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Anti-Theft Parking System using Facial Recognition and License Plate Analysis

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ABSTRACT: Modern parking systems are being transformed in the age of rapidly developing technology to provide more convenience, efficiency, and security. Without the usage of physical tokens or cards, face recognition technology will allow registered customers to access and depart parking spaces with ease. In addition, license plate analysis will offer another degree of identity and security, enabling accurate tracking of vehicles on the property. Accurate vehicle and user identification, real-time monitoring, and connection with the current security infrastructure are some of the system's key characteristics. Install the required libraries for image processing, deep learning, and data manipulation, such as OpenCV, TensorFlow, Keras, and NumPy, in your Python programming environment. Utilize facial recognition and detection techniques to recognize registered users as they approach or depart the parking lot. Tesseract OCR for identifying and detecting license plate information. Create a MySQL database to hold data about logged-in individuals, their faces, and the license plates of connected cars. Create functions that query and update the database in response to findings from license plate analysis and facial recognition.

KEYWORDS: Parking System, Face recognition, Licence plate, Anti-theft, Security.

I. INTRODUCTION

Effective parking space management is becoming essential to everyday life and urban development in our increasingly urbanized environment. Parking is crucial for environmental sustainability, traffic control, and generating income for businesses and communities, in addition to being a convenience for drivers. Utilizing technology, data, and automation, these systems maximize the utilization of existing resources, improve customer convenience, and better the general management of parking facilities. An overview of parking systems is given in this introduction, along with information on their importance, parts, and advantages for drivers and parking operators. Parking systems play an increasingly important role in building more sustainable and efficient cities as metropolitan areas continue to grow. One of the most important factors in parking systems is security. Here are the main components of a parking system's security, which include:

- Access Control: Put strong access control measures in place to prevent unauthorized entry. These can include turnstiles, barriers, gates, RFID card readers, license plate recognition systems, or mobile app-based access.
- Surveillance Cameras: Place surveillance cameras strategically throughout the parking area to keep an eye on things. High-resolution cameras help discourage criminal activity and provide important evidence in the event of an incident.
- Lighting: Sufficient lighting is essential to improve visibility and discourage illegal activity. Well-lit parking areas make a safer place for both cars and pedestrians.
- Data Security: Protect the information gathered by the parking system.
- Environmental Monitoring: To guard against possible dangers, several systems also keep an eye on environmental factors including carbon monoxide levels and fire alarms.

II. RELATED WORK

1) **Title: IoTRec: The IoT Recommender for Smart Parking System**
Author: Yasir Saleem, Pablo Sotres
Year: 2022
Link: https://ieeexplore.ieee.org/document/9161292
Objective:
The purpose of this project is to Recommend the slot for parking system with the aid of IoT
Merits:
- Its accuracy is high.
- It is efficient and time consuming is low.

Demerits:
- cost is high
- To challenging maintain the IoT

2) **Title: An Automatic System for Unconstrained Video Based Face Recognition**
Author: J. Zheng, R. Ranjan
Year: 2020
Link: https://ieeexplore.ieee.org/document/8999558
Objective:
The purpose of this project is Video-based face recognition is a hot topic in technology, useful for things like security cameras and analyzing videos. A new system we made works well, especially for spotting faces in surveillance videos, using a special detector called DPSSD, and then making sure the faces are correctly aligned.

Merits:
- Its Enhanced Security
- Its Efficient Processing.

Demerits:
- Required large database
- Spotting face accuracy is low

3) **Title: Random-Positioned License Plate Recognition Using Hybrid Broad Learning System and Convolutional Networks**
Author: C. L Philip Chen
Year: 2022
Link: https://ieeexplore.ieee.org/document/9158521
Objective:
This paper introduces a fresh method for recognizing license plates, employing a fully convolutional network tailored for detecting license plates in any position, achieving notable accuracy. It also presents a straightforward yet effective approach to segmenting characters, utilizing key character identification for slant estimation and vertical projection, enabling the distinction of similar characters like 'B' and '8', and 'O' and '0'.

