# Public Transportation Assistance for Blind Using IOT

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***Abstract:*** ***Public transportation assistance device for the blind is aimed at providing an assistance to the visually impaired in effectively utilizing the public transportation system by identifying his/her suitable vehicle for boarding, avoid unwanted ones. The use of multiple RF modules allows the blind to access more locations. The work involves using RF transmitter and receiver which uses a 433 MHz frequency band to transmit and receive signals between the bus and blind person. The haptic feedback motor is used to generate vibrations according to the messages received which informs the blind to get ready for boarding the vehicle. The work involves designing and building a prototype system that uses these transceivers. This technology improves the quality of the life of the blind people to go to the important places on their own using the public transport facilities. The technology can be extended to many more places as per the person's wish using different frequencies.***

***Result:*** ***This public transportation assistance device for the visually impaired enhances independent travel by identifying the correct vehicle for boarding and avoiding incorrect ones. Multiple RF modules enable access to more locations, using a 433 MHz RF transmitter and receiver to exchange signals between the bus and the user. Haptic feedback through a vibration motor alerts the user when their desired vehicle arrives, allowing them to prepare for boarding.***

***Keywords:*** ***RF Transmitter and Receiver Modules (FS1000A), Arduino Nano Microcontroller, Haptic Feedback Motor, Push Buttons, Public Transportation Assistance Device.***

## 1. INTRODUCTION

Efficient and accessible public transportation is essential for urban mobility, yet for visually impaired individuals, navigating public transit systems poses significant challenges. The lack of real-time information and guidance can make using buses, trains, and subways daunting,
leading to a reliance on others for assistance and reduced independence. Public transportation is a vital component of urban life. Nowadays visually

impaired encounter challenges in obtaining information related to transportation, stops, maps, and directions. There are many difficulties, including the difficulty to recognize the right bus or stop and the anxiety of missing the bus. Therefore, a system that enables individuals to enjoy transportation services on their own, independent of others, must be introduced in order to improve their quality of life. The Public Transportation Assistance Device for the Blind (PTADB) aims to solve this problem by utilizing modern technology. This work makes use of the capabilities of Arduino microcontrollers, transmitter and receiver modules, and haptic feedback motors to create a user-friendly aid for visually impaired people. The device will communicate with transmitter and receiver modules installed at various points in the transportation system such as bus stops or railway stations to provide critical information to the user. This work deals with a bus identification system using FS1000A transmitter and receiver module. Exact bus and its location is unknown for the blind person. The system provides vibration effect to help users identify the appropriate bus and board on to it. The whole system is designed to be integrated on a wearable band such that it can be carried along with them easily. By integrating haptic feedback motors, the PTAD delivers the information through vibrations, allowing the user to receive and interpret data without relying on auditory messages, which can be lost in noisy environments.

## 2. LITERATURE REVIEW

A bus detection device for the blind is a device that helps visually impaired individuals to detect and identify the presence of a bus. The device is based on RFID technology. The device could be 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 this configuration, an Arduino Uno is smoothly linked with an RFID reader on each bus, which is placed close to the driver. A loudspeaker or other voice help device is placed at each bus stop. Additionally, a mobile phone, running an application called Serial Monitor, is utilized for issuing voice commands.

This system describes a ZigBee technology bus monitoring system that aims to facilitate movement and transport for blind people. Two detection subsystems—one for blind individuals and one for buses—are part of the suggested system. By sending a voice message over the speaker, the blind passenger module recognition subsystem will promptly identify the bus segment and provide information about the bus route.

Design and implementation of a low-power active Radio Frequency Identification (RFID) system based on the nRF24L01 RF transceiver are completed. The nRF24L01 serves as the RFID system's reader and active tag, respectively. The nRF24L01 was selected because it is low power and operates in the ultra-high frequency (UHF) band at

2.4 GHz. The main aim of work is to develop system which helps to find the bus at bus stop for blind people. It uses RFID technology, Arduino Uno, voice IC APR9600 for voice announcement with speaker. When a bus comes to stop, RFID will read the tag and it will give voice by using speaker. Existing method is sign language and circuit to show postures of deaf people in order to understand the actions to other peoples. The RFID based circuit has fewer components and it is feasible, small size also makes it compactible and easy to use. The components which are present are low weight, cheap and can be replaced very easily. So, there is no difficulty for the blind person to operate it and carry it. When a bus enters in region of RFID, then the RFID tag identifies it and the Arduino Uno will convert the tag information into hearable and readable form to show other people. RFID tag contains the information of the bus and it will show the bus number to the blind.

