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Full Length Article

Bus Departure Indication And Auto Announcement System In Bus Stops, Useful In Rural Bus Stops

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Abstract
In present bus transportation system, we need one person in each bus station to enter the data of busses arrivals timings and the driver or conductor has to get down the bus to enter the timings for confirmation but this is a time-consuming process and needs lot of man power to implement in many bus stops.
And sometimes some busses will not stop in particular stops even though they have to stop because of these passengers have to face problem especially in the night time. To make this process fast, automatic and to reduce manpower and also to avoid missing stops we are implementing this project. This can be achieved easily with help of advancement in technologies. Now a day's so many technologies are coming out to make our lives more comfort, user-friendly and secure.
This is a complete stand-alone attendance system in which we store all busses arrival timings with time and date in excel file which will be created on SD card using Arduino microcontroller.

Keywords
Bus Tracking System, Arduino Microcontroller, Attendance Monitoring, SD Card Data Logging, Automated Bus Management

Introduction

The world is changing at a rapid pace, driven by technological innovation which reshaping the world faster than ever before. The fast development of innovation and hardware had changed our life from the most essential errand of flicking the change on to the most muddled assignment of substantial machining.

Today's cities have become increasingly automobile-dominated where everyone is rushing to reach their destinations, which leads to in transport-related challenges such as public transport weakening, congestion and accidents. Efficient and reliable public transport is essential to economic growth of urban where for the majority of people, the public transport is the main means to access employment, education, and public services.

Therefore, for those people who always rely on the public transport in their life, they mostly concern about the real time location of the bus which they are waiting for and the time it will take to reach the bus stop. By knowing the time taken to reach, they can make better travelling decisions. Furthermore, bus tracking and monitoring system for the school bus, provide the safety for the students that enable the parents and school authorities to track the location of the bus as well as the authorities can be able to monitor the speed of the bus to assure that the driver is not in danger driving due to the dearth of research in tracking and monitoring systems

Literature Review

(2017) Supriya A. Salunke et al. – Developed a school bus tracking system using Arduino, GPS, and GSM modules for real-time transport monitoring.
(2014) K. V. Padmaja et al. – Proposed an RFID and GPS-based bus tracking system for automatic bus identification and passenger information updates.
(2018) Ling N. S. – Introduced a GPS-based city bus monitoring system for detecting real-time vehicle location and traffic conditions.
(2017) M. T. Kamisan et al. – Designed an Arduino-based campus bus tracking system integrated with smartphone applications for easier transportation management.
(2016) P. John Samuel et al. – Demonstrated the use of Arduino microcontrollers for vehicle monitoring and transport automation systems.
(2010) V. Gutiérrez et al. – Developed an automated announcement system for public transport to improve passenger information and accessibility.

Existing System

In most rural areas, bus stops lack any electronic system to inform passengers about bus arrivals or departures. People rely on guesswork, fixed schedules, or verbal communication from drivers

and conductors, which can lead to missed buses, long waiting times, and inconvenience—especially for the elderly or illiterate. There are no real-time updates or announcements, making the system inefficient and unreliable.

Proposed System

The proposed system aims to modernize rural bus stops by automatically detecting when a bus arrives or departs and then providing both visual and audio announcements to inform waiting passengers. Using technologies like RFID, sensors, or GPS, the system can track buses and trigger announcements through a speaker and display key information on a digital screen. This reduces uncertainty, helps passengers stay informed in real-time, and enhances the overall travel experience, even in remote areas without internet or smartphone access.

