iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** V **Month of publication:** May 2024

DOI: https://doi.org/10.22214/ijraset.2024.62080

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue V May 2024- Available at www.ijraset.com

Bus Pass Validation System Using RFID

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Abstract: ***This project aims to revolutionize the validation of Student Bus Passes by introducing a card reader system integrated with a centralized database for instant verification. The automation of this process eliminates the inefficiencies associated with manual ticket checking, enhancing overall operationalefficiency. This system provides real-time notifications for valid passes, empowering bus staff to intervene swiftly. With a vision totransform public transportation, the mission is to deploy cutting- edge technology for seamless and reliable commuting experience.***
Index Terms: Card Reader, RFid, Real-Time, Validation

I. INTRODUCTION

In the kingdom of shared drive, the effectiveness of train ticket validation systems plays a critical job in ensuring a flowery and efficient journey experience. However, the contemporary methodology, mostly dependent on manual transit net checking, is full of obstacles that hinder its power. The laborious features of this action don't just consume valuable time but additionally introduce a more perfect chance of mistakes, leading to inefficiencies in the wide procedure. Acknowledging these restrictions, there's a critical necessity for a respectfully transformative answer that takes advantage of technological upgrades to smooth the validation process, enhance preciseness, and provide a more user-comfortable experience for both explorers and bus personnel. To address these pushing subjects, the suggestion is to establish a cutting-edge card reader system fixed on buses. This system will overturn the authorization of Pupil Bus Passes by conveniently incorporating a central database. By this integration, the system can momentarily check the genuineness of passes, exceedingly decreasing the time demanded for authentication. Moreover, the planned answer aspires to empower bus personnel with expressive clues, permitting them to instantly perceive the state of a passenger's bus pass. Besides, the system will be designed to formulate real-time news for invalid passes, permitting quick intervention and solving.

A. Objectives

1) Developing card reader system automating validation of Student Bus Passes without need for manual ticket checking, time-consuming.
2) Implementing advanced technological solution enhancing bus pass validation efficiency, decreases delays, improving transportation operations overall!
3) Integrating system with centralized database for instant notifications on invalid passes, swift intervention by bus staff, ensuring validation process integrity.

II. LITERATURE SURVEY

1) Bus Pass Multi Authority Approval System Using Logistic Regression. The main audience of this paper is individuals who struggle to get a pass manually right now. By utilizing an E-platform in this venture, they could get it. User must register their information. After their information is viewed, the Administrator can approve the bus pass. Consequently, the bus pass will be created. Users can view information by logging in with their unique IDs and get a bus pass. The bus pass can be renewed if it expires. Payment can be made with the assistance of UPI. The implementation of AI for developing an E-transport pass framework is a revolutionary approach that uses cutting-edge innovation to enhance the effectiveness and efficiency of the transport pass framework. The traditional transport pass framework has several disadvantages such as potential for fraud, errors in manual data entry, and lack of real-time data analysis. The E-transport pass system employs AI algorithms for validating tickets automatically, improving data entry accuracy, and identifying and halting fraudulent activities.
2) Designing Validation on a School Bus Passing Detection System Retrograde outsider Solid-Status LiDAR. The recent increases in school bus passing occurrences resulting in harm to and demises of offspring has triggered nationwide concerns; thus, the evolution of an encompassing resolution to minimize the possibilities of such misfortunes is vital. Neglecting active stopping indications and crossing limbs on scholarly buses that are overseeing and discharging children at halts is a grave road infringement, but it is complicated to incriminate drivers who are culpable of these offenses due to the dearth of surveillance

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and monitoring mechanisms that can provide significant transgression intelligence to legal enforcement agencies. This inquiry aims to tackle the obstacle of illicit transferring of school buses prevailing in miniscule municipalities and metropolises where the deficiency of ample superintendence abides. An identification setup encompassing a solid-status LiDAR unit and a dashboard camera, both of which are mastered by a Raspberry Pi computing system, was contrived. The chief task of the system is to clutch an illustration of the permit panel of the violating carriage and render that data accessible to legal enforcement agencies, enabling those agencies to undertake adequate enforcement measures, which consequently will serve as a discouragement to palliate forthcoming mishaps. Several state statutory entities have passed bonded bills and have prompted scientists to identify resolutions to tackle the obstacle. This identification system reaches two pivotal ends: diluting overall expenses of system installation and decimating video inspection time. It is a possible element for a comprehensive resolution to the scholarly bus transferring dilemma.

