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Parking Slot Prediction and Face Recognition Based Parked Vehicle Theft Prevention in Smart System using Deep Learning

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Abstract: *More than a million cars are on the roadways of a contemporary major city, but more parking spots are needed to accommodate them. Locating vacant parking places in mostcontemporary cities might take time, especially during busy periods like festival seasons. In the traditional parking system, drivers face considerable losses in terms of money, productivity and time which is wasted in search of parking spots in densely populated areas. Hence, it can be said that the traditional parking systems are not capable of providing a smooth parking experience to the drivers along with reducing the parking search traffic on the roads. This highlights the rationale of adopting advanced technologies to make the urban transport system modern and ease the problem faced by the drivers. This project proposes a Smart Parking System utilizing Edge Computing and Deep Learning algorithms to seamlessly link multiple parking stations into a unified network, establishing a shared parking system. To address security concerns in highly restricted areas such as residential zones, military bases, and government buildings, the system functions as a centralized automatic vehicle identifier for owner verification. Deep Learning algorithms, such as Convolutional Neural Networks used to recognize the driver/owner face of a vehicle during the departure phase, fortifying security measures and thwarting potential vehicle theft*

Keywords: CAP (Credit Assignment path)

I. INTRODUCTION

Parking is the act of stopping and disengaging a vehicle and leaving it unoccupied. Parking on one or both sides of a road is often permitted, though sometimes with restrictions. Some buildings have parking facilities for use of the buildings' users. Car parking is essential to car-based travel. Cars are typicallystationary around per cent of the time. The availability and price of car parking supports and subsidize car dependency. A parking space, parking place or parking spot is a location that is designated for parking, either paved or unpaved. It can be in a parking garage, in a parking lot or on a city street. The space may be delineated by road surface markings. Parking facilities can be divided into public parking and private parking.Public parking is managed by local government authorities and available for all members of the public to drive to and park in.Private parking is owned by a private entity. It may be available for use by the public or restricted to customers, employees or residents.Such facilities may be on-street parking, located on the street.

II. LITERATURE SURVEY

To develop a Smart Parking System utilizing face recognition technology to enhance security and optimize parking space utilization[1]. T0 develop a Smart Parking System integrated with deep To learning-based face recognition technology to improve security and optimize parking space utilization in urban environments[2]. To propose a Smart

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Parking System integrated with deep learning-based face recognition technology to enhance security and optimize parking space management in urban environments[3]. To propose a Smart Parking System integrated with deep learning-based facial recognition technology to improve security and optimize parking space utilization in urban environments. [4]. To propose a Smart Parking System integrated with facial recognition technology to improve security and optimize parking space utilization in urban environments. [5].

III. IMPLEMENTATION WORK

The implementation of the Smart Parking System involves a multifaceted approach to tackle the complex challenges associated with urban parking management. At its core, the system leverages cutting-edge technologies and intuitive interfaces to offer users a seamless experience. From the user's perspective, the system provides a straightforward registration process, enabling them to create accounts with essential details and preferred payment methods.

Upon logging in, users gain access to a range of functionalities, including the ability to search for parking spaces based on location and time preferences. The system utilizes real-time data to display available parking slots, empowering users to make informed decisions. Once a suitable space is found, users can seamlessly reserve it, specifying their desired arrival time and duration. Payment processing is integrated securely, ensuring that transactions are handled with reliability and transparency. On the administrative side, parking space providers have access to a dedicated dashboard where they can manage various aspects of their parking facilities. This includes adding, editing, or removing parking slots, as well as defining pricing structures and confirming bookings made by users. The implementation of facial recognition technology adds an extra layer of security, with the system capturing and comparing driver/user faces during entry and exit to prevent unauthorized access and vehicle theft. Behind the scenes.

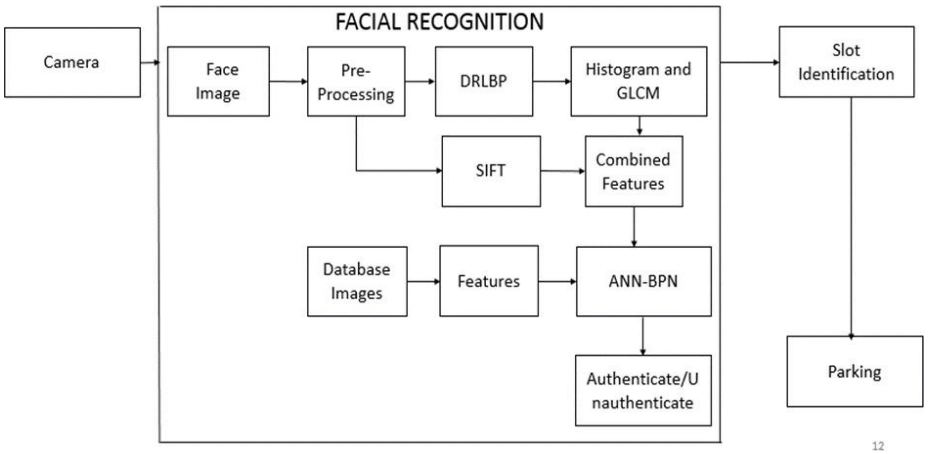

Figure 1: Architecture diagram for Smart Parking System

Web Application will store the person's identity by storing the image of his face by capturing the image through camera. The obtainable/unobtainable parking spaces are shown simply such as parking slots graphic, signs and colours on web application.

