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VEHICLE SECURITY SYSTEM WITH FACIAL AND VOICE RECONGNITION

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Abstract:

The proposed security and safety system presents an innovative approach to safeguarding vehicles through the integration of facial and voice recognition technologies. By leveraging these advanced features, the system aims to enhance protection against theft and unauthorized access, particularly in scenarios where the car is parked and unattended. At the core of the system is a discreetly placed webcam located within the steering column, which serves as the primary means of capturing facial data. When an individual occupies the driver's seat, the webcam captures an image of their face, initiating the authentication process. This image is then compared with previously stored facial data using sophisticated facial recognition algorithms. If a match is found, indicating that the person is authorized to access the vehicle, the steering wheel and doors are automatically unlocked, allowing the individual to proceed. Conversely, if the facial features do not align with the stored data, signalling an unauthorized attempt to access the vehicle, the system responds by automatically locking the steering wheel and doors, effectively preventing entry.

Keywords — **Micro Processor, GSM, LCD, WEB Camera, Buzzer, GPS.**

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I. INTRODUCTION

The escalating prevalence of vehicle thefts worldwide has propelled the necessity for innovative security measures. Addressing this pressing concern, our paper introduces a cutting-edge solution: a Vehicle Security System with Facial and Voice Recognition. In response to the sophisticated techniques employed by modern thieves, our system integrates advanced computer vision and biometric authentication technologies. Through real-time facial recognition and keyword verification, it ensures secure access to vehicles, thwarting unauthorized attempts effectively. Our system not only offers enhanced security features like multi-factor authentication but also provides real-time monitoring and alerts to pre-empt potential threats. Additionally, user enrolment and management functionalities ensure seamless integration with existing vehicle systems while prioritizing user privacy and data security. With scalability and adaptability at its core, our system represents a pivotal advancement in safeguarding vehicles in today's increasingly insecure environment.

With the exponential rise in vehicle ownership globally, the threat of car theft has become an ever-present concern, escalating in tandem with the advancement of theft techniques. Particularly vulnerable are vehicles parked in common lots or near residences, prompting the urgent need for enhanced security measures. This abstract

introduces a pioneering solution: a real-time vehicle security system merging cutting-edge computer vision with key-entered password processing. Leveraging sophisticated face detection and recognition technologies, the system ensures instantaneous user authentication through facial analysis. Additionally, it incorporates a secondary layer of verification, requiring users to input a specific keyword for added security.

The project's scope extends to the integration of biometric authentication, notably facial and voice recognition algorithms, into the vehicle's security framework. By employing these advanced technologies, the system offers heightened security features, including multi-factor authentication. This comprehensive approach enhances the robustness of the security system, ensuring reliable protection against unauthorized access attempts. Furthermore, the system includes real-time monitoring capabilities to detect and respond to suspicious activities promptly. Alerts and notifications are generated to notify vehicle owners or relevant authorities in case of security breaches, thus bolstering the system's effectiveness in thwarting theft attempts.

II. LITERATURE SURVEY

Ms. E. Devisri, N. Lahari Chowdary, M. Mahesh Babu, T. Naveen Kumar, and E. Purushotham [1] present a groundbreaking paper introducing a vehicle security system, the VSS-IoT, which integrates biometric authentication within the IoT framework to fortify vehicles against theft. Utilizing a Raspberry Pi 3 Model B+ development board, Pi camera, PIR sensor, and smartphone interface, the system ensures exclusive access to authorized drivers. In the event of an unauthorized individual detected within the vehicle, the system promptly alerts the owner and/or law enforcement via the Internet, providing the intruder's image and the vehicle's location to mitigate theft or damage. With a remarkable sensitivity of 97.7%, the VSS-IoT proves instrumental for real-time applications in thwarting security breaches.

Method R F Rahmat, M P Loi, S Faza, D Arisandi, and R Budiarto [2] present a comprehensive review titled "A review of Face Recognition Based Car Ignition and Security System," highlighting the paradigm shift introduced by face recognition technology in vehicle ignition systems. The paper emphasizes the transition from traditional keys to facial features for ignition, focusing on enhancing vehicle functionality while prioritizing safety through advancements in automotive electronics. Proposing a facial recognition system integrating face detection and tracking algorithms, the authors leverage MATLAB and Raspberry Pi B for implementation. The choice of facial recognition and detection is justified by its widespread applicability in interactive user interfaces and its pivotal role in computer vision.