Block Diagram

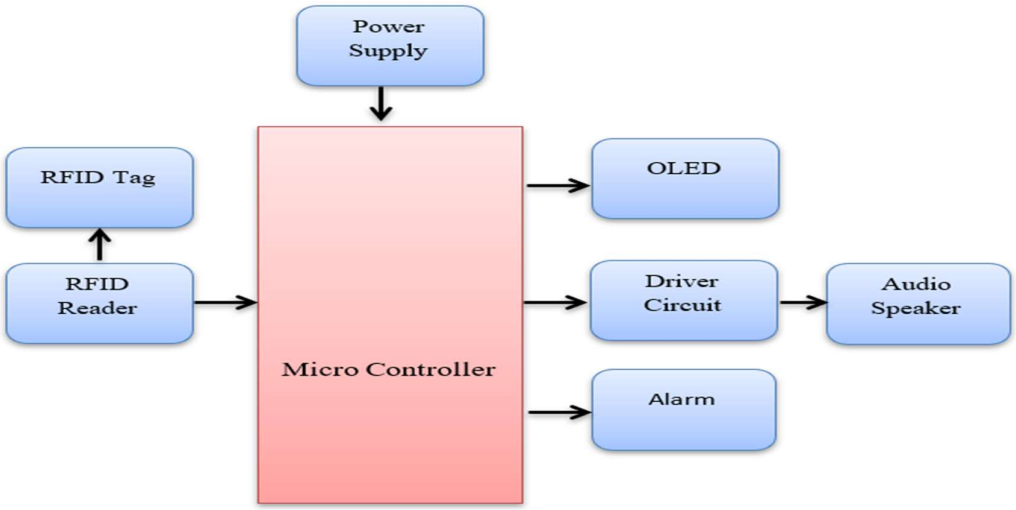

Fig 1 Transmitter Block Diagram

Working Principle :

The Smart Bus Stop Announcement System operates using RFID technology integrated with an Arduino UNO microcontroller to automate the process of bus identification and passenger information display. Each bus is equipped with a unique RFID tag, while RFID readers are installed at the entry and exit points of the bus stop. Whenever a bus approaches the bus stop, the RFID reader detects the corresponding RFID tag and transmits the data to the Arduino controller. The controller processes the received information and identifies the bus number along with its route details stored within the system database.

Upon successful identification of the bus, the system generates both visual and audio announcements for the convenience of passengers. The bus details are displayed on an LCD or digital display unit, while a voice module provides automated announcements regarding the arrival and departure of the bus through speakers. In addition, the system can store operational data such as bus timing and movement records using an SD card module. The implementation of this automated system minimizes manual intervention, enhances passenger convenience, and improves the efficiency and reliability of public transportation services, particularly in rural and semi-urban areas.

Hardware Implementation :

- Arduino UNO
- RFID Reader Module
- RFID Tags
- OLED
- Buzzer (alert system)
- Voice Announcement/Speaker Module
- SD Card Module
- 12V power adapter (power supply)
- Breadboard/PCB and connecting wires

Power Supply

The power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V.The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. This resulting dc voltage usually has some ripple or ac voltage variation.

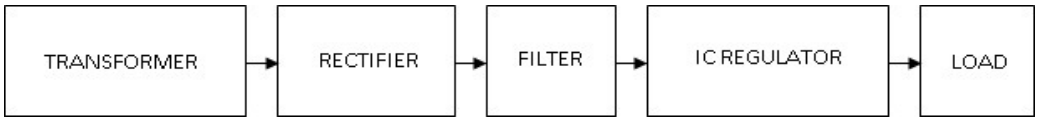

Fig:2 Block Diagram of Block Diagram

Bridge Rectifier:

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners.Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B the positive potential at point A will forward bias D3 and reverse bias D4.

MICROCONTROLLER

The Arduino UNO is the main controlling unit of the "Advanced Military Spying and Bomb Disposal Robot." It controls the overall operation of the robot by processing signals received from the RF receiver and sensors. The Arduino UNO is responsible for controlling the movement of the motors, obstacle detection using the IR sensor, metal detection, buzzer alerts, and wireless communication. It acts as the brain of the system and ensures smooth and accurate functioning of all connected components in hazardous environments.

OLED Display

An OLED display have the following advantages over an LCD display:
>Improved image quality - better contrast, higher brightness, fuller viewing angle, a wider colour range and much faster refresh rates.
>Lower power consumption.
>Simpler design that enables ultra-thin, flexible foldable and transparent displays.
Better durability - OLEDs are very durable and can operate in a broader temperature range.

RFID MODULE

RFID (Radio Frequency Identification) is a wireless communication technology used for automatic identification and tracking of objects using radio waves. An RFID system mainly consists of two components: an RFID tag and an RFID reader. The RFID tag contains unique identification data, while the RFID reader detects and reads the information from the tag without requiring direct physical contact. In the proposed smart bus stop announcement system, RFID technology is used to identify buses automatically when they arrive at or depart from the bus stop. The RFID reader captures the bus identification data and sends it to the Arduino controller for further processing. This technology provides fast, accurate, and reliable detection, thereby improving automation, reducing manual effort, and enhancing the efficiency of public transportation systems.