Merits:
- Detection Accuracy
- Speed and Efficiency

Demerits:
- complexity
- Train Data Dependency

III. EXISTING SYSTEM

A. *Existing System:*

A sensor-based smart parking system is a cutting-edge solution for optimizing parking management and improving the parking experience for both users and operators. These systems employ a network of sensors, including ultrasonic, magnetic, infrared, and video-based sensors, to continuously monitor the occupancy of parking spaces. The data collected is then relayed to a central server or cloud-based platform for real-time analysis, enabling users to access up-to-the-minute information about available parking spaces. The scalability of these systems makes them adaptable to various parking facility sizes, offering an efficient and user-friendly solution for modern urban parking challenges.

Ultrasonic Sensors:

Ultrasonic sensors use sound waves to detect the presence of vehicles. They emit ultrasonic pulses and measure the time it takes for the pulses to bounce back. When a vehicle occupies a space, the sensor detects the reflected sound waves and registers the space as occupied.

Infrared Sensors:

Infrared sensors use infrared light to detect the presence of a vehicle. They emit an infrared beam, and when a vehicle interrupts this beam, the sensor registers the space as occupied. Infrared sensors are commonly used in automated barrier systems.

RFID Sensors:

Radio-frequency identification (RFID) sensors use RFID tags on vehicles to identify and track parking space occupancy. These sensors require RFID readers at entry and exit points.

B .Disadvantages:

*   There is no system to recognize the face for avoid vehicle theft
*   Cost is high for deploy the IOT based parking
*   Manual intervention is need to allot slot and verify the authority

IV. PROPOSED SYSTEM

A. *Proposed System:*

A smart parking system using number plate and face recognition integrates cutting-edge technologies to enhance parking management and user experience. High-definition cameras capture vehicle images for number plate recognition, while face recognition software identifies individuals. A centralized database stores vehicle details and owner information, enabling automated access control and parking allocation. Real-time occupancy monitoring optimizes parking space utilization, while touchless entry, exit, and payment facilitate a seamless user experience. Automated operations and centralized management reduce labor costs and administrative overhead. Data-driven insights from parking usage patterns inform parking rate optimization and strategic management decisions. A proposed system for face and number plate recognition in the context of smart parking would encompass a range of integrated technologies designed to enhance security, streamline access control, and provide an effortless user experience. At the core of this system, high-resolution cameras equipped with dual functionalities—facial recognition and license plate recognition (LPR)—would be strategically positioned at the entrance and exit points of the parking facility. These cameras would serve as the initial points of interaction, capturing crucial data from both drivers and vehicles. Then recognize the number plate with corresponding faces using Optical character Recognition with OTP verification.

