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Bus detection for blind people using RF transceiver

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ABSTRACT

This paper presents a bus detection system exploitation RF MODULE technology that aims to ease the traveling and movement of blind individuals. The projected system consists of 2 detection subsystems, one on the buses and also the different on the bus stations, information system. Within the bus detection scheme, the near stations are going to be simply detected so declared through a voice message within the bus. Moreover, any existing blind man within the close space of the station is going to be detected by the bus scheme to alert the busman regarding the number of blind persons. Within the bus terminal scheme, the approaching buses are going to be detected so declared within the station so as to alert the blind individuals. A whole system paradigm has been made and tested to validate the projected system. The archived results show that the system performance is promising in terms of system practicality, safety, and cost.

Keywords— RF module, System integration, Engineering design, Blind, Detection

1. INTRODUCTION

Blind individuals are urgently in would like of special necessities and services together with the general public transportation to allow them the rights and skill to maneuver swimmingly and severally from one place to a different. One of the necessities for ease and luxury in enjoying life is that the ability to maneuver severally from one place completely different} victimization different attainable ways that like on feet, cars, metro ...etc. However, not a soul will merely rely upon his own in travel like some classes of disabled individuals. One of these disabilities is visual disorder, wherever this class of the society faces several issues in quality. Additionally, visual disorder limits the sort of transportation someone will use also because the delay resulted from victimization such transportation systems.

The most used transport suggests that for blind individuals is that the public transportation that is taken into account collectively of the necessary suggests that for travel in several countries. In any as an example, the share of individuals World Health Organization use the general public transportation is fifty fifth [1].

Unfortunately, public transportation isn't a straightforward mean to use and access by blind individuals in several countries. For instance, within the case of buses, blind individuals have issue in recognizing and estimating the arrival of buses at the bus stations. Moreover, they can't browse the bus variety to spot the proper bus to board. in contrast to traditional folks that travel severally, blind individuals would like support in guiding them ceaselessly to avoid accidents furthermore because the unacceptable timing within their appointments and conferences which can have an effect on their performance as active members in the society. Moreover, the problem of mistreatment the general public transportation by blind folks can create them additional isolated and unable to measure their traditional life. There square measure systems that had been built for helping blind and visually impaired folks like those given in [2-4]. However, existing helpful systems for quality of the visually impaired and blind folks publicly transport don't seem to be satisfactory, that is that the motivation behind this work. This paper presents a system to assist blind folks to travel swimmingly and severally from one place to a different by providing complete and clear info concerning the following: the existence of blind folks at the terminus to alert the busman, the approaching terminus, and also the buses arrival and their routes at a terminus.

2. RELATED WORK

Several systems had been planned for guiding blind folks. Here we'll simply mention the foremost connected ones to the theme of our project. One in every of these systems may be a central announcement system supported Bluetooth technology [5]. During this system, Bluetooth devices area unit put in in each the bus and therefore the terminal that area unit connected to a process scheme. Once a bus approaches the station, the 2 Bluetooth devices of the bus and therefore the station can connect with one another. After that, the bus Bluetooth device can transmit a message containing bus info to the station's process scheme. The transmitted message is scan by a text to speech device that is interfaced with the process scheme within the terminal. Then, AN announcement message contains the bus info are generated through a speaker. However there are unit 2 disadvantages during this system: it permits affiliation of 2 devices solely directly and it will lose affiliation in bound conditions.

An RF MODULE-based system to help the blind is delineating in [6]. Here, every bus has RF MODULE tag that contains data regarding the bus variety and therefore the coming back destinations. Likewise, every blind man ought to have a transportable device. The moveable device contains RF MODULE reader, receiver and management system. The most plan of this method is that the RF MODULE reader of the moveable device can observe the approaching buses to retrieve the bus data from their tags. The bus data are going to be wont to generate a personal audio message regarding the arrived buses for every blind man through the receiver. Sadly, during this projected system the motive force has no plan regarding the blind individual's existence within the station. Moreover, no alternatives square measure provided just in case if the blind man forgot his moveable device. An helpful system that uses Wireless Sensor Network (WSN) is represented in [7].

