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BUS DETECTION DEVICE FOR BLIND

N Harini[1], S. Chandrasahoda[2], G. Praneetha[3], K. Nandini[4], K. Nandhini [5]

[1, 2, 3, 4, 5]Department of Electronics and Communication Engineering, G. Narayanamma Institute of Technology and Science, Hyderabad, India

Abstract: A bus detection system utilizing RFID technology for bus detection, designed to facilitate the mobility and transportation of individuals with visual impairments. A bus detection device for the blind is a device that helps visually impaired individuals to detect and identify the presence of a bus or a public transport vehicle at a bus stop. The device is based on RFID technology. The device could be a handheld device or a wearable device that communicates with the user through audio feedback. The basic idea of the device is to use sensors to detect the presence of a bus and then provide feedback to the user in a non-visual format such as speech. In general, bus travel is commonly considered a safe and comfortable experience. However, with the rising volume of buses and passengers, the journey has become more challenging nowadays. This poses an additional difficulty for individuals with visual impairments when navigating bus travel. Overall, a bus detection device for the blind can greatly improve the accessibility of public transportation for visually impaired individuals, allowing them to travel more independently and confidently.

Keywords: Radio Frequency Identification (RFID), Tags.

I. INTRODUCTION

Presently, a globally prevalent profession involves aiding and assisting individuals with visual impairments. In many physica l settings, those who are visually impaired encounter challenges in obtaining information related to transportation, stops, termina ls, vehicles, schedules, maps, and directories. These difficulties hinder their effective utilization of public transportation. This initiative centers around a bus recognition system employing Radio-Frequency Identification (RFID) technology. Through the use of tags, the RFID system reads information embedded on them via RFID readers. The suggested system eliminates the dependency on assistance that visually impaired individuals traditionally r ely on for guidance in boarding the necessary bus to reach their destination. An RFID-based technology designed to facilitate the mobility and travel of individuals with visual impairments, specifically focusing on bus detection. This system is a device that helps visually impaired individuals to detect and identify the presence of a bus or a public transport vehicle at a bus stop. The device is based on RFID technology. The device could be a handheld device or a wearable device that communicates with the user through audio feedback.

Public transportation is a vital component of urban life, providing essential mobility for millions of people daily. However, for the visually impaired, accessing and navigating public buses can be a daunting task. The inability to identify the correct bus, stop, and the fear of missing the bus poses significant challenges. The project holds immense significance as it seeks to empower visually impaired individuals by providing them with a reliable and user-friendly solution to navigate public transportation systems seamlessly. Progress in technology has spurred the creation of inventive solutions with the goal of enhancing the well-being of individuals facing disabilities. Notably, the focus on devising assistive tools for those with visual impairments has garnered considerable interest. This system is a noteworthy initiative that addresses a pressing issue faced by blind individuals – navigating public transportation systems independently and safely.

II. EXISTING SYSTEM

In the existing system, the bus station subsystem utilizes RFID readers to capture the identification of incoming buses through RFID tags affixed to each bus. Subsequently, it retrieves comprehensive details regarding the bus's destination and route from a central server. The acquired information is then disseminated to all passenger modules and prominently displayed at the bus station. In addition to visual displays, announcements are broadcasted both at the bus station and within individual passenger modules, serving as alerts for visually impaired passengers. Simultaneously, the RFID reader within the bus subsystem reads the RFID tag at each bus stop, extracting details about the upcoming stop and showcasing the information within the bus for the convenience of passengers. This feature ensures that blind passengers are informed about the upcoming stops, facilitating their navigation. An accompanying announcement further assists visually impaired passengers in alighting at their desired destinations seamlessly.

III. PROPOSED SYSTEM

The system is crafted to offer guidance to the visually impaired through voice command signals, employing RFID technology for identification purposes. Each bus in this setup is equipped with an RFID reader positioned near the driver, seamlessly integrated with an Arduino Uno featuring a Bluetooth module. At every bus stop, voice assistance equipment, such as a loudspeaker, is installed. Additionally, a mobile phone, running an application called Serial Monitor, is utilized for issuing voice commands. The accompanying block diagram is presented below.

