

Applications of RFID in Public Transport System to Aid the Visually Challenged

Mayur Mudigonda¹, Aditya Ramani and Vickram Subramanian

Abstract - India boasts of one of the best transport systems in the world. To enhance this system so as to make it visually disabled friendly, we have proposed a simple but unique application of RFID. Through this paper we hope to address those needs which alleviate the disability in the transport system.

Keywords – Reader, RFID, Tags

I. INTRODUCTION

The existing system is not visually disabled friendly. Hence to improve on this system we propose to put forward a system wherein every vehicle (public transport) can be uniquely identified and its presence can be established through voice at specified locations.

Radio frequency identification, or RFID, is a generic term for technologies that use radio waves to automatically identify people or objects. Its applications are manifold [1]. There are several methods of identification, but the most common is to store a serial number that identifies a person or object, and perhaps other information, on a microchip that is attached to an antenna (the chip and the antenna together are called an RFID transponder or an RFID tag). The antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers that can make use of it [2].

II. RFIDS

There are two basic types:

Active tags- with a built-in battery power source

Passive tags -without any power source

Tags typically operate at one of four radio frequencies - 125 KHz, 13.56 MHz, 2.45GHz and around 900MHz [3]. Every tag has a unique identification number, and usually the tag will also have the ability to store other data - up to 512 bytes for passive tags and 32Kb for active tags. With higher-capacity tags, data may be organized into fields or pages that can be selectively interrogated during the read/write process.

¹Department of Information Technology, Chennai.

SSN College of Engineering, SSN Nagar, 603 110

¹Phone: +91-9840701559; E-Mail: mupstein@yahoo.com

III. TRANSPORT SPEECH SYSTEM (TSS)

The working of the system is divided into the following parts

1) *Vehicular Transmitter*

2) *Bus Stop Receiver*

A. Vehicular Transmitter

In our system an active RFID tag is attached to the vehicle. The tag consists of a transceiver [Fig 1]. The tag is powered by a battery source. The tag contains the following data

1) *8-bit Unique Identification Number (UIN)*

2) *8-bit Alphanumeric Bus Information (ABI)*

The data in the tag is pre programmed using an RFID developer kit. The tags we are using are re-programmable. Thus, in case the bus details change we do not need to use a new tag but just re-program the old tag. The UIN ensures security and prevents collision.

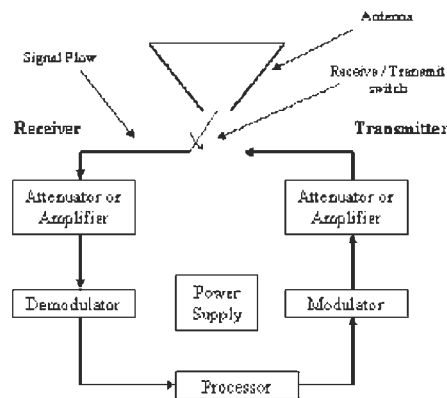


Fig. 1. RFID tag block diagram

B. Bus Stop Receiver

The Reader is a Radio Frequency transceiver that will transmit high frequency RF waves around 900 MHz. These waves upon hitting the tag will activate the tag. The tag then begins to transmit the data. This data is in the form of an analog sinusoidal wave. This data is then transmitted to the *Reader*. The *Reader* converts the data into a digital format and stores it into the 16 bit 80196 Intel Microcontroller. The microcontroller is running in programmed I/O mode and verifying whether there is any data in the queue of the microcontroller. In our system we have used a commercially available *Reader* called the Mercury 3.0 by *ThingMagic*.

Mercury3, ThingMagic's third generation agile reader is capable of reading both High-Frequency and Ultra High-Frequency RFID tags simultaneously. Its system specifications are

Frequency: UHF - 915 MHz, HF - 13.56 MHz

Antenna Ports: Two UHF & Two HF,

Types: 13.56, 15 MHz (Linear & Circular Polarized)

The reader provides flexibility in other ways, as well. Different transceiver modules—printed circuit boards that can be swapped in and out—can be used for reading tags at 915 MHz in the United States and Asia, 868 MHz in Europe and 960 MHz in Japan.