This WSN-based system operates in 2 phases: the invention of blind folks and therefore the interaction between the bus and therefore the bus terminal. The bus terminal is split into 2 areas, one for the conventional passengers and therefore the different for blind folks. The blind folk's space has 2 sticks within the door so as to link a switch to point out if somebody is there. Once the system detects blind folks within the station, the station can announce that to any existing bus within the frequency vary. Once the bus detects the message, it'll announce its range mistreatment electro-acoustic transducer before some meters of the station. Moreover, the bus incorporates a light-weight system to point the existence of the blind folks within the station. If the sunshine is red, a blind exists and if it's blue, no blind is there. One disadvantages of mistreatment WSN system is that the problem of recognizing if the person within the blind folk's zone is blind or not; folks could sit within the wrong mere space. Moreover, the detector cannot sight once a visually handicapped person leaves the required place, which can be a waste use of the system from the purpose read of spare computation and power consumption. Additionally, the system provides solely the bus range info that isn't enough to offer a transparent plan regarding subsequent stations [7]. In our projected system, there's no have to be compelled to have a special space for the blind persons. Another helpful system is associate degree automaton application known as

On the Bus [8] which helps people with special needs in mobility mistreatment voice notifications and may be employed by all the passengers. This application depends essentially on the GPS system and it will use the compass of the smartphone and 3G network. It's 2 modes; one for traditional folks and therefore the other for folks with special wants. Blind folks will move with application through voice commands. Then, the application can list the offered pathways to the destination and the user can choose the suitable one. From that application, the user will recognize the nearest station to the present place then the time needed for the bus to arrive. After boarding the bus, the applying can tell the user the number of bus stations ahead before reaching the desired destination. a drawback of this technique is that it wants Initial setup part to accommodate the requirements of the blind. However, if there were a malfunction, the blind can have difficulty in re-setting the application. In our proposed approach, the blind doesn't have to be compelled to bear any setup phase. He merely has to carry associate degree RF MODULE-based price ticket.

3 SYSTEM DESIGN

3.1 Marketing Requirements

- The planned system ought to meet the subsequent promoting requirements:
- The system ought to be generic enough to be applied in several countries.
- The system ought to generate a transparent steering message regarding the buses inward at the station.
- The system ought to generate a transparent steering message regarding the approached station.
- The system ought to be helpful for non-blind folks (besides the blind people).
- The system ought to be safe to use.

3.2 Engineering requirements and design constraints

In order to realize the selling needs mentioned higher than, we want to base our system on engineering read by shaping engineering needs. Our engineering needs are as follows:

- The system is going to be versatile to be used everyplace by dynamic the language settings.
- The system can emit safe radiation level at intervals frequency varies of three rates -300 Gc.
- The system can use unauthorized frequency bands reserved internationally for philosophy applications as well as
- RF MODULE.
- The system can manufacture associate degree correct and a transparent voice message at intervals frequency varies 250Hz-8 rates.
- The system can inform the users of following bus incoming at the station.
- The system can apprise the bus passengers regarding following coming back stations.
- The system can show for the busman the amount of blind folks within the station with their needed destinations.

3.3 Top Level Description of the Proposed System

The projected system consists of 2 schemes: a bus scheme and a station subsystem. They're each connected to an information. The 2 subsystems square measure accustomed sight the arrival of buses, approaching bus stations, and blind folks within the station. Each the terminus and therefore the bus itself have RF MODULE tag and RF MODULE reader. Moreover, every visually handicapped person within the station incorporates a tag that coupled to relevant travel details (e.g. destination, bus number, etc...) via the system information. This data is inserted within the information throughout the ticketing method. 2 separate announcement systems square measure utilized in this design; one within the terminus to announce the arrival of buses and therefore the alternative within the bus to announce the approaching stations that square measure within the route. Additionally, the busman is supplied with data concerning blind those who would like the bus. A purposeful decomposition of the system is shown in figure 1.

