

Smart Vehicle Tracking System using RFID with IoT

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Abstract— Nowadays, vehicle tracking and location identification are necessary for safety. With vehicle tracking, it is also important to record the arrival and departure timings of vehicles. This recorded data will be helpful in different aspects like identifying the stolen vehicle, to observing the transportation system functionality in an organization or any other place. Implementing a smart vehicle monitoring system that combines tracking and data collection is the main goal of the current paper. Additionally, a mobile warning is delivered to the driver's phone when the car arrives late. We can also access this data through mobile applications from anywhere. RFID technology is applied to this system's implementation. Radio Frequency Identification is what RFID stands for. It is a wireless technology which consists of a Tag and Reader as major components. To store the data on the website IoT technology is used. Such systems are simple to construct at a minimal cost when IoT (Internet of Things) and RFID technologies are combined.

Index Terms— Radio frequency identification (RFID), the Internet of Things (IoT), Automatic identification, and data capture.

I. INTRODUCTION

Human requirements and population expansion have grown in recent years, and as a result, so has the use of vehicles. Each organization contains vehicles for transporting people and goods. It is necessary to reach the workplace on time, it is possible by using vehicles. In present days not only educational institutions but also offices/organizations offer transportation facilities for their staff. So that the employees can travel at times of high traffic they can arrive on time and work without stress. So, we hire people to document these error-prone vehicles' entry and exit times. [1] The safety of the students is an important task for the management as well as parents in this scenario bus tracking systems are developed through the Internet of Things which helps the parents as well as authorities to track the movement of children while they are traveling in institutional buses or any other private vehicles in real-time.

A vehicle tracking system's purpose is to observe vehicles' arrival and departure timings. So, managing vehicles is a technology and the number of people who choose it will continue to grow.

This problem can be solved by using RFID technology. Automatic identification and collection of data are the main features of this technology. Because of these features can ensure accurate and timely data entry. [2] RFID technology is used not only for tracking, we can also use this technology for mapping, localization, positioning, tracking, navigation, and mapping. systems and to store the data which is captured by the RFID we used IoT Technology. IoT stands for Internet of Things, and it describes objects or gadgets with wireless connectivity, such as sensors, smartphones, and electronic gadgets. With the help of big data technologies, IoT makes it possible for

people to connect and manage these devices. Efficiency, economical, and less involvement of humans are the benefits of IoT technology.

Traditional manual methods are used to record the entry and exit timings of the transportation system. In this method errors may occur due to many reasons like the security guard may come late for his duty, or may he note the timings incorrectly. Also, it isn't easy to store the recorded data safely for a long time. In the proposed system novel features are added to the existing system to make it more user-friendly.

The contribution of this system "smart tracking system using RFID with IoT" is to record the entry and exit timings of the vehicles and also store this data in the cloud/website. Using this system not only the data is recorded but also a notification is sent to the driver in case of the vehicle's arrival and departure are late at a particular location.

II. RELATED WORK

Lou et al. [3] presented a method based on the Doppler Effect that uses GPS to monitor a vehicle's speed. Haversine theorem is employed to determine the speed of the vehicle in real-time. Dr. Thida et al, [4] The implementation of a parking lot security system in this study involves scanning an RFID tag to regulate the movement of a vehicle as it enters or exits a specific area. Md. Kishwar et al, [5] In this study, access control using RFID technology is used to allow or prohibit vehicles from entering certain regions or structures. Whenever the scanned data is matched with stored data then only allow inside otherwise entry is denied. Aravindhnan et al, [5] in this paper validation of attendance at particular sessions or places is done by using RFID technology. This data is more précised because of the use of RFID technology.[7] Chisowa et al, in this paper car parking system, is managed by RFID technology in the way scanning is done by RFID reader in entry and exit times. According to parking time, they can be charged.[8] Vamshi et al, in this paper we can get information on vehicle pick-up and drop-off times with easy access to vehicle locations via Live Location. Vijay Kumar et al, [9] In this paper passenger system for tracking is developed by using a GPS and GSM. passengers are tracked through ticket numbers and locations are displayed in Google Maps. Meet J Shah et al, [10] The suggested technology provides the passengers with the current location of the vehicle. This information saves the passengers time instead of waiting for the vehicle. Nafar et al, [11] in this an active vehicle tracking system based on RFID is implemented. By using this system within the 80 m range can identify 8 mobile vehicles. [13] Nishtha Agarwal et al., in this paper through RFID technology passengers' tickets are generated for a particular destination. The amount is deducted from the RFID card.[14] K.C.T Swamy et al, in this paper the employee ID, cab position, and cab ID are coordinated with the company through GSM. To track the geographic coordinates of the vehicle GPS module is used. [15] Motakabber et al, a vehicle tracking system is developed to prevent certain emergencies like theft, and accident cases through GSM and GPS.