This paper focuses on a prototype of an Internet of Things (IoT) system for the tracking and monitoring of intermodal containers throughout their whole shipment which may include heterogeneous methods (e.g., road transport and sea transport). The system accounts for a couple of devices for each container. The former is a sensor node placed on the inner surface of the container and it is in charge of monitoring the state of the shipped goods by sampling endo-container environmental parameters (i.e., temperature, moisture and air pressure). Such measurements are wirelessly sent outside the container by exploiting the Amplitude Shift Keying (ASK) modulation over a 433 MHz carrier. The other device is mounted on the outer surface of the container just above the inside one. This receives the data broadcast from the sensor node and forwards such information to a cloud service by making use of Sigfox technology.

## 3. METHODOLOGY

The methodology of the proposed work is structured around two core modules—the FS1000A RF Transmitter Module and the RF Receiver Module. Together, these modules form a transportation assistance device that provides real time information to visually impaired individuals, enabling them to identify public transportation stops and vehicles with ease. By utilizing radio frequency (RF) communication, the device effectively bridges the gap between public transit systems and visually impaired users, enhancing both accessibility and independence.

- RF Transmitter Module

The transmitter module is designed to be installed in public transportation vehicles or at stops, providing a reliable means of broadcasting information about location or vehicle identification to visually impaired users. The core components of this module are the Arduino Nano microcontroller and the FS1000A RF transmitter. The Arduino Nano, a compact and versatile microcontroller, enables the system to transmit specific, coded messages that correspond to particular locations or transportation options, such as buses or trains.

The FS1000A RF transmitter operates in the 433 MHz frequency band, which is well-suited for short-to-medium-range communication, providing ample range for public transport systems and ensuring the signal reaches nearby users' receiver modules. The device is programmed to send regular pulses or data packets that carry identifiers for specific locations (like a bus stop) or vehicles.

One of the strengths of RF communication in this setup is its resilience in urban environments, where Wi-Fi and Bluetooth signals might be disrupted. By using an RF module, the system ensures reliable signal transmission, which is essential for visually impaired users who depend on timely notifications for navigation. The transmitter's simplicity and low power requirements also mean that it is relatively low-maintenance, requiring only occasional battery replacement or minor upkeep when installed in public locations.

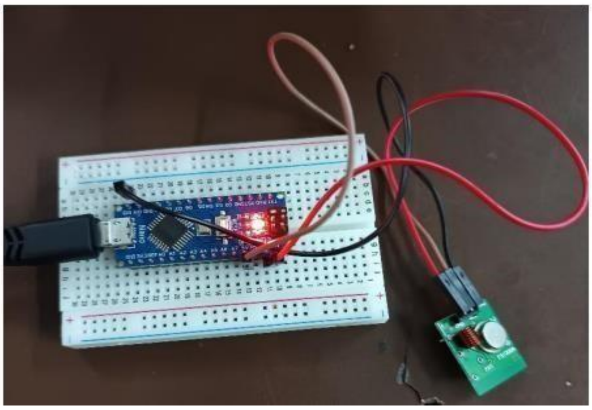

Fig.3.1. Transmitter part

- RF Receiver Module

The RF Receiver Module, designed as a handheld or wearable device, is the core component for the end user, receiving information broadcasted by the transmitter module. The receiver setup includes an Arduino Nano microcontroller, an FS1000A RF receiver module, a haptic feedback motor, and three push buttons for user control. This device is compact and designed for ease of use, ensuring it can be comfortably used by visually impaired individuals while in transit.

The Arduino Nano in the receiver module is programmed to decode incoming RF signals and identify the specific information each signal contains, such as a particular stop or bus number. This decoded information is then relayed to the user through tactile feedback, facilitated by a haptic feedback motor. The haptic motor provides discreet vibrations that can easily be felt by the user, making it an ideal notification method for visually impaired individuals who may not benefit from visual or auditory cues.