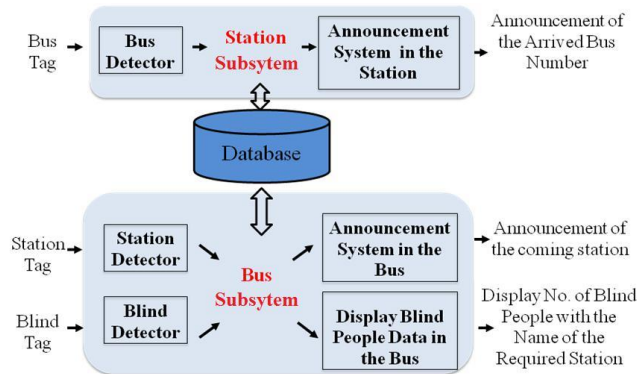


Fig. 1: Functional Decomposition of the System

3.4 Our proposed system provides the following advantages

The system allows the busman to grasp the amount of blind individuals that would like the bus and their needed destinations. This ensures that the busman offer special attention to blind individuals and wait till he's certain that every one blind persons get into the bus. This tackles the 1st drawback mentioned on top of in [6]. Moreover, the second of drawback of forgetting the moveable device of the system in [6] is easier to upset within the planned system since the visually handicapped person will simply acquire a brand new RF MODULE-based price ticket.

The bus system can have a central announcement system to inform all passengers in the bus regarding the approaching stations so as to alert bus passengers furthermore as blind individuals. This can meet our demand that the system advantages alternative passengers besides the blind individuals.

The station system can have a central announcement system regarding the buses arrival in order that all passengers get have the benefit of this feature.

RF MODULE technology match our demand in safety since its radiation is inside the quality safe frequency vary (3 kHz-300GHz) that's counseled by IEEE C95.1 2005[9]. Station subsystem consists of a detection system (RF MODULE Reader); associate announcement system and RF MODULE tag. In our system, every visually handicapped person are going to be given a RF MODULE tag that is connected to the knowledge regarding needed the specified desired } bus range and therefore the required destination via the system info. This data is inserted within the info once the tag is issued to the visually handicapped person.

3.5 Station subsystem description

Fig.2 shows the flow sheet of the station system that starts by checking for bus arrival. If bus ID tag is browsed, the management system can retrieve the bus range and its route from the info. Then, the station management system can check if this bus goes to prevent during this station or not. If yes, the bus range and its route can then be declared within the station employing a voice announcement. a similar state of affairs is continual once more once a brand-new bus approaches the station.

3.6 Bus subsystem description

It consists of a detection scheme (RF MODULE reader), a show scheme, Associate in Nursing announcement scheme and RF MODULE tag.

The flow chart of the bus scheme is shown in Fig.3. whereas the bus is approaching the station, the operation starts by police work tags' IDs of the station and blind folks within the station. counting on the RF MODULE tag detected (if any), the system reacts for every case as follows:

(a) Blind person tag is detected

Based on the data hold on within the system info concerning the tag, the system will verify if the blind man needs the bus or not. If yes, the amount of blind those who needs the bus and their destinations are shown on a show positioned next to the motive force so he are aware of the amount of blind folks and their destinations.

(b) Station tag is detected

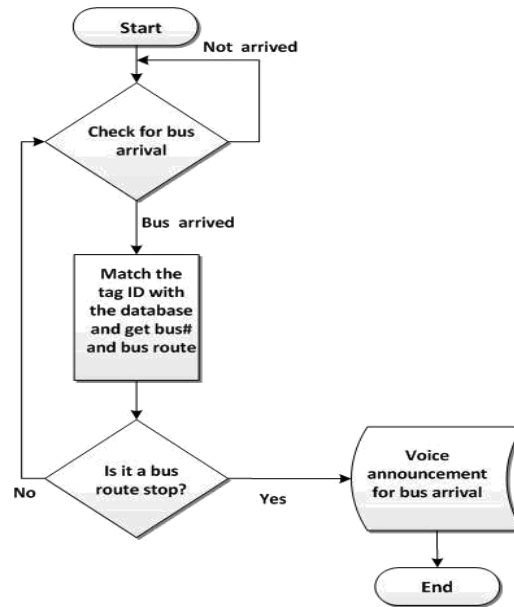


Fig. 2: Station Subsystem Flowchart

The bus scheme can initial check if the station is within the route or not. If yes, a voice announcement is generated within the bus concerning the approaching station name.

