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Dual Security Check Turnstile using ANPR Technology

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A B S T R A C T

A dual security check turnstile integrates ANPR technology with a camera to capture license plates, providing enhanced security through access control, monitoring, and data collection. By cross-referencing license plate information with an authorized vehicle database, entry can be allowed or denied. This approach offers increased security, reduced human error, and improved efficiency. ANPR technology in turnstiles is gaining popularity in the transportation, parking, and security sectors due to its accuracy and cost-effectiveness. Fraud detection can be enhanced by generating OTPs for flagged or unrecognized license plates, adding an extra layer of security. OTPs can be sent via SMS, email, or a mobile app. This integration strengthens security, preventing unauthorized access by fraudulent vehicles.

1. Introduction

The need for increased security in public spaces has led to the development of various security systems, including turnstiles. However, traditional turnstiles have limited security features and are prone to errors, compromising their effectiveness. In recent years, the integration of Automatic Number Plate Recognition (ANPR) technology with turnstiles has emerged as a promising solution to enhance security in transportation, parking, and security sectors. This paper provides a comprehensive review of the dual security check turnstile using ANPR technology, focusing on its architecture, working principle, benefits, and applications. The study also explores the challenges and limitations of this technology and offers recommendations for future research. The findings indicate that the dual security check turnstile using ANPR technology is a reliable, efficient, and cost-effective security solution that significantly enhances security in public spaces. By cross- referencing captured license plate information with a database of authorized vehicles, the system can quickly identify and prevent unauthorized vehicle access. Additionally, the integration of ANPR technology with turnstiles enables the generation of one-time passwords (OTP) for enhanced security in cases of fraud detection. ANPR technology can also detect fraudulent vehicles by comparing license plate information with a database of blacklisted or unauthorized vehicles, further strengthening security measures. Overall, the implementation of ANPR technology in turnstiles offers a reliable and efficient means of ensuring the safety of people and property in public spaces.

2. Literature Review

2.1 ANPR Based Automated Toll Collection System.

S. M. Motakabber, S. M. Farhad, and S. M. Alamgir Hossain, published in the International Journal of Advanced Computer Science and Applications. This paper proposes an ANPR-based automated toll collection system that uses ANPR technology to identify vehicles and automatically collect tolls. The paper discusses the architecture, working principle, and benefits of the system, including improved accuracy, efficiency, and security. The study concludes that ANPR-based toll collection systems are a reliable and efficient means of improving traffic flow and reducing toll collection errors.

2.2 ANPR-based Intelligent Transportation System: A Comprehensive Review

R. K. Singh, M. L. Dewangan, and D. D. Vishwakarma, published in the Journal of Advanced Transportation. This paper provides a comprehensive review of ANPR- based intelligent transportation systems (ITS). The study discusses the architecture, working principle, and applications of ANPR technology in ITS, including traffic monitoring, toll collection, and security. The paper also highlights the challenges and limitations of ANPR technology in ITS and provides recommendations for future research.

2.3 Automatic License Plate Recognition System Using Deep Learning Techniques: A Comprehensive Survey

M. F. Alhamid, M. A. Hossain, and M. A. Khan, published in the Journal of Imaging. This paper provides a comprehensive survey of Automatic License Plate Recognition (ALPR) systems using deep learning techniques. The study discusses the different stages involved in the ALPR pipeline, including image acquisition, preprocessing, plate detection, character segmentation, and recognition. The paper provides an overview of various deep learning techniques used for ALPR, such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and deep belief networks (DBNs).

2.4 Design of a Smart Parking System Based on ANPR and IoT

W. J. Wu, H. W. Wang, and C. Y. Lee, published in the International Journal of Distributed Sensor Networks. This paper proposes a smart parking system that uses ANPR and IoT technology to improve the efficiency and convenience of parking. The study discusses the architecture, working principle, and benefits of the system, including reduced traffic congestion and improved parking management. The paper concludes that ANPR and IoTbased parking systems are promising solutions for addressing the challenges of urban parking.

2.5 A Review of RFID Technology and Its Managerial Applications in Different Industries

S. M. Zahidul Islam, M. N. Uddin, and M. M. Rahman, published in the Journal of Information Technology Management. This paper provides a comprehensive review of RFID technology and its managerial applications in different industries. The study discusses the architecture, working principle, and benefits of RFID technology in industries such as healthcare, logistics, and retail. The paper also highlights the challenges and limitations of RFID technology and provides recommendations for future research.

2.6 Integrating IoT with ANPR for Smart Traffic Management System: A Review

S. Ali and M. I. Khan, published in the Journal of Sensors. This paper provides a review of the integration of IoT and ANPR technology for smart traffic management systems. The study discusses the architecture, working principle, and benefits of the system, including improved traffic flow, reduced congestion, and enhanced security. The paper concludes that the integration of IoT and ANPR technology has the potential to revolutionize the field of smart transportation.

2.7 Design and Implementation of a Smart Door Security System Using Facial Recognition and IoT

S. A. M. Abdulkader, M. H. Zaman, and M. A. Hoque, published in the International Journal of Scientific and Engineering Research. This paper presents the design and implementation of a smart door security system that uses facial recognition and IoT technology. The study discusses the architecture, working principle, and benefits of the system, including improved security, convenience, and accessibility. The paper concludes that facial recognition and IoT-based security systems are promising solutions for enhancing security in residential and commercial buildings.

