Bus Recognition System for Visually Impaired Persons

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Abstract—*An innovative and cost effective guide system for visually impaired or blind people is presented in this paper by the use of handheld hardware and software technology such as PDAs (Personal Digital Assistant), smart phones, wireless communications, TTS (Text To Speech) and database software for mobile devices. This paper presents visually impaired assistive system which focuses on independent mobility of visually impaired or blind people who suffer in an unknown environment without any manual assistance.*
Most commercial products developed, allow those with disabilities to substantially improve their quality of life. The use of these devices allows the user to experience the freedom of certain aspects of life such as mobility, communication and other fundamental tasks. Examples of such solutions include prosthetic limbs, text-to-speech devices.
This paper will shed the light on the field of transportation to improve the life quality of visually impaired persons using some technologies such as Radio Frequency Identification (RFID) and wireless sensors network with an objective of identifying certain paths for the user navigation as well as provide certain feature like object recognition. In the path recognition technique, RFID passive tag network is employed on the path and for the object recognition required tools and other objects in the route will be embedded with passive RFID tags.
This paper also explains the use of beacon transmitters to help the VIPs the freedom to independently commute via public bus transportation. Through the use of Beacon transmitters placed on public buses, VIPs are able to safely catch the buses with the aid of a portable handheld device and an audio and tactile interface. The wireless communication system between the transmitter and the portable receivers can be achieved through a number of current technologies.
The motive behind this paper is that buses are vital in enabling blind people to participate fully in society, access to facilities and services. Visually impaired persons will have the opportunity to get information about bus stop locations and departure timings or other transit schedule information.

1. INTRODUCTION

For visually impaired persons, outdoor pedestrian mobility is very difficult and often dangerous. The visually impaired commonly rely on a cane to assist them in efficiently reaching a desired destination without harm. Many systems were introduced for the convenience of persons.

Various successful projects initiated for visually impaired persons. This paper is explaining few of them, their working and their implementation.

2. RADIOVIRGILIO / SESAMONET PROJECT

Successful project undertaken is Radiovirgilio / Sesamonet project is a joint venture project between the Institutes for the protection and the security of citizen (IPSC) of the EC Joint Research Centre (JRC) and RFID lab of the University of Rome.

3. COMPONENTS OF THE SYSTEM:

The described system composed of four components:

1. The tag grid
2. The handheld
3. The RFID card reader
4. The navigation data centre
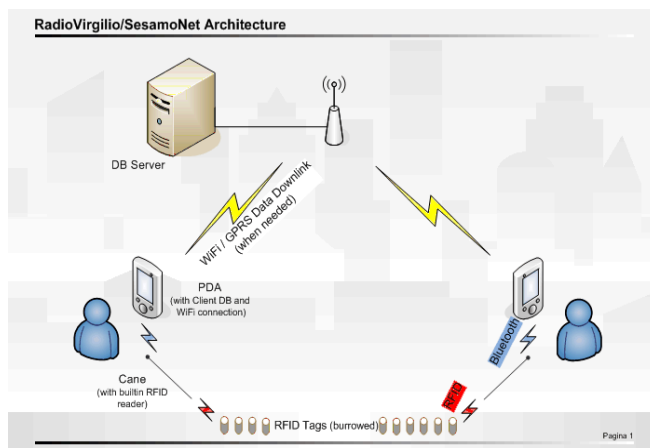
4. WORKING OF THE SYSTEM

The reader in the cane reads the tags ID by RFID communication. It then sends this information through a Bluetooth channel to the PDA device. The ID string and the

navigation data are processed and then an output is sent through another Bluetooth channel to the headsets which finally produce the audio output that is used by the visually impaired person. Navigation data can be periodically updated from a server, provided that an internet connection is available.

The key system in this system is the PDA, on which the Radiovirgilio/ Sesamonet client software is running. The PDA holds the client database that stores the data needed to reference the readings made by the RFID reader. The mobile device uses the tag ID string provided by the RFID reader for giving navigation and environmental information, which is then sent by text-to-speech software to the standard output.

**Mobile Device:** Development and tests are done on mainstream device whereas data is stored on a memory card.

The Tag grid: The tags of a protection capsule holding a radio frequency identification transponder. These transponders have data and ID memory blocks.

