International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

INTELLIGENT METRO SYSTEM BASED ON RFID

[1]O.Manikanta, [2] Mr.K.Saiman, [3]B.Mounish, [4]S.Sasi Balaji Reddy, [5]P.Nagendra Babu

[2]Asst.Prof, ECE Dept, RISE Krishna Sai Prakasam Group of Institution, Ongole-523001, AP

[1,3,4,5]B.Tech final year students, ECE Dept, RISE Krishna Sai Prakasam Group of Institution, Ongole-523001, AP

([1]onterumanikanta@gmail.com;[2] saimankambampati@gmail.com;

[3] mounishburlagadda@gmail.com; [4] surinabalaji@gmail.com;

[5] nagendrababu134185@gmail.com)

ABSTRACT

An Arduino microcontroller is used in the RFID-based metro door opening system with person count project to automate the opening of metro doors in response to passenger identification using RFID tags. An RFID scanner placed at the metro entry point scans the RFID card or tag that each traveler is carrying. Only authorised passengers are permitted to board or exit once the system successfully identifies them and initiates the door opening mechanism. In order to ensure efficient door performance and avoid crowding, the system also includes a person counting component that keeps track of the number of people entering or leaving the metro. This initiative improves metro station crowd control, convenience, and passenger security. The metro is one of the most widely used forms of transportation in Egypt, especially in Cairo, where it transports up to 3.6 million passengers daily. Here is the idea behind our project, which aims to provide a clever solution to the problem of ticket counter lines. In order to speed up citizen movement and save time, this solution involves developing a web and mobile application that simplifies the metro ticket purchasing process for users, reducing traffic at the ticket office and providing an admin dashboard for monitoring and control.

Keywords: Metro, RFID Tag and Reader, Database system, Embedded system, Smart Ticketing

1.INTRODUCTION:

By streamlining the process of controlling passenger flow in metro stations, the RFID-based metro door opening system with Arduino and person count seeks to improve efficiency and security. The implementation of automated technologies that not only guarantee seamless entry and exit but also efficiently handle crowd control is crucial given the expanding population and rising number of metro riders. In order to control the number of people within the train cars, this solution incorporates two essential features: real-time tracking of the number of passengers arriving or leaving the station and automated metro door opening based on RFID verification.RFID technology, which stands for Radio Frequency Identification, tracks and identifies items or people via RFID tags using radio waves. Passengers using this system receive RFID cards or keychains with special identification numbers on them. The RFID scanner reads the RFID tag as a traveler gets close to the metro

door, confirms the traveler's identification, and opens the door. In comparison to conventional ticketing systems, this contactless authentication method not only saves time but also minimises physical touch, making it more hygienic especially in the places with heavy traffic, like in the metro stations.

The system's built-in person count feature counts the number of passengers who enter via the doors. This is accomplished through the use of sensors that detect when someone enters or exits, such as infrared or ultrasonic sensors placed close to the doors. In order to accommodate all passengers, the Arduino microcontroller processes this data, keeps track of the number in real time, and makes sure the door stays open for a predetermined amount of time. This function aids in keeping an eye on passenger flow, guaranteeing that no train is overloaded and that the system runs within its intended capacity.The Arduino microcontroller, the central component of the system, controls every function, including human counting, door control, and RFID authentication. Building inexpensive, adaptable automation systems is made easy with Arduino, an open-source platform renowned for its simplicity and adaptability. Combining the sensors, motorised door system, and RFID reader into a single Arduino-based platform streamlines the entire design and makes adjustments and troubleshooting simple. It is simple to extend this system to larger metro stations with more doors and entry points.