III. PROPOSED METHODOLOGY

The novel features incorporated in the proposed system are the driver alert system and the arrival and departure timings of the vehicle.

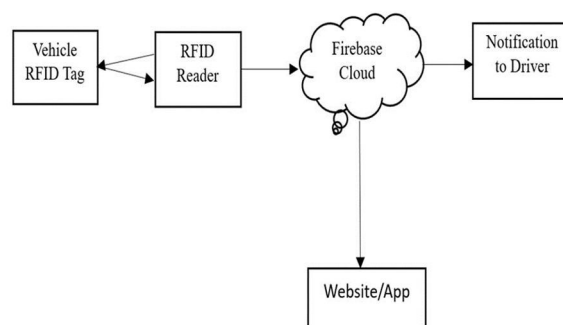


Figure 1. Block diagram of RFID reader used for tracking vehicle

UHF RFID reader is interfaced with an embedded system. RFID tag is identified by the reader and analyzed with existing data stored in the embedded device. This data is compared with the vehicle data to identify the vehicle. This identified vehicle is updated into the cloud using Wi-Fi. The developed Android mobile application is linked with the cloud to get alerts to the driver and also the location of the driver.

IV. FLOW CHART

A. Algorithm Steps

1. Initially connect the RFID Reader with the Wi-fi module. After scanning the tag ID the RFID reader receives the information about the vehicle. Now the data is ready for uploading into the database.
2. Check whether the Wi-Fi connection is established or not.
3. Once the Wi-Fi connection is enabled, the data that is read by the RFID reader is uploaded into the cloud and compared with the existing details of the vehicle.
4. At that time entry details are checked if the vehicle arrives within the time or not.
5. If the vehicle reaches within the time the data will be uploaded to the website and also an Android mobile app. By this can easily observe and access the data at any time.
6. A notification alert will be given to the driver if the vehicle data is inconsistent with the predetermined data.
7. Once the vehicle reaches the destination the process will end otherwise the process will repeat until reaches the destination.

