Offline Train Tracking System

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ABSTRACT

Population growth is directly related to transportation connectivity. In India, transport facilities are primarily served by Indian Railways. The work "OFFLINE TRAIN TRACKING SYSTEM" works on transmitter receiver-based logic. Transmitters are installed at stations and receivers are installed inside trains. When the train comes within range of the transmitter, the receiver receives the signal and displays the station name on the LCD screen. Transmitters installed at stations operate on 230 V AC and receivers in trains operate on 9 V DC. Work is not manually controlled. If the transmitter is on and the receiver is receiving the signal. Then, the station name is automatically displayed on the display. The work is not manually controlled. When the transmitter is ON and the receiver receives signals from transmitter, then the display unit automatically displays the station name. NRF Transceiver is used in both railway station and train. Lora transceiver can also be used in place of NRF transceiver module, it has the range of 2.5 Km, and it can be more helpful in the case of early projection of forthcoming station. NRF transceiver has the range of 500 meters. It is not expensive and effective in nature. Lora transceiver is expensive and more effective than NRF module. Microcontroller is used in this project, and it is programmed with Embedded C. LCD Display and voice alert is installed with the microcontroller. As the transceiver in the station gives area information to the transceiver located in the train, the microcontroller projects the station name in the display and voice alert is also installed.

Keywords: Soil Microbial Fuel Cell (SMFC), Renewable energy, Electrolysis

1 Introduction

We have observed how much of our lives have been simplified by live tracking applications. When we need a cab to get someplace, we can quickly book one through Ola or Uber and get real-time cab tracking. Some examples of implementation are tracking your real-time online orders, the trains and buses you need to catch, etc. As a result, it becomes harder to manually keep track of all these details. Nonetheless, this function is not used as much as it could. Nowadays, railroads use this live tracking service to monitor stations. But it is not utilised to maintain a record of the inquiries and inspections made at the station. This can lessen the amount of paperwork and manual labour needed to complete the activity. As a result, our project aims to address this issue. The study examines the variables involved in comprehending what it is that planned to implement and my implementation strategy. The various technologies used to structure this project are given below. India is a nation that is worldwide developing very quickly. To become a developed nation, a nation must experience overall development, including advancements in research, education, technology, services quality, employment, and transportation, among other things. Large numbers of passengers use the Indian Railways, adding to the additional strain on the country's rail infrastructure. It is quite challenging due to the railway tracks' active routine.

2 Project Retrospective

Experimental testing and analysis of prototype mode performance. Indian Railways trials are underway in several areas of New Delhi, India. Prices are much lower than the manual train tracking systems used previously. In the future, we will try to implement some significant changes such as:

B. Message train drivers to slow down trains and message responsible railway authorities to take necessary

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precautions to conduct inspections as soon as possible. Tracks will not be inspected until the deadline. Antennas are effective enough for the system to work, but more effective antennas increase the lateral resilience of the train. "Automatic station name display in train" has two modules, one for transmitter and one for receiver, and transmits area information. Area information is displayed in binary format Transmitted wirelessly over RF. The receiver contains an RF receiver and a microcontroller. Binary information data for ranges and names is When the memory matches the received binary and stored data, the corresponding area name will be displayed on the LCD and an audio alarm will be installed.

3 Methodology

3.1 Working

The working of this offline tracking system can be explained with the circuit diagram. This consists of a Transmitter module which is kept in the railway station and a receiver module kept in the coupe of the train. In the receiver module, the PCB contains a 5v jack in which the wall adapter is plugged in. The module works from the power supplied by the 5v jack. The four main components here are Arduino nano microcontroller, the wireless transmitter NRF24LO1 which covers up to a range of 300 to 500 metres, the PAM8403 Amplifier module, DF player card reader module. The digitalized audios are saved inside the card reader. The audio or the announcement is controlled by Arduino nano. That is which audio to be played is decided by the Rx and Tx lines via UART [universal asynchronous reception and transmission] communication. Through this serial communication data is transmitted. The Rx of DF Player is connected to the Tx of Arduino nano and the Rx pin of Arduino is connected to the Tx pin of DF player. Therefore, data is transmitted in either direction. The communication between Arduino nano and NRF transceiver is SPI communication protocol. The transmitter module contains only a NRF24L01 Transceiver and an Arduino nano microcontroller. The NRF module in the transmitter part transmits data continuously within a particular time and the transmitted data which will be the station name is passed through particular pipeline of certain RF frequency. The data will be received by all the modules which are connected to the pipeline. So, when the train arrives in a range of 300 to 500 metre, the transmitted data, or the station name, will be received by the receiver module in the train. So, the data received will be processed in the NRF Transceiver and that information will be sent to the DF Player via transmitter lines of the microcontroller. And the audio from the MF player will be sent to the amplifier and then to the speaker. The digital data in the card reader is converted into analog data before sending to the amplifier. Finally, audio will be played through the speaker. Also, the information will be displayed on a LCD Display via inter integrated communication. Here NRF Transceiver that is used can be replaced with Lora module which covers upto a range of 2km and is costlier than NRF transceiver.