2.LITERATURE SURVEY:

In their 2017[1] work, "Mechanical Parking System," Feng Yuan Wang and Yi Liu described a rotational system that enabled all of the cars to move in a round motion. All of the automobiles rotated as they were loaded and unloaded. Eight to twelve autos were better off using this approach. It had the advantages of being simple to use and making parking the car simple. Limitations included a complicated structure, high initial cost and upkeep, and the requirement that all vehicles be rotated in order to reach one car. In 2017, a study named "Smart Parking Occupancy Monitoring and Visualisation system for smart cities" was released by Robin Grodi, Danda B. Rawat, and Fernando RiosGutierrez [2]. Fernando Rios-Gutierrez, Danda B. Rawat, and Robin Grodi had planned out how the car would fit in the designated spot. When a car or other object entered the designated slot, RFID sensors detected it. The system needed a mechanism to alert drivers when a car was identified or when a parking space was occupied. The lack of a GPS sensor to search parking spaces from a distance and the fact that the parking spot could only be found by neighbouring locations were the drawbacks. In 2017, a study named "Smart Parking System for Commercial Stretch in Cities" was released by Dharmini Kanteti, D V S Srikar, and T K Ramesh [3]. A Smart Parking System was created by them. According to its model, preregistered IP cameras would take down the vehicle's registration number before continuing uninterrupted. Their information would be logged, including their estimated parking time and the location of their visit. Pre-registered users will receive notification after the money was taken out of their e-wallet. For new users, a comparable pricing structure would be used, but offline payment would be required. The system could handle all parking requests, however it was unable to handle any vehicles after 80 because the parking lot was full.In 2018, a study titled "Smart parking sensors, technologies, and applications for open parking lots" was presented by Vijay

Paidi, Hasan Fleyeh, Johan Håkansson, and Roger G. Nyberg [4]. Smart parking sensors, technology, and applications for open parking lots were proposed by the paper's authors. This study suggested a combination of multi-agent systems, convolutional neural networks, and machine vision that is appropriate for open parking lots due to its low cost and resilience to a range of environmental factors. It becomes challenging to assist the driver in selecting a parking lot when there is no way to make a reservation in an open lot.

3.EXISTING SYSTEM:

At the moment, tickets or tokens are used to travel in metro train stations. The customer must purchase a ticket for the trip, stand in queue and keep the ticket with them until they arrive at their destination. The authorities will punish them if they fail to get the ticket in the middle. Utilising a token system, each member is assigned a unique ID through the use of an RFID tag [7]. The customer must scan his token in order to board the train; the system will then read the RFID tag ,verify it,and let him in.The token is good till he reaches his destination; he cannot prolong his journey or get off the train in the midst. The consumer must scan the token with the system after arriving at the destination; if the trip is legitimate, the gates will open; if not, they won't, and the passenger will be fined if he misplaced his ticket.

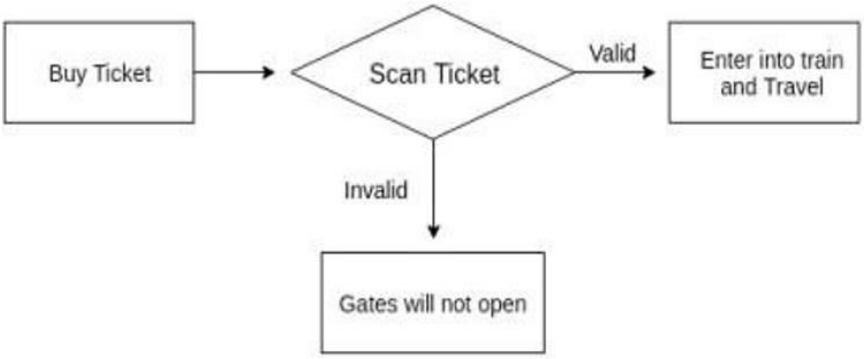

Fig 3.1: current ticketing system

India, South America, North America, Spain, Asia, and Egypt are among the countries with underground systems**.**

• One of the oldest rapid transit networks in Africa and the Middle East is the Cairo metro, also known as Metro Anfaq al-Qahirah. The National Authority for Tunnels runs it, and it's a relatively inexpensive and effective way to get around Cairo.There are now three running lines inCairo's metro system.

• Spain's capital, Madrid, is served by the Madrid Metro (Spanish: Metro de Madrid), a fast transit system. With a total length of 293 km (182 mi), the system ranks as the 14th longest rapid transit system globally. However, plans for development were significantly hindered by the European debt crisis, which resulted in the cancellation and postponement of numerous projects.