3) Smart School Bus pass: To Ensure the Safety of Chil dren. Bus trackings synchronously allows the youths to engage more in their routine tasks than waiting for a bus running back of its schedule while having aid of the notification and also ensuring safety of every student. Nowadays, addressing to need of the hour, many educational institutions began pressing more towards the efficient tracking system of their vehicles ensuring safety of their pupils. The bus's successful tracking is reached by acquiring the geographical cords with the aid of GPS module and passed the data to a remote server using a Wi-Fi module. The data uploaded will then be made available to the client whomever it may concern, through a mobile app that fetches the information and plots the whereabouts of the vehicle. The alert system triggers the micro-controller to create a push notification from the server script after scanning the RFID tag of the student by the RFID reader indicating that the student boarded the bus to the respective authorities and the parent. The bus's effective trailing enables the school authorities, parents, and also the drivers to plan their routines precisely at the same time ensuring the safety of the children, right from boarding to leaving the bus. The appliance conjointly permits the management to be informed about the emergencies or complaints.

4) Tracking and Security Features Enhancement in a Clever School Bus Using IoT. The population transportation systems are often not considered by the parents as a mode of transportation, due to the dangers and lack of safety precautions they hold. An Internet of Things (IoT) founded applications and gadgets implemented in these School buses, correct the concerns amongst the parents to have a trustable infrastructure. The system gives a resolution to meet safety requirements by consistent student tracking using RFID and GPS technologies to stating boarding and deboarding time of the student passing through 2 checkpoints, real-time bus position, and speed tracking to abide by the rules. Moreover, a dual authentication to confirm that no unauthorized person can access the bus system, and surveillance IP camera for indoor monitoring. Detectors like Door detectors and Proximity sensors connected to Arduino Uno are used to mark the onboard and post-deboarding protection to depict a child's existence in the reddish zones, respectively. This can eliminate or bring down the happening of any unwanted instances. A mobile application displaying all the required information is made accessible for the easiness of parents. Overall, the proposed system can uplift the safety of school children while traveling, providing parents with a stress-free and worrisome environment.

III. METHODOLOGY

The methodology employed for the development and evalu-ation the Bus Pass Validation system consisted of several key steps, outlined below:

1) *Initialization:* The system starts by including necessary libraries and defining constants. It initializes components such as the LCD screen, WiFi connection, and HTTPS communi- cation.
2) *Main Loop:* The main loop continuously checks for objects using an infrared (IR) sensor. When an object is detected, it proceeds to check for an RFID card using the MFRC522 RFID module. If an RFID card is detected, the system reads data from specific blocks on the card. It constructs a JSON payload with the read data, including student ID, and sends it to a Google Sheets data via HTTPS POST request. After sending the POST request, it sends a GET request to the Google Sheets database to retrieve additional data, such as the student's balance.
3) *ReadDataFromBlock() Function:* This function is respon-sible for reading data from a specified block of the RFID card. It authenticates the card using a predefined key and reads the data from the block. If the authentication and reading processes are successful, it returns the read data.
4) *Error Handling:* The system includes error handling mech-anisms, such as checking for successful connections to WiFi and Google Sheets. It also handles cases where authentication or reading from the RFID card fails.
5) *Delay:* After each iteration of the main loop, there is a delay to prevent excessive processing and to allow time for data publishing.

6) *Continuous Operation:* The system continues to loop indefinitely, repeating the process of detecting objects, reading RFID cards, and sending data to Google Sheets.