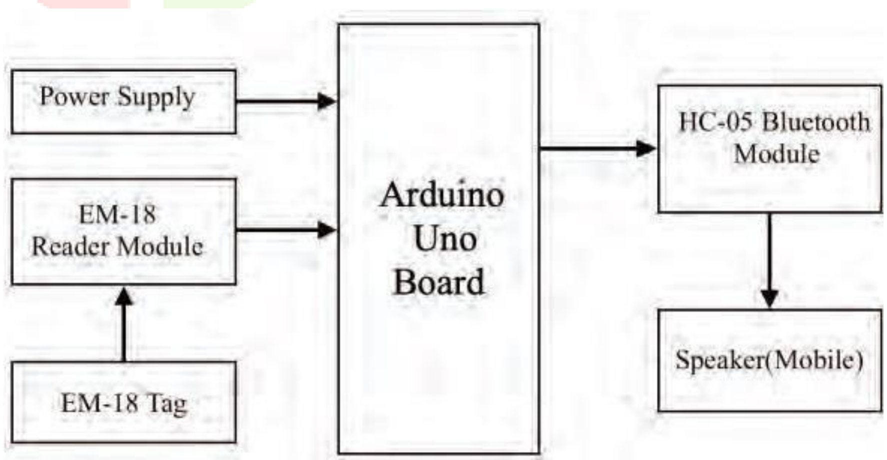

Figure 1. Block Diagram of Bus Detection Device for blind people using Arduino

RFID Tags on Buses

RFID tags are placed on buses, usually near the entrance or on a prominent surface. This tags comprising a microchip and an antenna, these tags hold essential data about the bus, encompassing details like its route number or a distinctive identifier.

RFID Readers for the Blind

Blind individuals are equipped with RFID readers, often integrated into a handheld device or a wearable accessory like a cane. The RFID reader consists of an antenna and a small computer system capable of detecting RFID signals and processing the information received. The RFID technology used in this system provides a contactless and relatively simple way for blind individuals to identify buses at bus stops. The system's effectiveness depends on the accuracy of the RFID tags' information and the range and reliability of the RFID readers.

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Hardware Resources

Key components in this setup include the Arduino Board, Bluetooth module, RFID reader, and tags, serving as the primary hardware resources.

A. ARDUINO UNO

Arduino boards are a collection of compact control sheets designed to simplify the process of hardware design, testing, and prototyping for artists, developers, and various professionals. They serve as the central intelligence for tasks such as robot development, the creation of innovative digital musical instruments, or the establishment of systems that enable potted plants to send tweets when in need of watering. The chosen board, Arduino Uno, is constructed around an ATMEGA microcontroller, essentially a comprehensive computer condensed onto a single chip. Distinguishing itself from devices like the Raspberry Pi, the Arduino is adept at directly connecting various components such as sensors, LEDs, small motors, speakers, and servos to its pins, capable of reading or outputting digital or analog voltages ranging from 0 to 5 volts. Through a USB connection, the Arduino board links to a computer, where programming is carried out using a straightforward language like C, C++, or Java through the Arduino IDE. The program is then uploaded to the board. The Arduino can function while tethered to the computer via USB or independently. It doesn't require a keyboard or screen, needing power only when code modifications are made. The Arduino Uno can be powered either through the USB connection or an external power source, operating within a voltage range of 6 to 20 volts. It's important to note

that supplying less than 7V may result in the 5V pin delivering less than five volts, potentially causing instability. Conversely, using more than 12V may lead to overheating of the voltage regulator, risking damage to the board. The recommended voltage range for stable operation is 7 to 12 volts.