RFID reader cane: the RFID antenna is custom made and placed inside the far end of a white plastic cane so that the VIPs can use their stick as a usual way. The other end holds the RFIS controller, the Bluetooth interface and the batteries.

Navigation data server: The data server holds the database containing all information that is used for navigation - the tag position, tag sequence and all kind of environmental information.

5. PROJECT USING BEACON TRANSMITTERS:

A radio-frequency based solution has been developed which consists of two modules: a mobile-like hand-held user module, and a bus module installed inside the bus. Once at a bus stop, the user presses the query button on the handheld module to obtain route numbers of the buses in vicinity. These numbers are read out to the user via a speaker / head phone in the user module. This essentially solves the first problem of helping the user know if the desired bus is there at the bus stop. Once the route number of a desired bus is read out, the user needs to select it by pressing the selection button. This triggers a voice output of the number from a speaker installed at the entry door of the bus, thereby assisting the user in orienting and navigating towards its entry. The select button can be pressed multiple times to trigger the guiding voice output from the bus. Once the select button is pressed, it activates a bulb at the driver panel thereby informing the driver about a person with special needs who wants to board his particular bus.
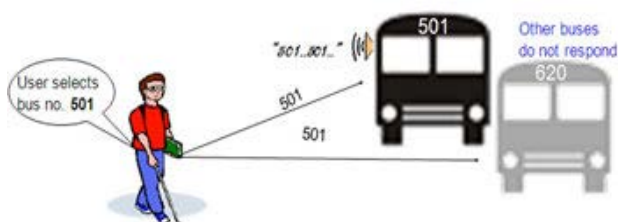
The system is providing the following two solutions:

- Informing the user about route number of all the buses at a bus stop

- Assisting the user board the bus

6. WORKING

In collaboration with DIMTS (Delhi Integrated Multi Modal Transit System Ltd) and with funding support from DST, Govt. Of India.


The system has been extensively tested on IIT Delhi and Delhi University buses with volunteers from the National Association for the Blind, Delhi. The user feedback and enthusiasm has been really positive.

7. VIAS SYSTEM

One more successful project undertaken was Blind Path Identification System; this system was based on RFID. This strategy comprises a mechanism integrating GSM and RFID technology.

The proposed assistive system is composed of three subordinate systems, the pathway infrastructure, and the navigation device and database server.
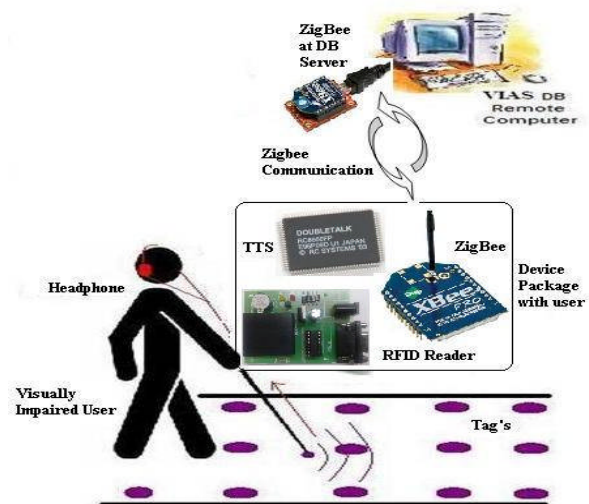
The pathway infrastructure is designed with the grid of RFID tags. Each tag can be fixed under the floor or carpet of the path. The RFID tag is used by visually impaired persons for navigation. In this pathway infrastructure, object recognition infrastructure is designed. The necessary objects in the route are identifiers and RFID tags are placed at those points. Then these RFID tags are used by VIPs for object recognition.

8. FUTURE SCOPE

These prototypes are helpful for assisting visually impaired persons while boarding a bus. These projects can be further enhanced for safety and comfort for these people. This system can be installed over taxies or other transportation medium, so that people can commute easily with few changes in the hardware and software. This prototype can be turned into a safety device.

9. CONCLUSION

Nearly 300 million blind people in the whole world are making use of these systems. Helping them to make them more independent on their daily life is a great task. Thus this paper presented the usage of many bus identification systems for visually impaired persons. With these added devices, a whole life of those people will change and now they can commute from one place to another without the help of anyone.

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