Real-time (obtainable/unobtainable) informative parking spaces is revised immediately on web application.

First, the person will book a parking slot through the web app. After that when the person will come into parking slot then facial recognition is done at the time of entry, person's face is matched with the faces stored in the database. Database consists of the images of person's face who has booked the parking slot through the web app. Then if the face is recognized then he/she is given access to the parking area otherwise the person is denied the access to the parking lot.

The camera will capture an image of the vehicle driver and compare the new captured image with the owner profile picture which exists in the data base. IF the system found a match, the gate will be opened and IF not then gate will remain closed.

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Required Technologies

- DRLBP: It is used for different object texture, edge contour and shape feature extraction process. It is strong to illumination and contrast changes as it only takes the signs of the pixel differences. The proposed characteristics retain the contrast data of image patterns.
- SIFT: this is a feature detection algorithm in computer vision to identify and describe local features in pictures.
- GLCM: The texture sifter functions give a statistical view of texture found on the image histogram. These functions can give useful data about the texture of an photo but cannot give at about shape, i.e., the spatial relationships of pixels in an photo.
- ANN: The neural network is not considered as an algorithm, but rather a framework for various machine learning algorithms to work collectively and operate complex data inputs. An ANN is based on a group of connected units or nodes called artificial neurons, which loosely construct the neurons in a biological brain.

Face Processing

The Face recognition is an optical pattern recognition issue. There, a face as a 3-Dmaterial subject to altered illuminations, expression and so on is to be explored based on its 2-D image (three-dimensional images e.g., acquired via laser may also come into use). A face recognition system usually comprises of four modules detection, alignment, feature extraction, and matching, where localization and normalization (face detection and positioning) are the major handling steps which are done before face recognition (facial feature extraction and matching) is completed. Face identification segments theface places from the background. In the case of video, the identified faces are needed to be followed using a face tracking constituent. Face positioning targets at attaining more correct confinement and at normalizing faces of the person and hence face detection provides rough estimate of the location and scale of every detected face.

Slot Identification

Identification of vacant slots in a parking area is done with the help of cameras .And the slots which are vacant or booked are shown on the web app. Then the person can book the vacant slot according to his convenience. When person arrives at the entrance of the parking then after the facial recognition he is directed towards the slot he has booked

IV. EXPERIMENTAL RESULTS

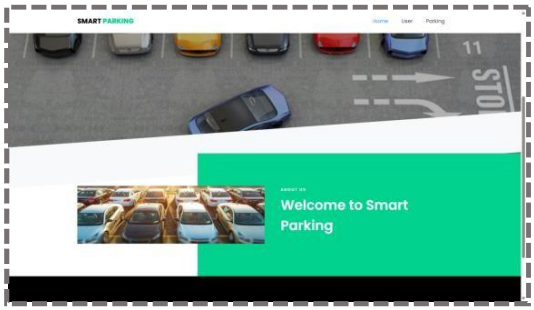

Figure 2. Home page

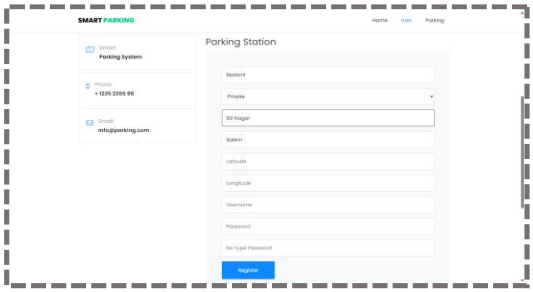

Figure 3. Station Details

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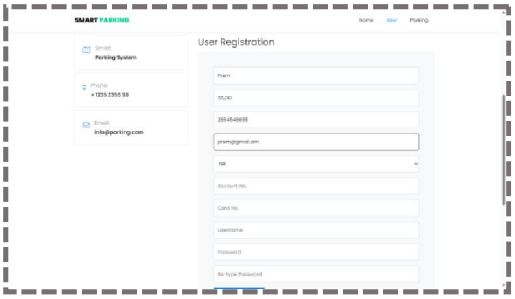