3.2 NRF24L01 Transceiver

WiFi and Bluetooth are commonly used for communication between two different microcontrollers sending and receiving data. However, for instances beyond 200 meters over Bluetooth and WiFi range, the solution is the NRF24L01 transceiver. It operates at a frequency of 2.4 GHz in the HIS ISM frequency band of the world and uses HIS GFSK modulation for data transmission. They communicate via serial peripheral interface or SPI communication with data transfer rates up to 10 MBit/s. All parameters such as frequency channel, output power and data rate can be set via SPI communication. Not compatible with 5 V. Connect to 3.3 V if available or use a voltage regulator such as the AMS1117 to regulate 5 V to 3.3 V. They are mainly available in two versions. You can start with the small and cheap NRF24LO1 OF 300-meter range and the NRF24L01 PA/LNA with the RFX2401C chip which is basically a range extender that operates at a range of 1000 meters.

3.3 Arduino mc

Arduino mc are the integrated circuits, basically tiny computers. They can deal or run with small, not complicated simple programs. Fast enough to process any data. The communication between Arduino and NRF Transceiver is serial peripheral interface communication. And the communication between Arduino and Lcd display is inter integrated communication. There are different types of Arduinos like Arduino uno which is fast and simple. The Arduino communicates with DF player through universal asynchronous reception and transmission communication. There are also fancy Arduino with more powerful processors which have wifi, ethernet and more.

3.4 D F Player

A compact and affordable MP3 module that delivers optimized output directly to your speakers is the DFPlayer Mini, the MP3 Player works for the Arduino. Comes with a battery, speaker and pushbuttons, this module can be used independently or in combination with microcontrollers such as Arduino, ESP32, Raspberry Pi or any other microcontroller with Uart can.

3.5 Microcontroller and Sensors

Microcontroller is used to execute or process a single task within an application Arduino MC is used.

3.6 Voice Alert and Display

The station name is displayed on the liquid crystal display, and an audio alarm (announcement) is installed. Voice/audio notification and alarm system. in offline train tracking project, a PIR sensor is used, which is infrared technology based automatic control module, and IR sensor, which is used for avoiding the obstacles, has an obstacle avoiding sensing module has a pair of transmitting and receiving tubes.

3.7 Embedded C

A simple extension of the C language used to develop microcontrollers application. C gives machine instructions for the given input. This method gives more performance to the embedded system. The Arduino compatible coding is that the Arduino compatible microcontroller programmed and uploaded using Arduino IDE. Embedded C is a high-level language, and nearer to java than to assembly. Compiler / linker is used to insert the C startup code. Fixed point arithmetic, multiple different memory banks, and basic input/output operations and functions, conditional statements, loops, functions, arrays and strings, and unions.

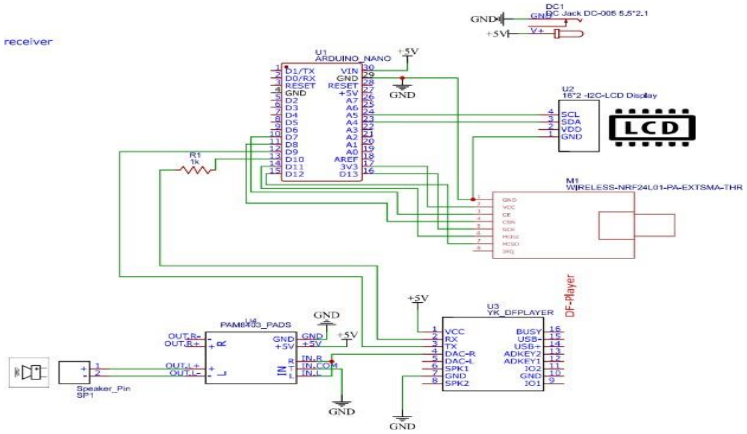

Figure 1: *Circuit Diagram*

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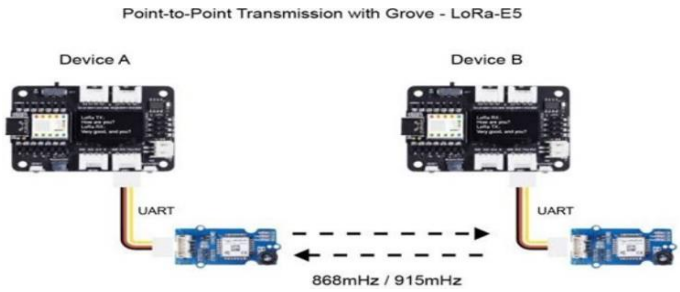

