Designing Autonomous Intelligence System for School Bus using Smart Mining, Tracking & API's

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Abstract*: The majority of parents believe that school buses are generally dangerous for their children, and the usage of private automobiles exacerbates the already intolerable traffic gridlock. However, the usage of private automobiles may be decreased and the amount of traffic in cities, particularly during school hours, can be reduced with the introduction of safe and convenient school buses. The suggested clever and safe tracking system for school buses allows parents to keep track of all of the vehicles. This system's Android application may be used to deliver alerts to students as they enter and depart the building using barcode scanners, confirming the student's entrance using dual authentication. The goal of the study is to show that a secure tracking system might be used to create a safe and intelligent school bus. The outcome of this study project is anticipated to increase the trust and dependability of parents in school buses and decrease the usage of private transportation. The pupil will be kept secure, which will reduce anxiety for the parents, and the city's traffic system will run smoothly*

Keywords: GPS, QR Scan, Smartphone App, Google Maps API, School Bus

I. INTRODUCTION

In this, we are going elaborate prolusion of the proposed system. This chapter includes an overview of the system, provocation, and ideal of the system. In the terrain of quotidian affairs, one of the common problemsis business jams where the particular motorcars carrying scholars during academe hourdirectly.com- pounds the negative impacts on business jam. This happens because parents having private transport don't want to take the trouble of using public trans-harborage or traditional academe machines for academe-going children. While parents who don't enjoy private transport and use the public bones to carry their children to academe, soften stay around the academe for the total of academe- hour duration.

These parents constantly have to take number of different routes in route to academe and back home. Another probable script is that the parents shoot their children to academe alone but they stay strained as they don't have any regular status updates of their loving ones. There can also be issues analogous as the scholars may not go to academe or just simply passing time outside the institution, while their parents having no way to descry the whereabouts of these scholars. Metro cosmopolises see worsening of the business situation, particularly in academe hours.

All the sides agree that a sustainable result furnishing proper safety in academe buses would be salutary to parents as well as to the scholars themselves. It will also reduce business jam in academe- hours. These parents constantly travel a variety of routes to go to and from academe. Another likely situation is where parents drop off their youths at academe by themselves, but they remain anxious since they don't admit regular status updates from their loved ones.

There may also be problems with the pupils not attending class or simply spending time down from the institution without being suitable to be set up by their parents. The business issue in metro centers is getting worse, especially during academe hours. All parties concur that a long- term result icing respectable safety on academe buses would be profitable to both parents and the pupils themselves. It will also lessen business in academe hours.

Implementing an autonomous intelligence system for a school bus entails integrating a number of technologies, like smart mining, tracking, and APIs, to provide a system that can operate automatically without requiring human involvement.

The system's main objectives are to increase transportation efficiency as well as guarantee student safety while they are on the bus. Smart mining is the process of analysing data to draw out relevant information that may be used to decision-making. To optimise the bus route and timetable in the setting of a school bus system, data on student pick-up and drop-off times, traffic patterns, and weather conditions may be analysed. Another crucial component of an autonomous school bus system is tracking technology. This may include of GPS tracking to keep an eye on the bus's.

II. LITRETAURE SURVEY

Smart Tracking System for School Buses

Authors: Khaled Shaaban, Abdelmoula. Bekkali, Elyes Ben Hamid and Abdullah Kadri Year & Publications : 2017 Journal of Traffic and Logistics Engineering

Millions of children require school bus for pick up and drop to the school on an everyday basis. A safe transport for these children is one of the main concerns that need to be taken care of by the school management. Hence, the need for reliable management system of school bus in today's world has increased to a greater extent. We propose a Smart tracking system for School buses, which is an android based application designed and implemented to provide remote tracking and SMS mode of alert mechanism. The application is user friendly, interactive and secure, which uses Google APIs to fetch the current location and GPS to track the school bus in real time. In order to show the feasibility and effectiveness of the system, this paper presents the methods and workflow of different modules used in the application.