B. RFID READER AND TAGS EM-18

The system employs RFID technology to wirelessly transmit a unique serial number of an object using RF waves, effectively characterizing the system. Unlike traditional barcode technology, RFID allows for identification over a distance without requiring a direct line of sight. RFID tags offer a broader range of unique IDs compared to barcodes and can incorporate additional data, such as manufacturer details, product type, and even environmental factors like temperature. The EM18 module emits a 125KHz signal through coils. When a 125KHz RFID passive tag enters the module's field, the module becomes activated. The tag, through a change in current balance across the coils, transmits information back to the program memory array. As illustrated in Figure 3, the EM-18 Reader Module stores data in either of two types of memory: ROM (read-only memory) or RAM (random access memory). Data stored in ROM is immutable, while RAM allows for modifications. RAM is also referred to as Read/Write Memory.

C. Arduino Software

The Arduino Integrated Development Environment (IDE) simplifies the process of coding and uploading it to various boards. Compatible with Windows, Mac OS X, and Linux, the IDE is built on Java and relies on processing and other open-source programming. This software is versatile and can be used with any Arduino board. Arduino, as an open-source prototyping platform, is built on user-friendly hardware and software. It has the capability to interpret diverse inputs, whether it's light on a sensor, a button press, or a message, and transform them into outputs, such as activating a motor, illuminating an LED, or posting something online. Achieving this functionality involves utilizing the Arduino programming language, based on the wiring paradigm, and the Arduino software (IDE), built on processing.

IV. IMPLEMENTATION

The microcontroller serves as a central hub that coordinates the actions of both the EM-18 module and the APR33A3 module. It receives information from the EM-18 module, processes it, triggers the appropriate message from the APR33A3 module, and sends the audio signal to the speaker.

By combining the capabilities of the EM-18 RFID reader module and the APR33A3 voice record and playback module, you can create a seamless audio output system that provides relevant information to visually impaired users at bus stops, helping them identify and board the correct buses.

A. Bus Tagging

Every bus within the fleet is furnished with an RFID tag containing pertinent details about the bus, which may include its route number or a distinctive identifier uniquely linked to that particular bus.

B. Reader Initialization

The blind individual initializes their RFID reader, usually by pressing a button or using a touch interface.

C. Scanning for RFID Signals

As a bus nears the bus stop, the RFID reader carried by the visually impaired individual scans the vicinity for RFID signals. The reader's antenna releases radio waves, triggering the activation of the RFID tag on the approaching bus.

D. Tag Identification

Upon receiving the radio waves, the RFID tag on the bus activates and energizes. Subsequently, the microchip embedded in the tag transmits its stored information utilizing the same radio waves, and this transmitted data is then captured by the RFID reader.

E. Processing and Alert

The RFID reader processes the information received from the tag. This could be the bus's route number, bus identification, or other relevant data. If the reader identifies a bus that matches the user's preferences (e.g., the desired bus route), it generates an alert. This alert could be in the form of sound, vibration, or speech output.

F. User Response

Upon receiving the notification, the visually impaired person has the option to determine whether to board the identified bus or await the arrival of another one.

G. Repeat the Process

The blind individual can repeat the process whenever a new bus approaches the bus stop.

Methodology and Working

Bus drivers are equipped with individualized RFID tags. As a bus approaches a stop, the driver positions their assigned RFID tag in proximity to the RFID reader. The RFID reader captures information about the bus through a distinct identification code. Simultaneously, it identifies the RFID tag containing details such as the bus number and its destination. Functioning as a transmitter, the RFID reader relays the bus's identification code to the Arduino. The Arduino, programmed with the unique identification code, transmits signals to the Bluetooth module. The Bluetooth module, functioning as a receiver, accepts the signals from the Arduino. The voice-based playback system, pre-loaded with relevant information, then broadcasts the transmitted details through the speaker.