2.8 A Survey on Security Issues and Challenges in Internet of Things (IoT)

N. A. Alrajeh, M. M. Alqahtani, and A. H. Alrajeh, published in the Journal of King Saud University - Computer and Information Sciences. This paper provides a comprehensive survey of security issues and challenges in IoT. The study discusses the different types of security threats, vulnerabilities, and attacks that IoT devices are susceptible to, as well as the existing security solutions and frameworks for addressing these issues. The paper concludes that there is a need for more research and development in the area of IoT security.

2.9 A Comprehensive Study on Fraud Detection Techniques

M. N. Uddin, M. M. Rahman, and S. M. Zahidul Islam, published in the Journal of Information Technology Management. This paper provides a comprehensive study of fraud detection techniques. The study discusses the different types of fraud, the techniques for detecting and preventing fraud, and the existing fraud detection systems and frameworks. The paper concludes that there is a need for more research and development in the area of fraud detection, especially in the context of emerging technologies such as AI and blockchain.

3. Methodology

To implement dual surveillance at the entrances to ensure security and focus on specific scenarios. It comprises permitting the entry of the vehicle with the owner itself and the generation of OTP for the vehicle with a guest appearance. Manual check seems more complicated as it requires an individual's deep observation and also kills a lot of time. When the comparison of the detected number plate and the database strikes right, entry of the vehicle is permissible. . It provides indications for Guest Entries which would help in categorizing the approaching vehicles. Our prototype detects a vehicle number plate using C programming code implemented into Arduino Uno. Using RF ID which is attached to the Arduino controller indicates the presence of a new incoming car. RFID (Radio Frequency Identification) cards are a type of smart card that uses radio waves to transmit and receive data wirelessly. They contain a small microchip and an antenna, which allows them to communicate with RFID readers or scanners. Only the registered car number plate is permitted, if not registered an OTP is sent to the owner. To prototype, deploy and manage the gate system automatically by the implementation of software on hardware to reduce the complexity and human interference. A GSM (Global System for Mobile Communications) module is a hardware component that enables devices to communicate over a cellular network using GSM technology. It integrates a GSM modem and other necessary components onto a single chip, making it easier to incorporate cellular connectivity into various electronic devices. It aims in tracking the count of vehicles moving in and out. It prioritizes the entry and exit of authorized vehicles alone. It detects a vehicle number plate using the inbuilt technologies. RFID attached to the Arduino controller indicates the presence of a new incoming car. When a new car is detected, the system gets ready for number plate detection. The developed system first detects the vehicle and then checks for its authorization. The resulting data is then used to compare with the records

on a database. A comparison of the detected number plate is checked for any matches with the prior set database. In case of any positive matches are found, the gates automatically open, but in case of any mismatch, it's redirected to generate OTP. Further OTP generation algorithms are implemented to control the gate system. The system is implemented on the entrance for security control of highly restricted areas, Military zones, and areas around top government offices like the Parliament, Supreme Court, etc.

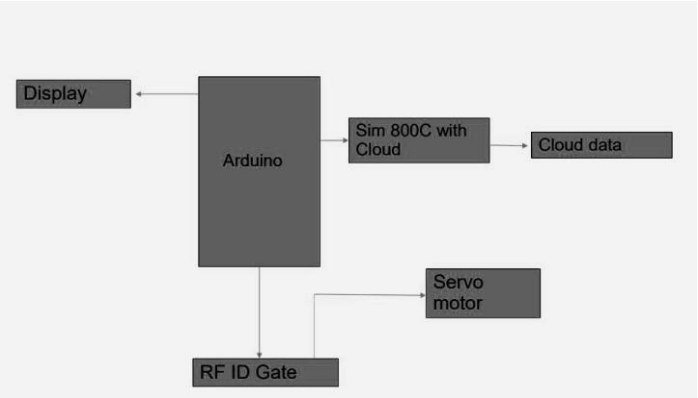

Fig 3.1 Block Diagram of the proposed system

4. Conclusion

In conclusion, implementing a dual security check turnstile using ANPR technology and additional fraud detection features can enhance security and prevent unauthorized access to restricted areas. The system uses a combination of technologies such as IR sensors, servo motors, RFID cards, and an I2C display to enable smooth and efficient functioning of the turnstile. The use of ANPR technology for vehicle identification allows for automatic identification and authentication of vehicles, while the addition of fraud detection features such as OTP generation for suspicious vehicles adds an extra layer of security. The use of Google Sheets as a database for storing and managing data also allows for easy access and analysis of information. However, it is important to note that proper implementation and regular maintenance are crucial to ensuring the system's effective functioning. Additionally, the system may not be suitable for high-security areas or areas with heavy traffic due to its limitations in handling a large number of users. Overall, the implementation of a dual security check turnstile using ANPR technology and additional fraud detection features can be an effective solution for enhancing security in restricted areas, provided that it is implemented and maintained properly.

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