Bus Tracking System using GPS on Smartphones

Authors : K.Irene Monica, S.Gurupriya and S.Arokia Magdaline Year & Publications : 2019 International Journal of Engineering Research Technology (IJERT)

The GPS (Global Positioning System) bus tracking system combines the use of automatic vehicle location in individual vehicle with software that collects these fleet data for a comprehensive picture vehicle locations. Bus information can be viewed on electronic maps via the internet or specialized software. Modern bus tracking systems commonly use GPS technology for locating the bus. These systems are particularly using in large cities. This tracking system are commonly used by operators for functions such as tracking, routing, on board information, dispatching and security. These are helpful in daily progresses, such as: traffic congestion, unexpected delays, irregular vehicle dispatching time, other incidents. It provides more convenience with publics and give real time bus.

Application Based Bus Tracking System.

Authors : Vinaykumar. N, Sai Kumar Kodumunja, Akshitha Ramavarapu, and Sushma Ch. Year & Publications :2022 International Journal for Research in Applied Science Engineering Technology (IJRASET).

Buses are available to transport people to a variety of locations, although few passengers are aware of their existence. Complete information, such as the verity of buses those travel those the required end of location, bus numbers, bus time to, bus route data, and the time instant it will take for the vehicle to arrive at its end location, will assist passengers with various routes, track the present location of the bus, and provide the correct time for the bus to arrive at its end location. The proposed system is designed to address the concerns listed above. The system is an web app that offers critical bus data for all of Hyderabad. Because the Android Operating System provides a lot of features, it was picked for this type

of gadget. It has only lately been released. It has grown to enormous proportions, with about every second person owning a piece of it. Since its launch, an ever-increasing number of Android apps have been created on a massive scale. A vehicle tracking system can be used to track a vehicles location and movement at any time ´ and from any location. A fastest Google locations and GPS module based car tracks object are used in this project.

These are some examples of similar ideas that have been attempted to be implemented in engineering and technology literature. To create a smartphone application that allows bus riders to track their buss location? Users would be able ´ to look for a specific bus by inputting its number, and the programme would reveal the buss current location. Essentially, this programme provides a brief overview of bus locations, routes, and expected travel time with an online attendance feature, and it is entirely based on Google Maps and its API.

QR Scan Based Intelligent System for School Bus Tracking.

Authors : Anumkar Gadekar, Aditi Kandoi, Garima Kaushik, Surekha Dholay. Year & Publications : 2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT)

Ensuring safety and security is a major concern and top priority. There have been a lot of reports of mishaps with children during travel. Child safety is always the main concern for parents as well as the school authorities, especially when they are away from their child. They are always eager to ensure that all necessary precautions are being taken. The literature review comprises of numerous papers of child safety, conductor safety, live location and path tracking of buses. The common features across the previous work include location tracking and transmission, unique identification of each child and notifications about the activity to parents. Architecture Model and Flow Description: The core of this research is to implement an intelligent system for tracking school buses. • Attendance using QR Code. • Alerts • Route Optimization • Website for school authorities

III. METHODOLOGY
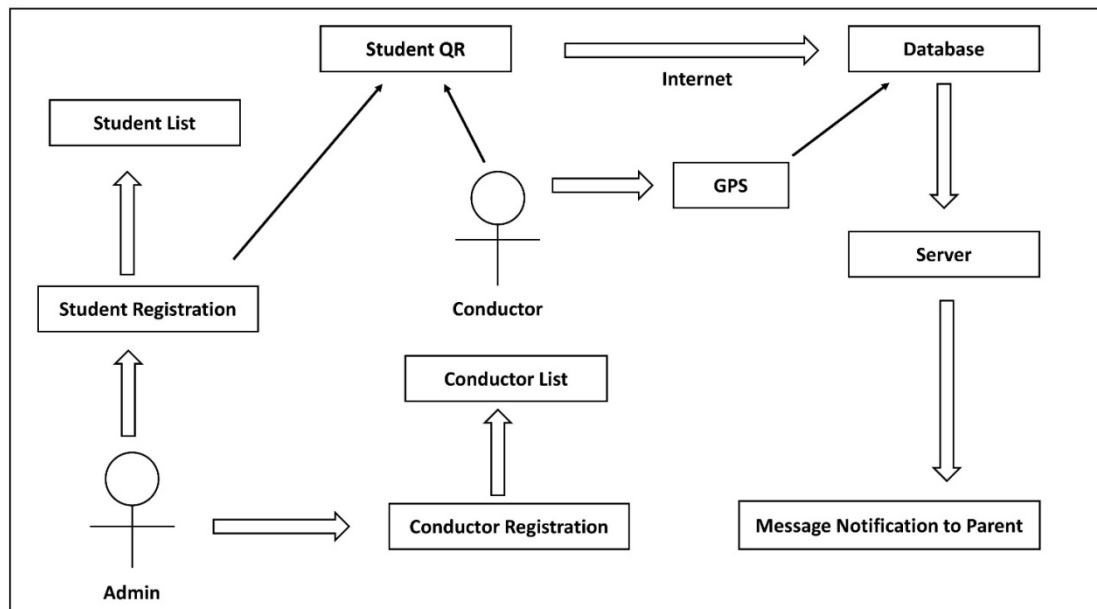
Step 1: Student Registration: Administrators have full access to this system. The pupils' registration will include interaction. The database's admin can add and change student data. The Android application itself will update with the new data. The administrator can add and update the conductor information in the database .