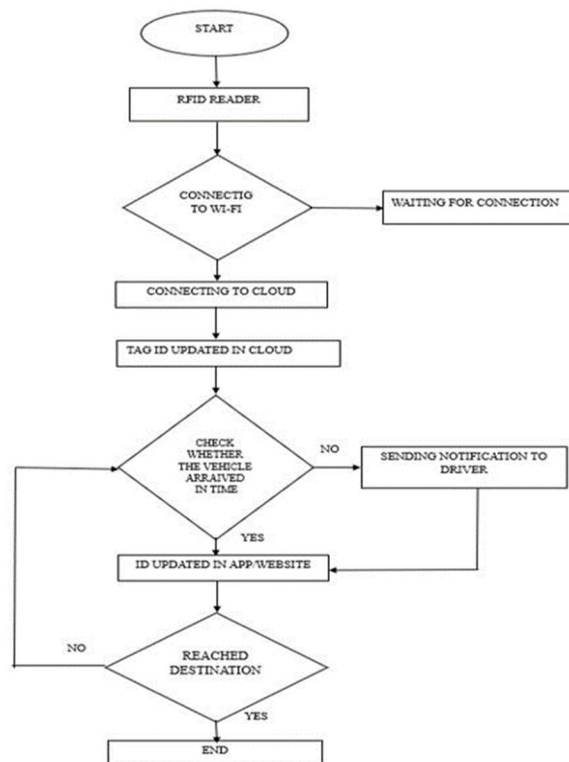


Figure 2. Flow chart of the vehicle tracking system using IoT

V. RESULTS

Firestore is a web and mobile application development platform. This server platform is used for Microsoft SQL, MySQL servers, and Android applications. These are connected to the server with PHP files.

Here we consider results in two cases

Case 1: Vehicle arrived within the time.

Case 2: Vehicle arrived out of time.

For example, we define the vehicle arrival time is at 10:30 a.m. All the vehicles should arrive within 10:10 am otherwise it will be treated as a late entry.

Case 1: Vehicle arrived within the time.

From Fig. 4, we can observe the entry times of different vehicles along with tag ID, time, vehicle number, and entry position of the vehicle.

Case 2: Vehicle arrived out of time.

From Fig. 6, we can observe the vehicle will enter the gate by 10:20 a.m. As per the prescribed data, the vehicle was entered late by 10 min. In this case, a notification will be sent to the driver's mobile.

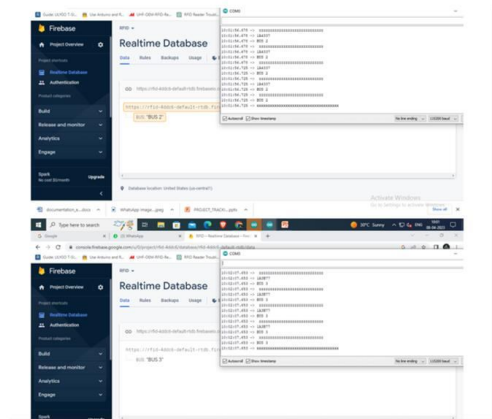


Figure 3. Data stored in a real-time database

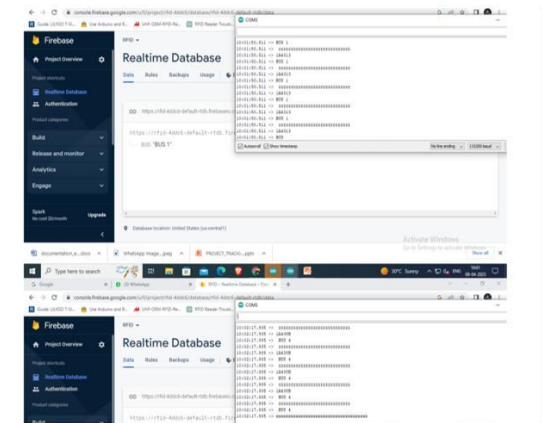


Figure 4. Data stored in a real-time database

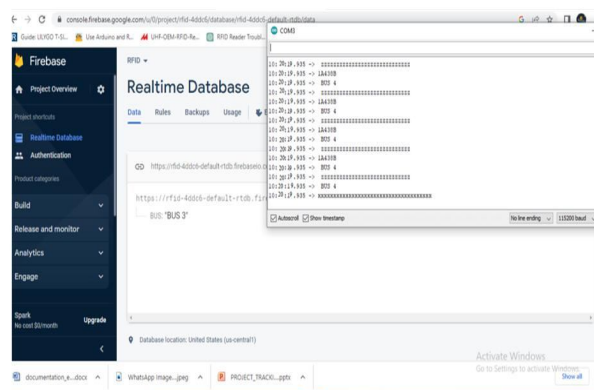


Figure 5. Data stored in real-time database when the vehicle arrives out of time

A message alerting the driver is delivered to their mobile device if there is a delay in the vehicle's arrival. The driver receives this message if he arrives at the college late. additionally, how the driver arrives on time for his job.