• To serve the nation's capital and surrounding cities in the National Capital Region (such as Gurgaon and Noida), the Delhi Metro Rail Corporation built an urban Mass Rapid Transit

System (MRTS) with 10 lines and 253 stops (DMRC).

4.PROPOSED SYSTEM:

The person seated at the metro station counter manually prints and seals a large number of tickets each day that display that date. Passengers typically discard their used paper tickets here and there when their trip is over, which eventually pollutes the environment. Due to the existing system's reliance on paper ticketing and the wasteful usage of used tickets, many trees are once more being killed. However, the RFID-tagged card that the passengers use in our suggested solution handles everything automatically, thus reducing the aforementioned complications. The following are some advantages of RFID-based ticketing systems over traditional ones(including paper-based and magnetic tickets): Operators like transport authorities can save time and money on staff by using automatic ticket systems, which also make it possible to organise fare collecting considerably more effectively. Additional benefits of these systems include their cheap maintenance costs and decreased losses due to fraud. Radio Frequency Identification (RFID) technology would be used in a planned RFID-based smart metro system to automate ticketing and fare collection, as well as maybe other features like train location and monitoring. Fares would be automatically deducted based on the distance travelled, and passengers would enter and depart stations using RFID-enabled smart cards or tags. This technology seeks to improve productivity, decrease human error, and streamline the metro experience.

4.1 BLOCK DIAGRAM :

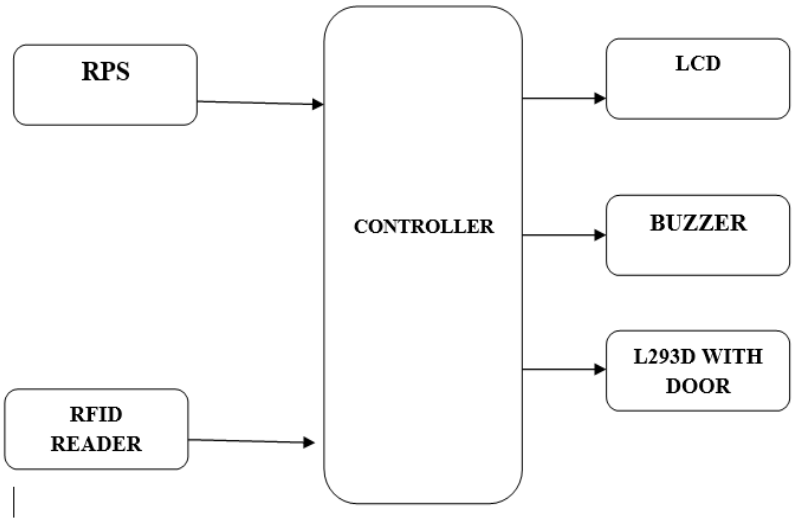

Fig 3.1 Block diagram

The suggested solution eliminates the need for passengers to wait at the ticket desk in order to obtain their tickets. The passengers save time as a result. We can lower the number of accidents and fraudulent actions with this system. Every traveller will have a prepaid card

with a unique RFID-based identifying number. The Visa card can be used to recharge the card. An RFID reader circuit is built at the platform gate's entrance and exit. It is expected that the passenger will show the tag in front of the reader circuit at the platform gate when they enter. Likewise, upon departing at the designated station, the traveler must present the tag in front of the reader circuit at the exit point.