Step 2: Conductor Registration. The conductor can continue using their smartphone or the bus' GPS.

Step 3: Scan QR Code: The bus conductor scans the QR code on the back of the student ID card. Then, automatically calculate the student attendance, and then notify their parents through SMS.

Step 4: The bus conductor scans their QR code to produce the notice, which is the fourth step. notifications of drop-off and pickup for parents.

Step 5: Location: The user's location is discovered. A URL containing the location is provided through SMS. The link points to Google Map. Simple location detection is possible.

IV. PROPOSED WORK

In the system architecture, the application is often run by the school administration under the Admin Domain. The person who has administrative privileges must first log in using a unique username and password. The admin has the opportunity to change and add information about the students, buses, and conductors. Additionally, options for user authentication and permission are given in this module. The status bar displays recent activities in addition to them. The student ID card in this system has a QR Code scanning and verification mechanism connected to it for

authentication purposes. The matched result is shown on a display system inside the bus. The bus also has GPS installed for on-the-go navigation.

1) Step 1: The initial step will include scanning the student's QR code for the initial level of verification.

2) Step 2: The attempt will be deemed invalid if the barcodes don't match.

3) Step 3: The verification is complete.

4) Step 4: In the event of a successful match, information is transmitted to the database and parents are alerted of the student's arrival.

5) Step 5: The student's code is verified once again when they approach their destination spot.

6) Step 6: After notifying the parents, the kid will not be permitted to exit the bus before arriving at the school or to do so late.

- Login/Register: This system has been carefully safeguarded and is designed to protect your privacy. This system establishes separate accounts for each user and stores their information in the database (My SQL). This information includes personal information about students and conductors such as their names, their addresses, their phone numbers, and their email addresses. Only the end user has access to this private data. No one else has access to this information. The user's specific account allows them to view their prior data.
- Registration: The administrator grants complete authority in this section. Administrators have the ability to develop and register student and conductor data. After the admin registration procedure is finished, QR codes are generated.
- QR Scan: Scan the QR code that was produced for each student and placed on the back of their ID card.
- Conductor login: An administrator can share the conductor's username and password when creating data. When students board the bus, the conductor has a QR code scanning option. The parents then receive the message. Pick up and send the message on a cell phone or Whatsapp at that moment.
- Notice Generation: When a motorist scans their QR code, a notice is generated and sent. notifications of kid drop-off and pick-up are sent to the parents.
- Location: The user's location is tracked. A URL containing the location is provided through Whatsapp.

AES Algorithm

Using AES encryption in a bus tracking system can help protect sensitive data, such as the location information of buses and passenger details. Here's an overview of how AES can be applied to a bus tracking system:

Data to Encrypt: Determine which data in the bus tracking system requires encryption. This may include the GPS coordinates, route information, bus ID, or any other sensitive data.

Key Generation: Generate a strong AES encryption key. You can use a secure random number generator to create a key of the appropriate length (e.g., 128, 192, or 256 bits). Make sure to securely store and manage the key, adhering to best practices for key management.