The three-button configuration on the receiver module enables the user to customize their experience based on destination preferences:

- **Button 1** activates reception for "Place 1," setting the receiver to recognize signals associated with a specific destination or transit option. For instance, a user might set this button to notify them when a particular bus or train is nearby.
- **Button 3** enables reception for "Place 2," allowing the user to manage alerts for a different location or transit option, expanding the flexibility of the device.

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- **Button 2** disables signal reception entirely, allowing the user to turn off notifications when they no longer need guidance, such as when they reach their final stop. This feature also helps conserve battery life and minimizes unnecessary haptic alerts.

When the RF Receiver Module receives a signal from an active transmitter, it provides the user with a vibration alert through the haptic motor, notifying them that they are in proximity to a particular transportation option. The device's tactile feedback mechanism is especially beneficial in crowded or noisy environments where auditory cues may be insufficient or easily missed. This method of feedback offers a simple and intuitive way for users to interact with the device and be guided effectively.

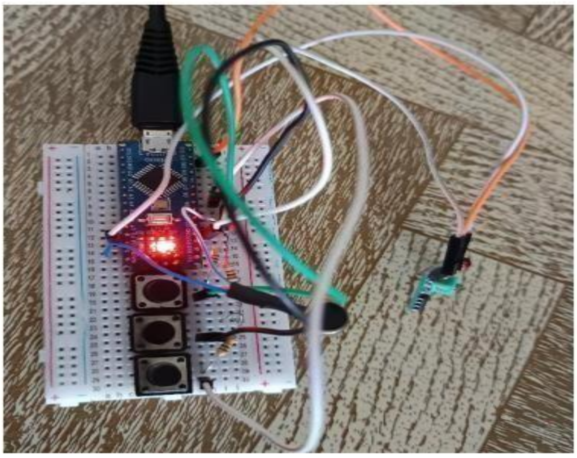

Fig.3.2. Receiver part with multiple pushbutton

This methodology ensures a straightforward, reliable, and safe solution for visually impaired individuals navigating public transportation. By focusing on simplicity and user control, the work prioritizes accessibility, allowing users to receive alerts only for the locations they need, minimizing distraction, and conserving device battery. The device's modularity and adaptability also mean it could be integrated into a variety of public transit systems, making it a versatile tool for enhancing accessibility.

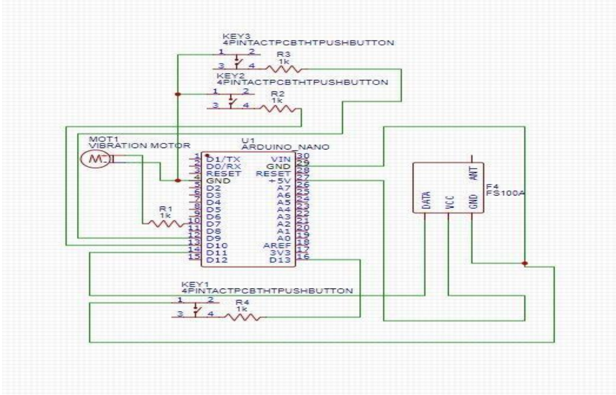


Fig.3.3. Circuit diagram of Receiver part

Fig.3.3. circuit diagram shows an Arduino Nano-based public transportation assistance device for the visually impaired. It includes: Arduino Nano (U1): Central control unit that receives signals and processes inputs. RF Module (FS100A): Connected to Arduino for receiving data signals from buses. Pushbuttons (KEY1, KEY2, KEY3): Allow user interaction to enable or disable specific features. Vibration Motor (M1): Provides haptic feedback to alert the user when their desired bus arrives. Each pushbutton has a 1kΩ resistor connected, and the vibration motor is also connected with a 1kΩ resistor to control its current flow. The setup allows the device to alert the user with vibrations upon receiving the correct signal from the RF module.