5.HARDWARE DESCRIPTION:

5.1 ARDUINO UNO :

In order to create digital devices and interactive objects that can sense and control both physically and digitally, Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits. Anyone can build Arduino boards and distribute its software thanks to its products' GNU Lesser General Public License (LGPL) or GNU General Public License (GPL) licenses. Commercial preassembled Arduino boards and do-it-yourself (DIY) kits are both available**.**

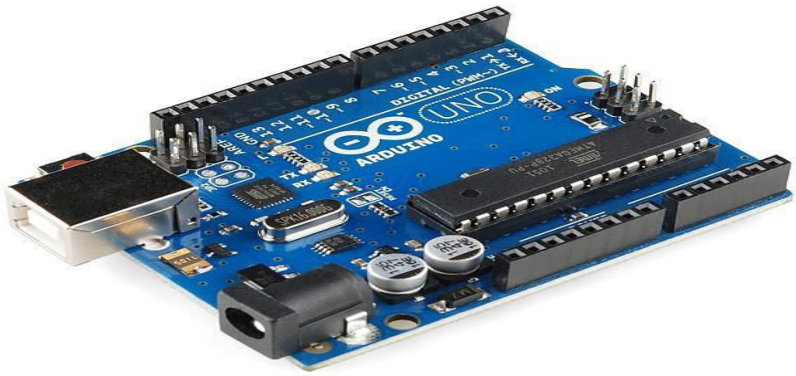

Fig 5.1:ARDUINO UNO BOARD

5.2 RFID READER MODULE : The distinctive digital information on the tag is decoded using an RFID reader. The RFID reader transmits an electromagnetic wave, which acts as the input for the tag. The peculiar arrangement of metallic pins is activated by these electromagnetic waves. An RFID reader module plays a crucial role in an RFID-based smart metro system by enabling automatic fare collection and seamless passenger authentication. It works by emitting a radio frequency signal that powers up nearby RFID tags embedded in smart cards or tokens. When a passenger taps their RFID card near the reader at the metro entry or exit gate, the module reads the unique identification number stored in the card. This data is then transmitted to a central processing system, which verifies the passenger's credentials, deducts the appropriate fare from their account, and grants access. The process is contactless, quick, and efficient, reducing congestion and improving overall commuter experience. Additionally, RFID readers can store transaction logs and help in monitoring travel patterns, enhancing both security and service optimization in the metro network.

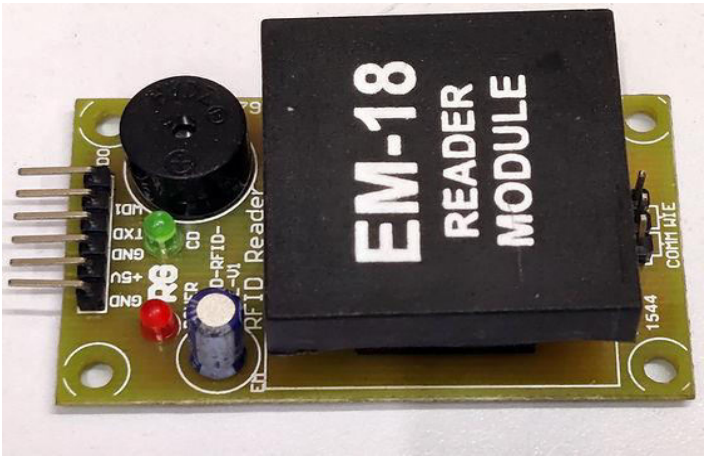

Fig 5.2 RFID READER MODULE

6.RESULTS:

Only authorised individuals with valid RFID cards will be able to access the parking lot, according to the circuit diagram above, which depicts the design of an RFID-based smart auto parking system utilising an Arduino Uno. The LCD display shows information about the slots' availability when the circuit is turned on. The Arduino will permit the automobile to park in the secured area if the card number matches the number that is stored in the database. Information on slot occupancy is shown on the LCD screen with the use of infrared sensors inserted into each slot. The LCD screen also shows a greeting along with the cardholder's name. The LCD screen shows information about the available slots, such as the free slot number, as the automobile pulls in. To stop numerous admissions using the same card, there would be an exit gate and another RFID reader when the vehicle left the parking lot. Additionally, this stops cars from entering from the departure side. The number of available slots is updated as the vehicle exits the parking lot, and the LCD display reflects this. Examining the current public transport ticketing system reveals that it is extremely time- and money-consuming. In order to create an online and mobile application for metro train management, this paper suggests a ticketing system. The operation would be fully automated, efficient, modernised, and reasonably priced if it were successful. The proposed method can be used to toll gates, bus tickets, and other places. Considering the usefulness of the RFID system described in this study, as well as the feasibility and efficiency of implementation