Encryption: Encrypt the sensitive data using AES with the generated key. Follow the steps outlined in the previous response to encrypt the data. You may choose an appropriate mode (e.g., CBC, GCM) and padding scheme (e.g., PKCS5Padding) based on your specific requirements.

Decryption: On the receiving end (e.g., the server or authorized clients), decrypt the encrypted data using the same AES key. Ensure that only authorized entities possess the key to decrypt the data.

Secure Transmission: Ensure secure transmission of the encrypted data between the bus tracking device (e.g., GPS tracker) and the server. You can use secure communication protocols such as HTTPS or implement additional layers of encryption, such as TLS, to protect data in transit.

Access Control: Implement proper access controls and authentication mechanisms to restrict access to the decrypted data. This ensures that only authorized personnel or systems can access and utilize the sensitive information.
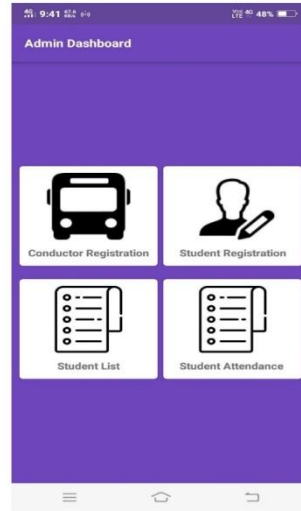
Key Rotation and Management: Consider periodic key rotation to enhance security. This involves generating new AES keys and securely updating the keys on all relevant devices and systems. Implement proper key management practices, including secure storage, secure transmission of keys, and key revocation procedures when necessary.

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A bus tracking system should also incorporate other security measures such as access controls, user authentication, secure storage, and secure communication protocols to ensure the overall security and privacy of the system.
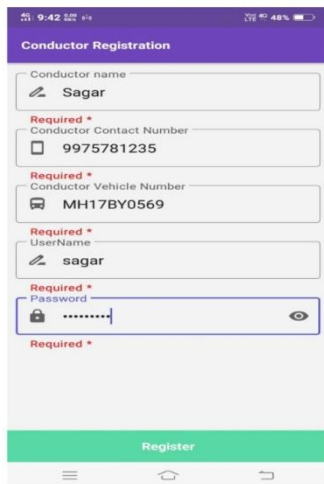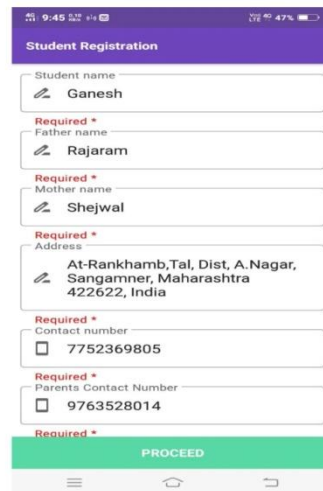
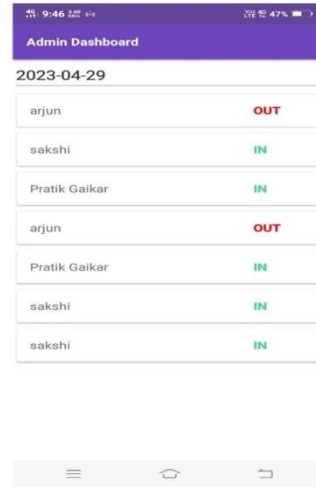## V. EXPERIMENTAL RESULT