Here are some of the operations involved at the Backend

A. Initialization

The database begins by opening the desired Google Sheets file using its ID. It retrieves specific sheets within the spreadsheet using getSheetByName().

B. HTTP POST Handling (doPost(e))

This function is triggered when an HTTP POST request is received by the database. It parses the JSON data sent in the request body. Based on the command specified in the JSON data, it performsdifferent actions:

- If the command is ”insert row”, it inserts a new row in the specified sheet with the provided data.
- It also handles scenarios such as sending SMS messages using Twilio and decreasing counter values in the spread-sheet.
- It responds with a success message or an error if the request body is empty or in an incorrect format.

C. HTTP GET Handling (doGet(e)

This function handlesHTTP GET requests, specifically for retrieving data. If thecommand parameter is ”get data”, it retrieves the value fromcell K2 in Sheet1 and responds with it. This feature could beused by the Arduino project to fetch data from the spreadsheet.

D. Twilio Integration (sendTwilioSMS(phoneNumber, message))

This function sends an SMS message using theTwilio API. It requires the Twilio account SID, auth token, and Twilio phone number.

E. Helper Function

Decreases the counter value for a given primary value inSheet2.

- decreaseCounterValue(primaryValue): Decreases the counter value for a given primary value inthe specified sheet.
- getSheetData(): A helper function to get data fromSheet1.
- ReadSheetData

In this expanded content, a SheetHandler class is introduced to handle operations related to Sheet1 and Sheet2. The decrease_counter_value method is defined to decrease the counter value for a given primary value in Sheet2. The get_sheet_data method serves as a helper function to retrieve data from Sheet1, while the read_sheet_data method reads data from Sheet2. These functions collectively provide a structured approach to manage and manipulate data from the specified sheets, enhancing the functionality of the program.

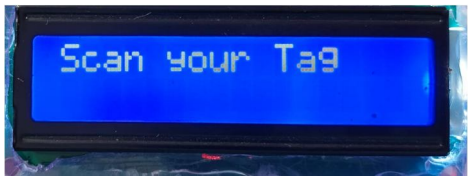


Fig. 1. Initial Display

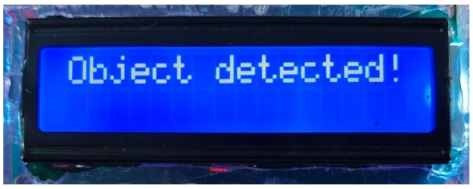


Fig. 2. Error when encounter with objects other then RFid card

IV. CONCLUSION

The system demonstrates a practical IoT solution for bus pass validation, showcasing its potential in data acquisition and management. With modular architecture, secure commu- nication, and cloud integration, it offers reliability in handling bus pass data. This technology holds promise in optimizing bus pass systems, ensuring efficient validation and tracking in in- terconnected environments.Moreover, the system implements error handling mechanisms to address network connectivity issues and authentication failures, ensuring robustness and reliability in data transmission. Additionally, it incorporates functionality to send SMS notifications using Twilio API, enhancing user engagement and communication. The integra- tion of Arduino, RFID technology, and Google Sheet.

A. Figures and Table

Table I System Testing

Test Case Id	*DESCRIPTION*	*ACTION*
1	System when come accross with other then RFid card	Object detected Error
2	When tapped with RFid card(Bus pass)	Processing
3	When card is valid	Displays Student ID
4	If there no balance in card	Insufficient Balance , Recharge
5	when card is valid and recharged	Validation Successful



Fig. 3. validating



Fig. 4. Displaying student details



Fig. 5. When there is no recharge in card

V. ACKNOWLEDGMENT

To express sincere gratitude to all those who contributed to the completion of this project. Firstly, thank the project super- visor Mr.Usman K for the support and guidance throughout the venture. Would also like to thank the Ballari Institute of Technology and Management for providing access to resources and facilities essential for conducting research and experi- ments. The support given by mentors and college is a constant source of motivation. Finally, acknowledge the contributions of all the researchers,engineers, and scholars whose work and publications have informed and inspired the project. Their dedication to advancing the field of digitizing the bus pass validation and IoT technologies has laid the origination for the venture.