V. RESULT

The RFID token consists of the serial number. This serial number is unique to all the tokens. Hence this will be read by the EM-18 reader module when placed on it. The EM-18 Reader module is responsible for reading the unique serial number of the respective RFID token. This module reads the serial number when RFID token is placed on it. This then sends the unique serial number to the Arduino. Arduino microcontroller is responsible for giving out the respective message to be played for the RFID token read by the EM-18 Reader module. The Arduino IDE code is dumped to the module. The code is regarding what message is to be sent when that serial number is triggered. The message to be played for the respective RFID token is sent to the APR33A3 voice recordand playback module. This module is responsible for the recording of the message and playing it with respect to the RFID token. We can record the message to be given out using the mic on the APR33A3 module. The message sent by the Arduino is played through the speaker. The speaker gives out the message that is to be played for the respective RFID token. In this way the visually impaired can know the destination of the bus. Hence, he can decide if he needs to board the bus.

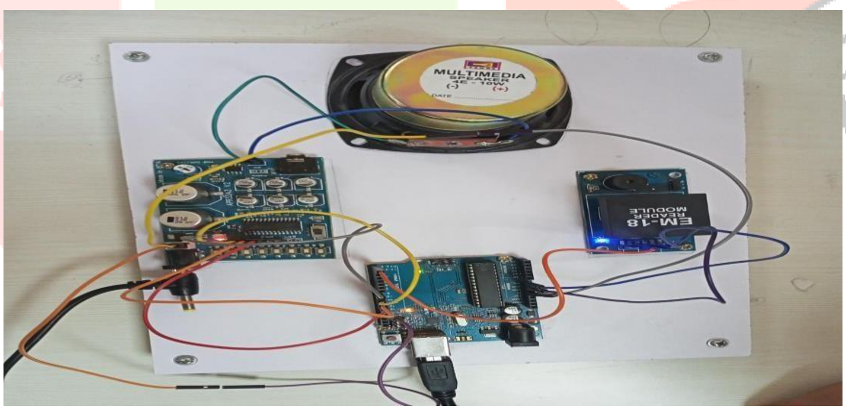

Fig 2. Circuit diagram

VI. CONCLUSION

Incorporating RFID technology for bus detection to aid visually impaired individuals represents a significant leap in promoting inclusivity within the realm of public transportation. This innovative approach, leveraging RFID's capability to identify and track buses in real time, offers a transformative solution for visually impaired individuals. RFID technology provides in valuable real- time information about bus arrivals and departures, granting blind passengers unprecedented autonomy and confidence in navigating their commutes. With audio or text notifications about approaching buses and routes, it relieves them of the anxiety associated with uncertain travel. Accessibility lies at the core of this innovation, ensuring that individuals with visual impairments can seamlessly access and comprehend the provided information. This inclusivity transcends barriers, ultimately creating a level playing field for all traveler. Furthermore, the potential for integrating RFID technology with other transportation systems, such as GPS, promises even greater accuracy and efficiency. This synergy further solidifies the notion that technology can be a powerful enabler of independence and equal access for everyone in society. While challenges like tag maintenance and infrastructure costs exist, they should not deter us from pursuing this promising avenue. As RFID-based bus detection continues to evolve, we can anticipate a brighter future, wherevisually impaired individuals can confidently and independently navigate public transportation, contributing to a more inclusive and equitable society

Future Scope

This project holds significant promise and future scope for enhancing the lives of visually impaired individuals. Initially, the focus should be on improving sensor technology for accurate obstacle detection. Integrating with public transportation systems, developing companion apps, and incorporating GPS for navigation are key steps. Crowdsourcing data and ensuring global accessibility are crucial for widespread adoption. Sustainability, user feedback, and regulatory compliance are ongoing concerns. Collaboration with relevant organizations and continuous innovation are vital. Balancing cost-effectiveness with functionality is essential, and data security and privacy must be a priority. Ultimately, this project has the potential to greatly improve the independence and movement of individuals with visual impairments in communal areas.

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