Admin Credentials

Admin Dashboard

Conductor Registration

Student Registration

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Student List

Student Attendance
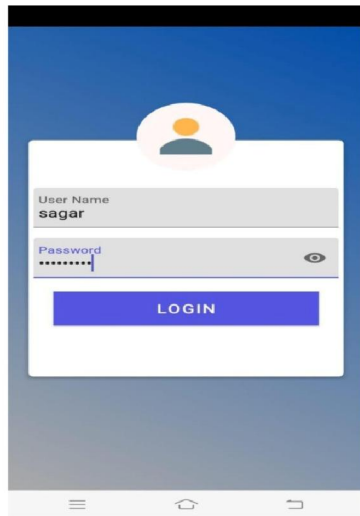
Conductor Credentials
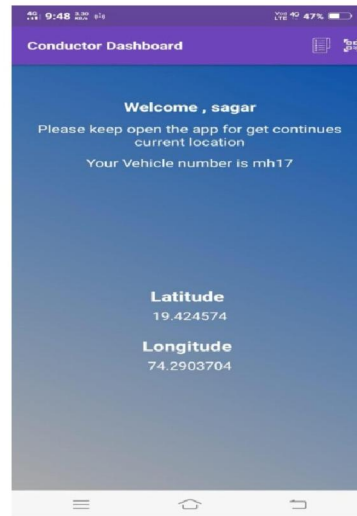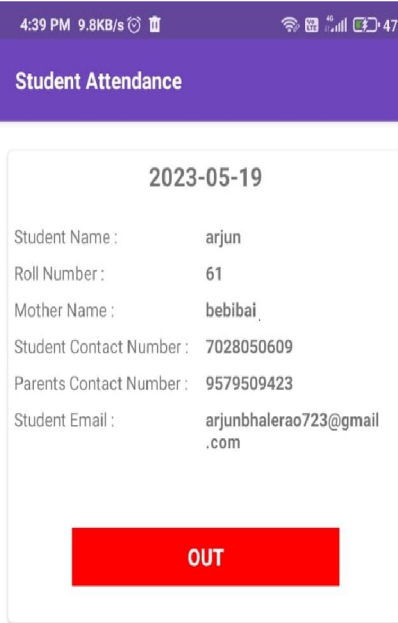
Conductor Dashboard
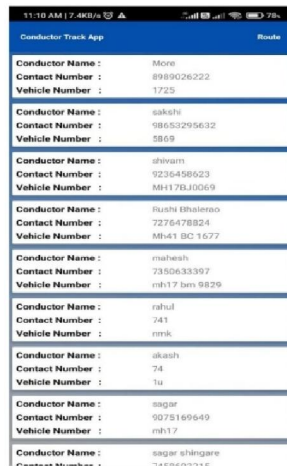
Pick-up (Option IN)

Drop-out (option OUT)
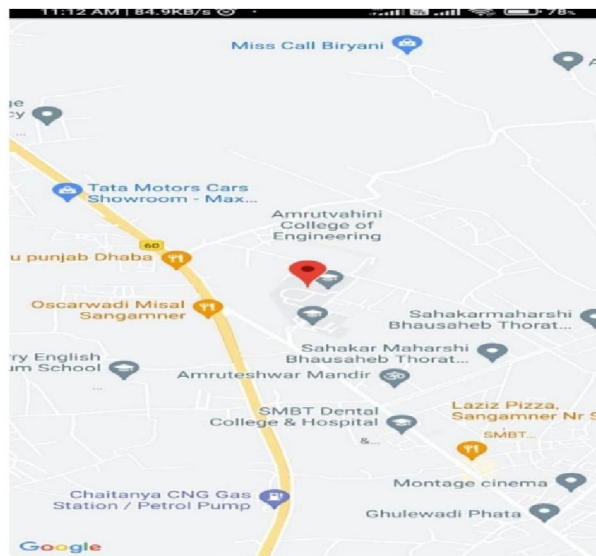

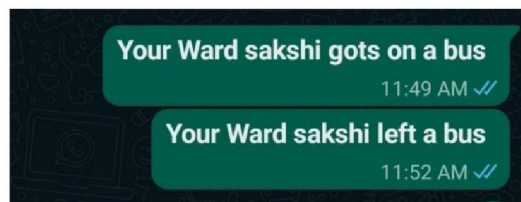**Conductor List**

Conductor Route

Student QR Code

QR Scan

Conductor's Live Location

Whatsapp Notification to Parents

VI. CONCLUSION

A safe school bus system has been suggested for the city in this research. This device will guarantee safety, lessen parental stress and worry, and unquestionably enhance driving conditions. Additionally, it will offer a simple pick-up

mechanism via sending alerts. Guardians will get notifications via an Android app that allows them to view the bus's current location on a map, making it simple for them to follow the bus's progress and be alerted when it is necessary. As a result, users will be able to rely on a system that is extremely trustworthy, secure, and intelligent.

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