In our system the bus numbers are stored sequentially in an IC 27C256 EEPROM [Fig 2]. We have also used a series of analog EEPROM IC 25120. Each IC 25120 is capable of storing 120 seconds of analog data. Speech data is stored directly on to an on chip non-volatile memory without compression or digitization using a microphone in consecutive locations. Data which is stored on IC25120 EEPROM consists of

1) *Alphanumeric Bus Information (ABI)*

2) *Starting Location*

3) *Destination*

Against each entry of ABI in the IC 27C256 EEPROM its respective memory segment address in IC 25120 EEPROM is stored. IC 25120 is equipped with a differential speaker driver, thus the data stored in the IC 25120 can be heard by connecting a speaker to the speaker pins SP+ / SP- of the chip.

When an ABI data is found in the register of the microcontroller it compares the value with entries in the IC 27C256 EEPROM. When a match is found the memory segment address is loaded into the OUT port of the microcontroller. The IC 25120 then gets triggered and it plays the speech data stored in that segment through the speaker.

The speaker is positioned such that the maximum area of the bus stop is covered. Thus the visually challenged, illiterate and the old can use this system to identify the particular bus that has arrived in the bus stop.

When more than one bus arrives at the bus stop simultaneously, then the *Reader* stores the tag ids onto a queue in the register of the 80196. Thus when one tag id is processed it is

removed from the queue. We have made an allowance for storing tag ids of up to 5 buses simultaneously in our system. This is at least two more than the maximum arrival at any bus stop. When ever a tag is stored in the register, the microcontroller checks whether the current bus number is making a valid stop at this bus stop. In case it is not found it will be treated as an exception. Thus even buses which come near the vicinity of the bus stop and leave will not be processed as their details would not be stored on the EEPROM.

IV. ALGORITHM

- 1) WHILE(1)
- 2) Receive the tag address from the Reader
- 3) Store the tag id onto the queue (register) of the microcontroller
- 4) Compare the first tag id with all the entries that are stored on the EEPROM
- 5) If a match is found then the memory segment address is copied to the OUT port of the microcontroller, which is in turn connected to the IC 25120
- 6) Else the current bus will not stop here for boarding (exception handling)
- 7) Remove the entry from the register, and free the memory
- 8) END WHILE

V. CONCLUSION

The development of any society is not determined by the epochs of individuals but of the society as a whole. Thus the authors feel that more effort should be taken to aid the differently abled to lead normal lives. The implementation of this system requires the support of the government and public transport officials. Thus we are looking for more solutions that are simple, efficient and easy to implement.

This system can be expanded by giving each user an RFid tag, a RF transceiver and an earphone. This tag can be used to identify the user. The transceiver i.e. the Reader at the bus stop is made intelligent to answer queries asked by the users. Thus when the user asks it a question regarding the bus routes, it checks the history of bus routes in the past few hours and the cross checks this details with the bus route time table and makes an intelligent decision in guiding the user to his destination.

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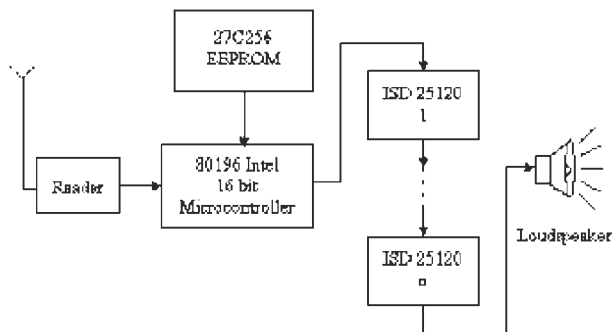


Fig. 2. RFid receiver side block diagram