B. *Advantages:*

*   Automated system

*   Cost is reduced because of camera based verification

*   Computational complexity can be reduced

*   Relevant features extracted in face and number plate verification
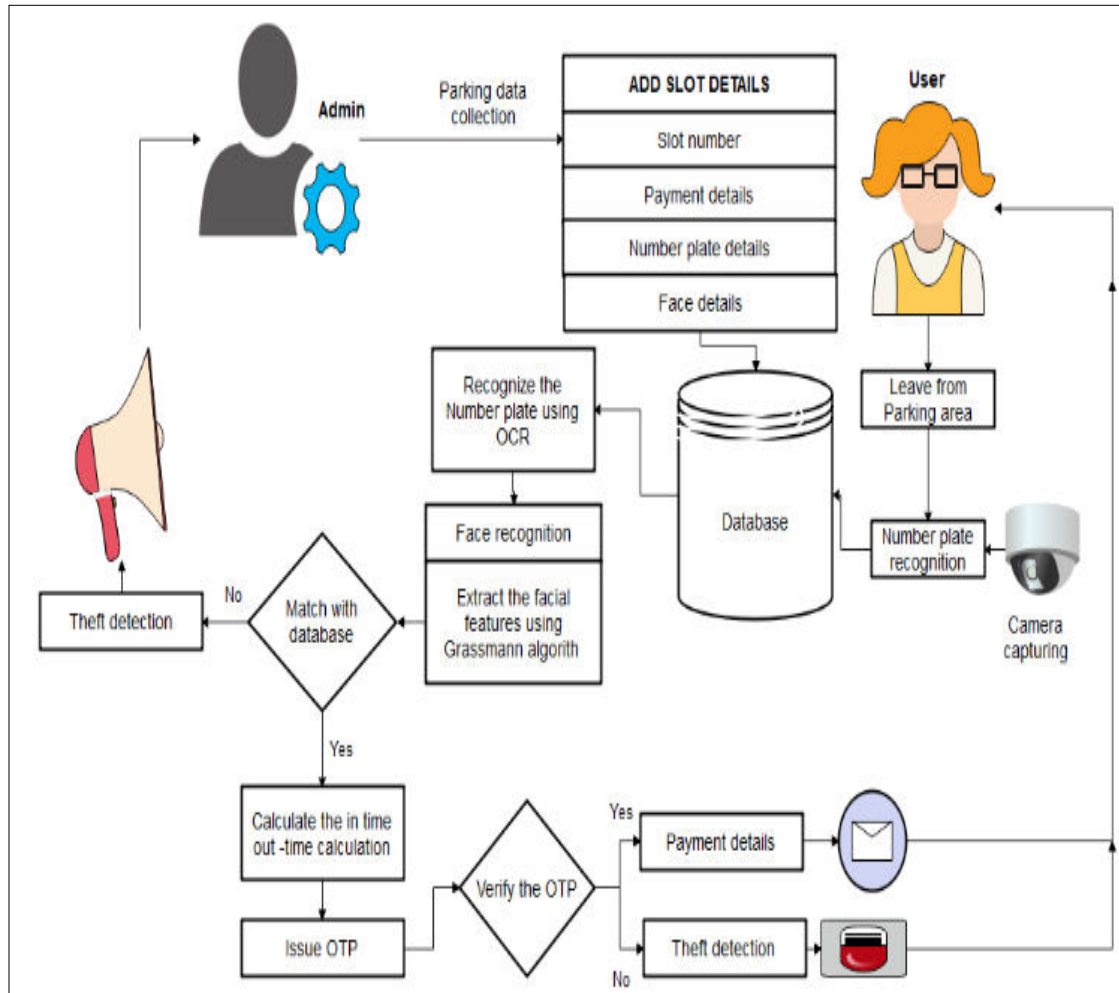
C. *System Architecture*

Fig 1: System Architecture

V. CONCLUSION AND FUTURE WORK

In conclusion, a smart parking system that integrates face and number plate recognition technologies offers a promising solution to address the growing challenges of urban parking management. By harnessing deep learning algorithms, these systems can efficiently monitor and manage parking facilities, enhancing the overall experience for both users and operators. The use of facial recognition in such systems not only simplifies access control but also adds an extra layer of security, ensuring that only authorized individuals gain entry. Simultaneously, number plate recognition technology provides a convenient means for users to enter and exit the facility without the need for physical tokens or access cards. The synergy between these technologies, when supported by robust data processing and management, can provide valuable insights into parking patterns, usage statistics, and real-time space availability. This data-driven approach not only optimizes parking space utilization but also contributes to reduced traffic congestion and environmental benefits.

Expand the payment options available to users by integrating mobile payment solutions such as mobile wallets, contactless payments, and in-app payments. This provides users with greater flexibility and convenience in paying for parking, reducing the reliance on cash or physical payment methods. In future we can extend the framework to analyse the multiple features in tokenbased parking system and embed with mobile application

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