Figure 4. User Registration

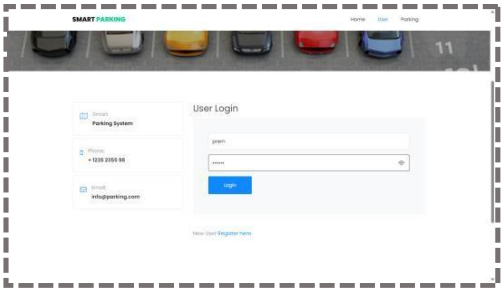

Figure 5. User Login

Figure 6. Station Details

Figure 7. Slot Details

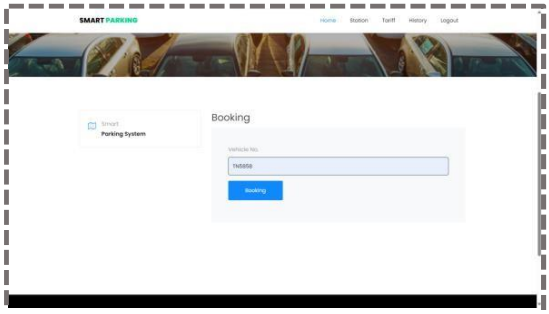

Figure 8.Booking Details

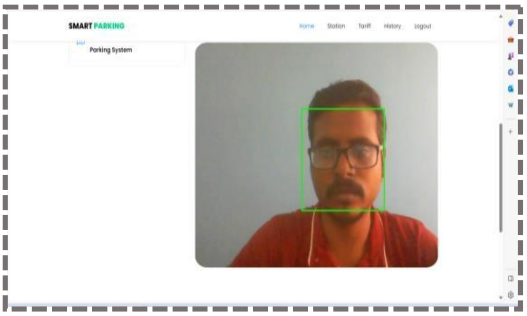

Figure 9. Face Detection

Figure 10. Face Detection

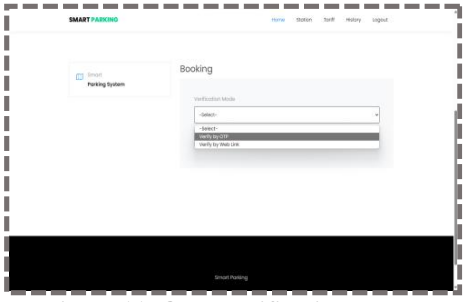

Figure 11: OTP Verification

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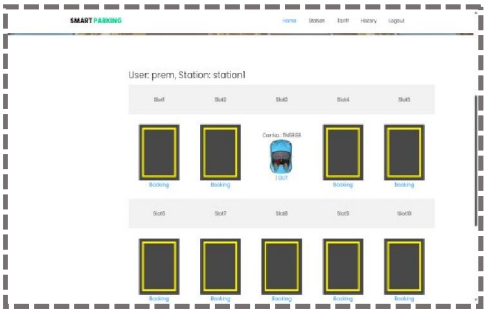

Figure 12. Slot Parking

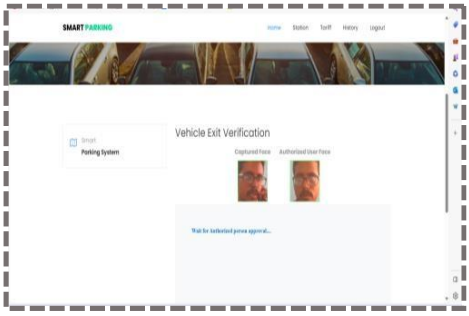

Figure 13. Vehicle Exit Verification

V. CONCLUSION

In conclusion, the project stands as a transformative solution poised to revolutionize urban parking management. By leveraging advanced technologies and innovative features, the project addresses the challenges associated with traditional parking systems, providing users with a seamless and secure parking experience. The integration of Edge Computing and Deep Learning algorithms establishes a robust foundation for real-time decision-making and enhances the overall efficiency and security of urban parking environments. The Smart Parking System's ability to link multiple parking stations into a unified network fosters a shared parking ecosystem, promoting optimal space utilization. The Vehicle Theft Prevention module, incorporating facial recognition and deep learning, exemplifies the project's commitment to security. This proactive approach not only safeguards parked vehicles but also empowers owners to intervene swiftly in case of suspicious activities, reinforcing user trust. The End User Dashboard, Parking Space Provider Admin functionality, and Web Admin controls create a well-rounded and user-centric platform. Users benefit from features like easy registration, intuitive parking slot search, and transparent tariff information. Parking space providers gain tools for efficient management, and administrators wield control over the system's overall health and security. Looking ahead, the future scope of the project holds exciting possibilities, from IoT integration and predictive analytics to collaborations with smart city initiatives and advancements in user experience. The project is positioned not only to meet the current demands of urban mobility but also to adapt and thrive in the dynamic landscape of smart cities.

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