the rectified voltage.

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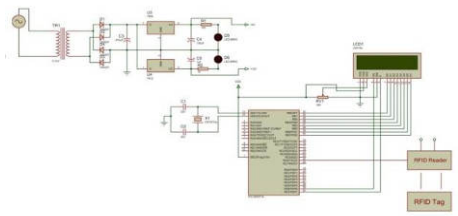
The voltage multiplier circuit is often called a charge pumper. In addition to the programming voltage, the read/write device needs command decoder and other controller logics. As a result, the read/write device needs more circuit building blocks than that of the read only device.

Therefore, the device size is larger and cost more than a read only device. The FRAM device needs the same voltage for reading and writing. However, its



manufacturing cost is much higher than CMOS technology. Most of RFID device available today's market place are CMOS based device.

VI IMPLEMENTATION

FIG.3 OUTPUT

LF-127KHz RFID Reader Module is the one the most commonly used module for Radio Frequency Identification Projects. It Low Cost, Small Size, Low Power Consumption and Easy to use. It can be directly interfaced with microcontrollers using UART communication

VII. FUTURE WORK

This prototype to assist the Visionless people while boarding the bus has wide applications other than just helping the blind people inform their presence to the bus driver. In further stages of development this project can be used to enhance the safety and comfort of a larger section of society

VIII.CONCLUSION

Since 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. The proposed system is easy and provides a convenient service for all the passengers; not only the blind ones. The system has two subsystems which are: the bus subsystem and the station subsystem. Bus subsystem announces the coming stations in the bus route for all passengers. Moreover, the bus driver will be provided with the number of blind people who required the bus and their destinations. The station subsystem will give announcement of the approaching buses.

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