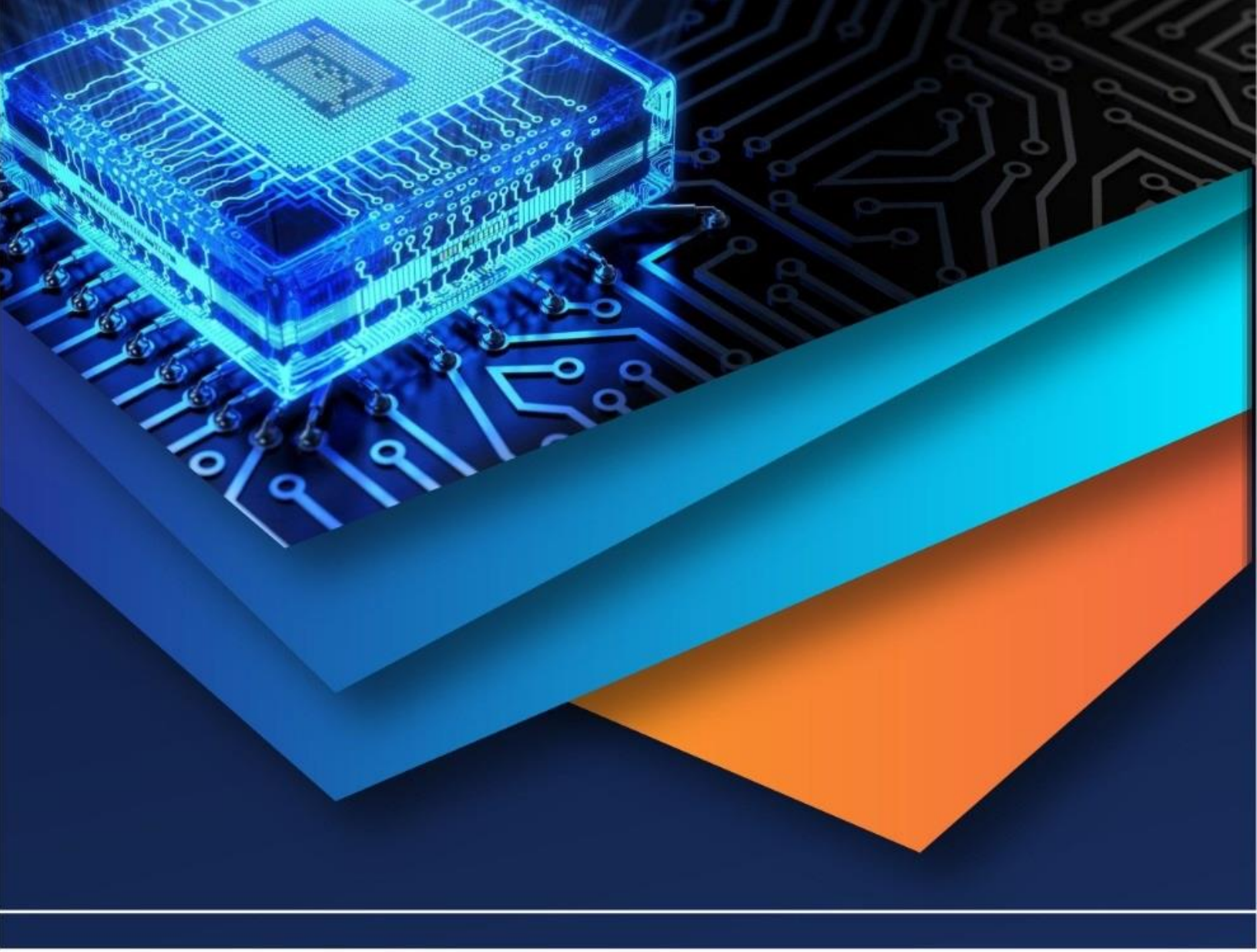
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