Yogeshwar G. Landge and Vaishnavi S. Pandhare [3] present a comprehensive survey titled "A Survey on Vehicle Security System using IoT," addressing the escalating concern regarding vehicle theft prevention amidst rapid economic development. The paper highlights the inadequacies of previous vehicle security systems and introduces a novel approach leveraging wireless technology. The proposed system integrates a low-cost Bluetooth module for car monitoring and utilizes biometric fingerprint scanning for enhanced door access security. Moreover, an ultrasonic sensor is employed to calculate distances between the vehicle and obstacles, issuing alerts to prevent collisions. Seat belt usage is mandated for vehicle operation, and an IR sensor detects window break-ins, signalling the microcontroller. This controller, connected to the Bluetooth device and alarm system, promptly transmits alerts to the dashboard and authorized users' mobile phones, ensuring swift responses to potential threats.

Dr. G. Sirisha[1], K. Shivasai[2], D. Ranjith[3], K. Hitesh□, and J. Bharath Kumar□ [4] present a research Endeavor titled "Design and Build a Facial Recognition Based Motor Vehicle Security System," aiming to develop a system utilizing facial recognition technology to combat motor vehicle theft, providing direct recognition of vehicle owners. The methodology involves a comprehensive

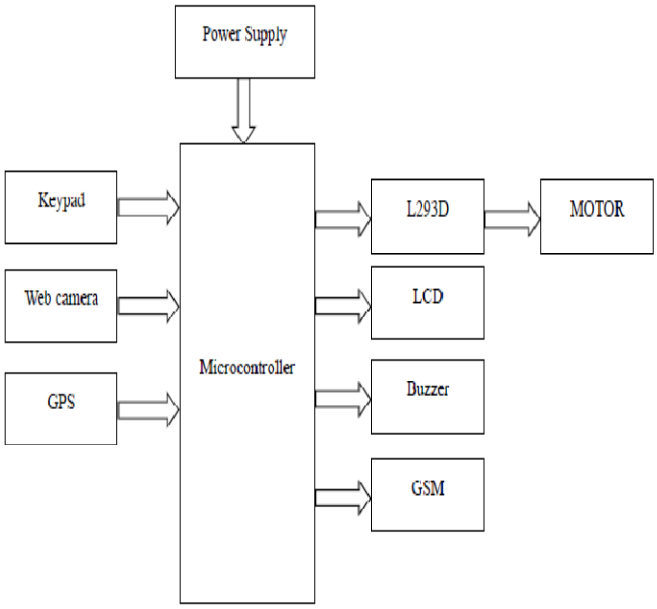
literature review, comparing various journals to uncover novel approaches. The central focus is on reducing motor vehicle theft rates through the implementation of the Internet of Things (IoT) methodology. By creating this system, law enforcement agencies can benefit from enhanced capabilities in mitigating motor vehicle theft crimes.

B. Ajay Bhargav, D. Hari Krishna, and U. Syed Abudhagir [5] present a paper titled "Anti-Theft Vehicle Security System with Facial Recognition," emphasizing the significance of implementing a robust security system to safeguard private transportation assets in the face of increasing concerns about vehicle theft. Motor vehicles, being the primary mode of transportation worldwide, necessitate effective security measures to maintain control and track them efficiently. The inclusion of a security system with facial recognition technology grants exclusive control to vehicle owners, addressing their security concerns and ensuring the protection of their valuable assets.

III. PROPOSED SYSTEM

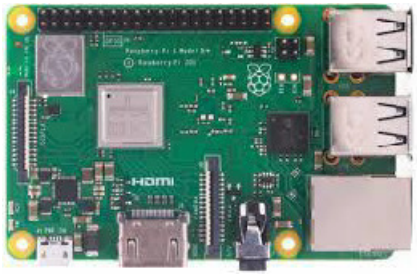
Introducing a revolutionary Vehicle Security System Using Facial and Voice Recognition, this proposed system leverages cutting-edge biometric technology to thwart unauthorized vehicle access. Upon activation, users are presented with options for vehicle start, user registration, or data deletion, ensuring seamless control over the system. Registration involves multifactor authentication, including facial scanning, keypad password, and OTP verification, ensuring robust authentication, and enhancing user privacy. In the event of unauthorized access attempts, the system swiftly compares the scanned face against its database, triggering alarms and sending location alerts to deter theft. With traditional security measures proving inadequate against rising theft rates, this innovative solution provides a comprehensive defence, significantly reducing the risk of vehicle theft. By integrating facial and voice recognition technologies, it not only enhances security but also contributes to lowering insurance costs for consumers, thereby elevating safety and peace of mind for vehicle owners. Moreover, its adaptability to various vehicle models and scalability for fleet management make it a versatile solution for diverse transportation needs, underscoring its potential for widespread adoption and impact in mitigating vehicle theft globally.