3.7 Database Design

The information Entity Relationship, ER, diagram is shown in Fig.4. The information consists of 4 tables: rider table, station table, pass table and bus table. The station has zero or several riders whereas the passenger has one and just one station as an end. The station has one or several buses that travel by it, whereas the bus passes through one or several stations. The pass table is meant to attain the many-to-many relation between bus and station tables. Within the bus table, the first secret's RF Module whereas the bus no is AN attribute that indicate the quantity allotted to the bus by the bus operator for identification. The station table stores the reverent info concerning every station and it's four entries, a station Tag ID as a primary key and station name, coordinate N and coordinate E as attributes (the last 2 square measure accustomed store the geographic location of the station). The rider table is employed to store relevant info concerning the rider. It contains four attributes: rider ticket no as primary key, blind Tag ID is attribute, station Tag ID and RF Module that square measure foreign keys from bus and station tables to point the destination of rider, and that bus s/he ought to board to achieve the destination, severally. The pass table that is an injection table to relate the bus and station tables during a many-to-many relation. Its 2 primary keys the station Tag ID and RF Module, stop no that indicates the sequence of the stations within the path and at last the departure Time from every station. Moreover, the bus table relates every bus tag ID to the bus variety, and it contains 2 attributes: RF Module and bus no.

4. IMPLEMENTATION AND TESTING

To check the practicality of the planned system, a epitome was designed and tested. The RF MODULE reader utilized in this testing was CF-RU5106 with active tags of sort EPC C1G2. the primary step in our testing was to determine communication from computer with the reader. Then, the reader computer code is employed to work out the suitable settings like the baud, waveband, association sort, and also the tag mode. These settings were later utilized in the developed epitome. the developed system epitome is shown in figure 5. Within the following sub-sections, we tend to gift our epitome implementation and testing results for numerous components of the system.

4.1 Station Subsystem

The station scheme is employed for bus detection and it consists of RF MODULE reader, speaker, and a computer as a process scheme. Here the computer is employed for 2 purposes: as a process scheme interfaced with the opposite elements of the scheme and for ticketing purpose accessed via the system web site. The RF MODULE reader, that is connected to the USB port, is employed to discover the approaching buses. Then, the computer retrieves the tag ID data from the information. At the tip of the method, the speaker announces if there's any bus approaching that station. A PHP script was written for sleuthing RF MODULE tags and so takes the choice for the output relying when on the tag ID data that is keep within the information.

4.2 Bus Subsystem

The bus system consists of RF MODULE reader, speaker and liquid crystal display all connected to the process system that is that the Raspberry Pi. The Raspberry Pi board was at the start properly ready and organized to be used as process system for the bus system. Fig. five shows the interface between elect parts and therefore the process system. The liquid crystal display is connected to GPIO pins of the Raspberry Pi. Additionally, the 2 USB ports square measure accustomed connect the RF MODULE reader and therefore the Wi-Fi electronic device to supply network property to access the info. A PHP script were written to notice each the station and blind individuals tags so reacts in step with the tag sort as explained within the system style section. Fig. six shows the made circuit example with success police investigation blind tags and displaying info the knowledge the data} to the driving force within the liquid crystal display screen once retrieving the desired information from the info.

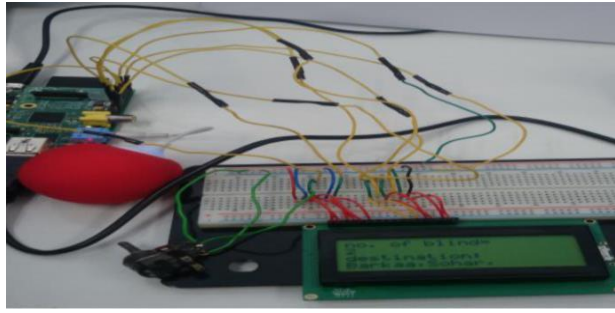


Fig. 6: The bus subsystem prototype

5. CONCLUSIONS

Since the calculable range of blind folks over the planet is between forty to forty five million, special services ought to be provided to them so as to administer them the correct to measure as others do. during this paper, we have a tendency to given a bus detection system for blind folks mistreatment RF MODULE. The projected system is simple and provides a convenient service for all the passengers; not solely the blind ones.

The system has 2 systems that are: the bus system and therefore the station subsystem. Bus system announces the approaching stations within the path for all passengers. Moreover, the busman are supplied with the amount of blind people that needed the bus and their destinations. The station system can offer announcement of the approaching buses. A paradigm of the projected system was with success engineered and tested. Our style is promising in terms of its performance and practicality.

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