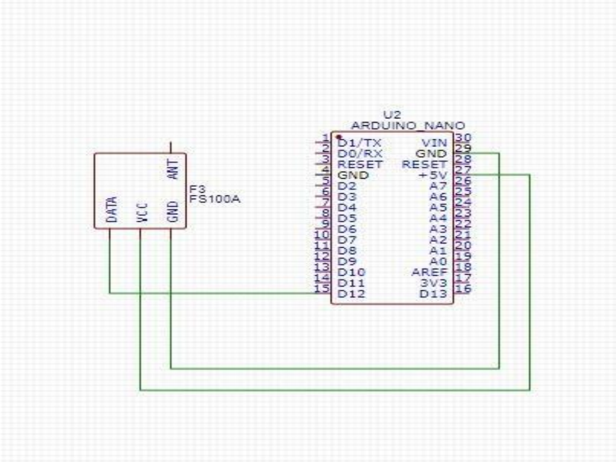


Fig.3.4. Circuit diagram of Transmitter part

Fig.3.4. circuit diagram shows a simple setup with an Arduino Nano (U2) and an RF Transmitter Module (FS100A). The RF module has four pins: Data, VCC, GND, and Antenna (ANT). Data Pin: Connected to one of the Arduino's digital input pins to receive signal data. VCC and GND Pins: Provide power to the RF module, connected to the 5V and GND pins on the Arduino. ANT Pin: Connects to an antenna for better signal reception. This configuration allows the Arduino to receive data signals from the RF module, enabling it to process incoming messages, such as identifying nearby buses.

## 4. RESULT

The Public Transportation Assistance Device for the Blind (PTADB) is designed to support visually impaired individuals in navigating public transit independently. Traditional transit systems often lack accessibility features needed by visually impaired users, making it difficult for them to identify the correct bus, locate stops, and understand directions. PTADB addresses these challenges by combining Arduino microcontrollers, FS1000A transmitter and receiver modules, and haptic feedback motors.

This device communicates with transmitter modules installed at bus stops or train stations, allowing it to receive critical, location-specific information about arriving buses. Upon arrival of the desired bus, the device alerts the user through distinct vibration patterns, ensuring they can recognize the signal even in noisy environments. The haptic feedback replaces auditory cues, making it reliable in various settings.

A push button on the wearable device allows users to indicate their intended destination by pressing the button a specified number of times, allowing the system to identify and alert the user when the correct bus arrives. The entire device is designed to be worn on the wrist, making it both portable and accessible.

The serial monitor output serves as a real-time log of the device's status and interactions. It helps in debugging and ensures that the device is operating correctly by displaying messages related to setup, button presses, and received signals.

"Receiver enabled for 'Aluva'. Press button 2 to disable.": Indicates that the device is now set to receive and process messages related to "Aluva." . "Receiver enabled for 'Highcourt'. Press button 2 to disable.": Indicates that the device is now set to receive and process messages related to "Highcourt.". "Receiver disabled for both 'Aluva' and 'Highcourt'. Press button 1 or 3 to enable.":

Indicates that the device is no longer receiving messages related to either "Aluva" or "Highcourt.". "Message: Aluva": Indicates that the device has received a signal identifying a bus to "Aluva.". "Message: Highcourt": Indicates that the device has received a signal identifying bus to "Highcourt.".These messages confirm that the device is actively receiving and decoding signals from the transmitter. Based on the user's selection (enabled receiver for "Aluva" or "Highcourt"), the corresponding message will trigger the vibration motor to alert the user.

## 5. CONCLUSION

Public transportation assistance device for the blind is targeted mainly on the visually impaired people. This system provides an advancement in the transportation of the blind independently without relying on an individual for help. By integrating technologies such as Arduino Nano, wireless communication modules i.e. transmitter and receiver modules, haptic feedback motors, and push buttons, we have created a user friendly system that addresses the specific needs of the visually impaired in using public transportation systems. This work has demonstrated that with relatively affordable and accessible components, it is possible to create an assistance device which can improve the quality of life for the visually impaired people.

The device enables users to receive information about bus arrivals and destinations through vibration, ensuring they can confidently and independently utilize public transportation services. Planned to implement the work using nRF24L01 but due to some inconvenience we used FS1000A module which has a transmitter and receiver module. FS 1000A enables wireless communication between transmitter and receiver. Through haptic feedback motor and multiple pushbuttons, a user-friendly interface is incorporated In conclusion, this work describes the potential of combining modern technology with innovative design to create practical solutions for accessibility challenges of the visually impaired.

## 6. REFERENCES

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