7.CONCLUSION:

At summary, the efficiency, security, and control of passenger flow at metro stations are greatly improved by the RFID-based metro door opening system with person count. The solution guarantees quicker and contactless admission by automating the door operation using RFID authentication, enhancing the entire traveller experience.In addition to showcasing how Arduino and RFID technology may simplify metro operations, this project offers a scalable and affordable way to update public transit systems while enhancing convenience, security, and operational effectiveness. The introduction of automated vehicles

(AVs) is anticipated to have a major impact on smart parking systems in the future. Robotic parking valets, specialised AV parking lots, and self-parking cars are already being tested in a number of places worldwide. People would be able to travel without cash thanks to the automated parking fee system. Additionally, it would improve the parking system's efficiency and decrease long lines, waiting times, stress, and tension. It is possible to use the smart parking management system for fleet, ship, and aircraft management. The gadget can be integrated with home automation systems for residential and domestic parking systems, which can use the sensors to determine if a person is entering or leaving the parking space to control different home appliances. This project aids with the removal of unauthorised passengers from metro trains. RFID cards can withstand any damage caused by the elements. This concept also supports the soon-to-be-adopted trend towards cashless transactions. Before boarding a train, there is no need to wait in queue to purchase tickets. There are no designated stations; travellers are free to get off wherever they like, and the fare will be deducted accordingly. By speeding up the ticket reservation procedure, the strategy saves time. An RFID system creates a system that can do mass identification, capture precise location data, and facilitate faster and simpler contactless payments.

8.REFERENCES:

[1] S. Andhale, N. Dighe, A. Kore, D. Gaikwad and J. Koti, "RFID based Smart Ticketing System," 2020 5th International Conference on Communication and Electronics Systems

[2] M. Foisal Mahedi Hasan, G. Tangim, M. KafiulIslam, M. Rezwanul Haque Khandokar and A. Ul Alam, "RFID-based ticketing for public transport system: Perspective megacity Dhaka," 2010 3rd International Conference on Computer Science and Information Technology, Chengdu, China.

[3] Tom Igoe, “Getting started with RFID”, Maker Media, Inc., March 2012.

Stephen B. Miles, Sanjay E. Sarma, John R. Williams, “RFID Technology and Applications”, Cambridge University Press; Reissue edition, April 14, 2011

[4] S. A. Weis, “Rfid (radio frequency identification): Principles and applications,” System, vol. 2, no. 3, 2007.

[5] M. L. McKelvin Jr, M. L. Williams, and N. M. Berry, “Integrated radio frequency identification and wireless sensor network architecture for automated inventory management and tracking applications,” in Proceedings of the 2005 Conference on Diversity in Computing. ACM, 2005, pp. 44–47.

[6] A. Rahmati, L. Zhong, M. Hiltunen, and R. Jana, “Reliability techniques for rfid-based object tracking applications,” in Dependable Systems and Networks, 2007. DSN’07. 37th Annual IEEE/IFIP International Conference on. IEEE, 2007, pp. 113–118.

[7] J. Landt, “The history of rfid,” IEEE potentials, vol. 24, no. 4, pp. 8–11, 2005.

[8] “Automaticidentificationanddatacollection(aidc).”[Online].Availab le: http://www.mhi.org/fundamentals/automatic-identification

[9] A. V. Pugliese III, “Baggage check-in and security system and method,” Mar. 28 2000, uS Patent 6,044,353

[10] J. Svec, “Methods and apparatus for luggage tracking and identification using rfid technology,” Dec. 20 2013, uS Patent App. 14/137,429.

[11] L. M. Ni, D. Zhang, and M. R. Souryal, "Rfid-based localization and tracking technologies," IEEE Wireless Communications, vol. 18, no. 2, 2011.
[12] A. R. D. Balakrishna, "Rfid based airport luggage checking and tracking system using gsm technology," IJSETR, vol. 03, no. 31, Oct. 31 2014