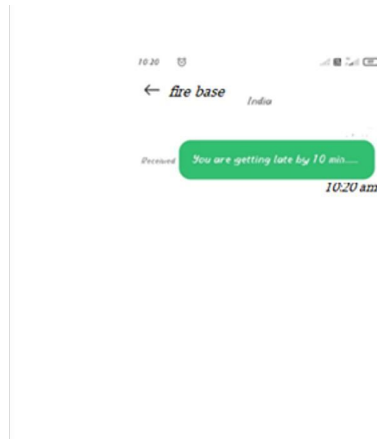


Figure 6. Notification alert to driver's mobile phone

B. Data on the website

ESTD: 2001 COUNSELLING CODE: VSVT			
SRI VASAVI ENGINEERING COLLEGE (AUTONOMOUS) Sponsored by: SRI VASAVI EDUCATIONAL SOCIETY website: www.srivasaviengg.ac.in Peddattadepalli, Taddepalligudem - 534 101, W.G.Dist, (A.P.)			
BUS NO.	STATUS	CHECKIN DATE	CHECKIN TIME
BUS 2	CHECKIN	2023-4-18	14-3-21
BUS 3	CHECKIN	2023-4-17	16-38-50
BUS 3	CHECKIN	2023-4-21	11-1-31
BUS 1	CHECKIN	2023-4-21	11-7-8
BUS 2	CHECKIN	2023-4-21	10-59-9
BUS 3	CHECKIN	2023-4-21	10-58-13

Figure 7. User interface: Website for viewing the data

On the website, the users can view the data that has been scanned using the reader. This data is displayed using the Firebase real-time database as a backend. The tag data is processed to show the number of the vehicle and time of arrival, along with the data, which is shown on the website. The status of the scanned data is also displayed as “check-in”.

C. Mobile application

In this system, a mobile Android app is also used. With this app, we can easily access the data from anywhere. The data is uploaded to the app along with the website.

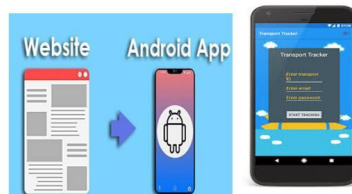


Figure 8. Mobile app for tracking system

Fig. 9 shows us how the vehicle data is uploaded into the mobile application. We can see the information on the three vehicles, including their numbers and entry and departure timings, in this reference figure. Rather than constantly checking the internet, you may simply observe the intricacies of the transit system by using this app.

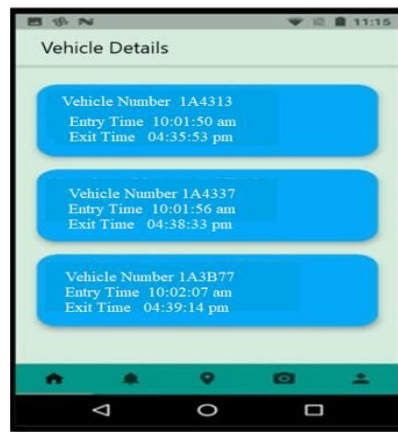


Figure 9. Vehicles entry and exit timings observed in mobile app

VI. RESULTS AND CONCLUSION

In this paper, a smart vehicle tracking system with IoT is designed to track the entry and exit timings of the vehicle at the entrance of the gate. By using this system transportation facilities can easily observe the entry and exit reports instead of men power. Also, there is no chance of incorrect reports. We can also identify the heavy traffic routes to avoid the dalliance of vehicles.

This system upgradation is possible with technology emerges which can be adapted to the desired environment. Different Capacities of the vehicles and new vehicles can be assigned with new tags. And with that authorized vehicles will get entry into the community. Further changes are easily flexible because it is an object -oriented model.

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