VOICE ANNOUNCEMENT MODULE
The Voice Announcement/Speaker Module is used to provide audio notifications regarding the arrival and departure of buses at the bus stop. It receives signals from the Arduino UNO microcontroller and generates prerecorded or programmed voice messages through a speaker system. This module helps passengers by delivering clear and audible announcements, which is especially beneficial for elderly and visually impaired individuals. The use of automated voice announcements improves passenger convenience, reduces dependency on manual announcements, and enhances the overall efficiency of the smart bus stop system.
provides the required speed, power, and stability for smooth navigation in hazardous Areas.

SD CARD MODULE
The SD Card Module is used for storing and maintaining important data generated by the smart bus stop announcement system. It is interfaced with the Arduino UNO microcontroller to record information such as bus arrival time, departure time, and bus identification details. The stored data can be accessed later for monitoring, analysis, and record maintenance purposes. The use of an SD Card Module improves data management, enables efficient storage of system logs, and enhances the reliability and functionality of the overall transportation monitoring system.
BUZZER
A buzzer or beeper is a signalling device, usually electronic, typically used in automobiles, house hold appliances such as a microwave oven, or game shows.
It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates sounds.

SCHEMATIC DIAGRAM

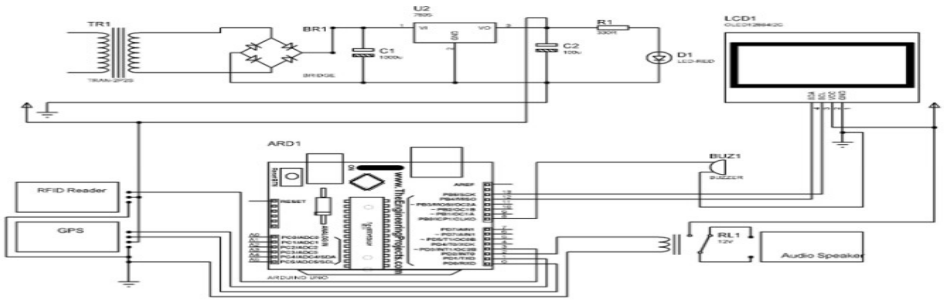

Fig:3 Schematic Diagram

RESULTS

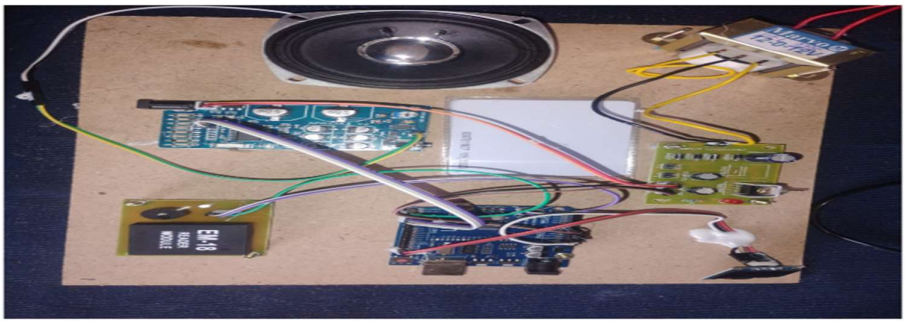

Fig:4 Hardware Kit in ON Condition

CONCLUSION:

The Smart Bus Stop Announcement System successfully demonstrates an efficient and automated solution for improving public transportation facilities, especially in rural and semi-urban areas. By integrating RFID technology with an Arduino UNO microcontroller, the system is capable of automatically detecting buses and providing real-time visual and audio announcements to passengers. The implementation of components such as RFID readers, display units, speaker modules, and SD card storage enhances the overall functionality and reliability of the system. This project reduces the dependency on manual announcements and minimizes confusion among passengers regarding bus arrivals and departures.

Furthermore, the system offers a cost-effective, user-friendly, and reliable approach for smart transportation management. The automated announcement mechanism improves passenger convenience and accessibility, particularly for elderly and visually impaired individuals. The project also demonstrates the practical application of embedded systems and automation technologies in real-world transportation environments. With future enhancements such as GPS integration, IoT connectivity, and mobile application support, the proposed system can be further developed into a fully intelligent and smart public transport assistance system.

FUTURE SCOPE :

Integration of GPS technology for real-time bus tracking and live arrival updates.

Development of a mobile application for passengers to access bus schedules and notifications remotely.

Implementation of IoT and cloud-based monitoring systems for centralized transportation management.

Addition of multilingual voice announcement features for better accessibility and passenger convenience.

The robot can be upgraded into a fully autonomous system. Integration of solar-powered systems to improve energy efficiency and support sustainable operation.

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