Figure 2: *Transmission Between the Transciever*

Every traveler faces network and internet connection issues when taking a train. Using these techniques, a simple solution was devised. The system provides millions of Indian train passengers with the train information they need, regardless of whether they have an internet connection. This result is achieved by installing the system in a train coupe at one station and can be applied to all stations. This study describes an automated station announcement system that displays codes at stations while announcements are being made. The main purpose of this work is to create an automated station announcement system that uses voice ICs and radio frequency cards to track station data. You can add any number of stations.

4 Result

The NRF transceiver connected to the microcontroller, which is placed in the station transmits data, i.e.: station name NRF module placed in the train which is the receiver section collects the data. The amplified output noise is produced in the speaker through UART communication between Arduino and DF player. The data is also displayed in an LCD display through I2C communication.

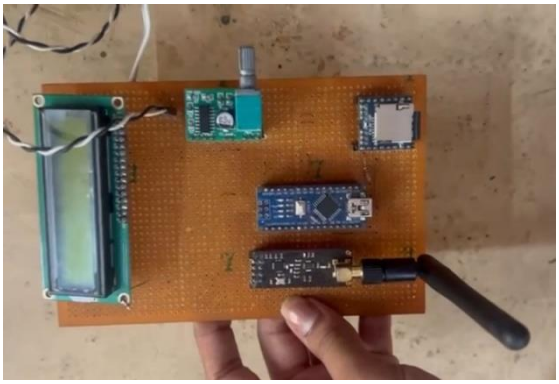

Figure 3: *Nrf Transciever Model*

5 Future Works

With the help of this technology people are able to identify the upcoming station names even without internet connectivity rectifying today's problem. Common people on the train, especially those who don't have mobile phones, can avoid confusions, and will find it useful.

6 Declarations

6.1 Acknowledgment

We take this opportunity to express our deepest sense of gratitude and sincere thanks to everyone who helped us to complete this work successfully. We would like to place on record our sincere gratitude to our project guide DR. ASHA T S, Professor, Electronics and Communication Engineering, N.S.S. College of Engineering, for the guidance and mentorship throughout this work.

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References

[1] M.Gruden, A.Westman, J.Platbardis, P.Hallbj ´ orner, A.Rydberg, "Re- liability ¨ Experiments for Wireless Sensor Networks in Train Environment", Wireless Technology Conference 2009. EuWIT 2009, European, Rome

[2] P.J.Soh, G.A.E.Vandenbosch, V.Volski. H.M.R.Nurul, "Characterization of a Simple Broadband Textile Planar Inverted-F Antenna (PIFA) for on Body Communications", ICECom, 2010 Conference preceedings, 20- 23sept 2010.https://www.studymode.com/essays/Design-Of-An-Antenna-For-a-1683608.html

[3] T.Alvez, R.Augustine, M.Grzeskowiak, B.Poussot, D.Delcroix, S.Protat, J.- M.Laheurte, P.Queffelec, "BAN antenna design using ferrite polymer composite", Antennas and Propagation, 2009. EuCAP 2009. 3rd Euro- pean Conference on, 23-27 March 2009.

[4] R. Wagnsness, "Electromagnetic Fields", 2nd ed., John Wiley Sons, Inc. 1986.https://archive.org/details/wangsness-electromagnetic-fields-2nd

[5] C.A.Balanis, "Antenna Theory", 3rd ed. New Jersey USA, John Wiley Sons 2005. C.A.Balanis, "Antenna Theory", 3rd ed. New Jersey USA, John Wiley Sons 2005.

[6] Chandan G, Ayush Jain, Harsh Jain, Mohana - Real Time Object Detection and Tracking Using Deep Learning and OpenCV, Proceedings of the Inter- national Conference on Inventive Research in Computing Applications, 2018.http://www.antenna-theory.com/antennas/patches/antenna.php

[7] Grove LoRa E5 https://wiki.seeedstudio.com/Grove LoRa E5/.