BLOCK DIAGRAM:



IV. HARDWARE DESCRIPTION

1. Raspberry Pi: The core component of the system, Raspberry Pi serves as the central processing unit for integrating various functionalities. It handles data processing, user interface, and communication with peripheral devices.



2.Web Camera: The web camera captures live images for facial recognition. It interfaces with the Raspberry Pi to provide real-time video feed,

enabling the system to identify authorized users and detect unauthorized access attempts.

3. Keypad: The keypad provides an additional layer of security through password input. Users can enter a unique code via the keypad, enhancing authentication alongside facial and voice recognition methods.

4. DC Motor: The DC motor is responsible for vehicle control, enabling the system to start or stop the vehicle based on user authentication. It interfaces with the Raspberry Pi to execute commands securely.

5. Motor Driver: The motor driver acts as an interface between the Raspberry Pi and the DC motor, translating digital signals into physical motion. It ensures precise control over the vehicle's operation, enhancing safety and reliability.

6. Buzzer: The buzzer serves as an audible alarm system, alerting nearby individuals in case of unauthorized access attempts. It emits a loud sound to deter theft and notify users of potential security breaches.

7. LCD: The LCD (Liquid Crystal Display) provides visual feedback to users, displaying system status, authentication prompts, and error messages. It enhances user interaction and facilitates system monitoring.

8. GSM Module: The GSM module enables communication between the vehicle security system and external devices, such as smartphones or remote monitoring stations. It allows users to receive alerts and notifications via SMS or calls, enhancing system responsiveness and user convenience.

9. GPS Module: The GPS module provides accurate location tracking for the vehicle. It enables the system to send location updates in case of theft or unauthorized access, assisting authorities in recovering stolen vehicles and apprehending perpetrators.

These components work synergistically to create a comprehensive vehicle security system that integrates facial and voice recognition technologies, enhancing security, and mitigating the risk of theft.

V. SOFTWARE DESCRIPTION

Software Description (100 words):

Python is a dynamic, high-level, and interpreted programming language renowned for its simplicity, versatility, and rapid development capabilities. It supports various programming paradigms, including object-oriented, imperative, and functional styles. With its intuitive syntax, dynamic typing, and absence of compilation steps, Python facilitates quick development and debugging cycles. It's ideal for diverse applications, from web development to enterprise solutions, due to its multipurpose nature.

Python Features:

- Dynamic typing and intuitive syntax
- Versatility in supporting multiple programming paradigms
- Rapid development and debugging cycles
- Extensive standard library and third-party packages support

Python Applications:

- Web development
- Enterprise solutions
- Scientific computing
- Data analysis and visualization
- Artificial intelligence and machine learning

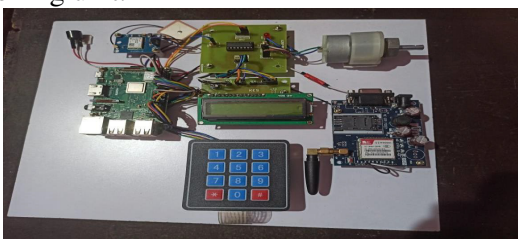
VI. RESULTS:

PROTOTYPE BOARD

• This is an overall view of Vehicle security with facial and voice recognition when power is not supplied to it.

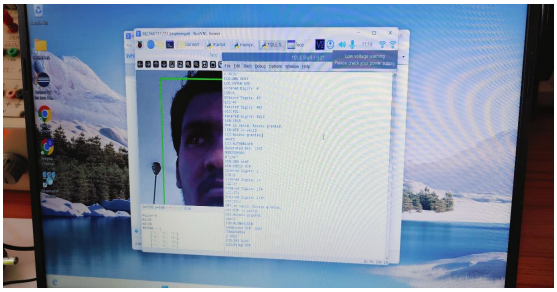
• To implement our Vehicle security with facial and voice recognition, we have designed an experimental setup.

• The setup utilizes Raspberry Pi as the main controlling unit.



Prototype Board

FACE RECOGNITION WITH WEB CAM

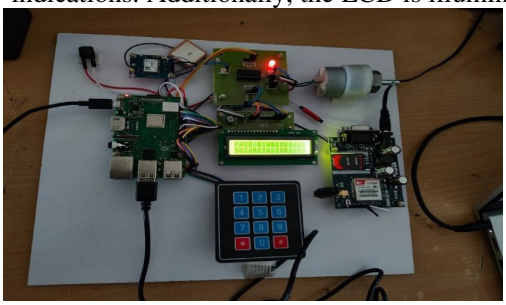


Face Recognition With WEB Camera

Facial Recognition Cameras capture driver's face. Real-time Processing Unit compares it to stored templates. Authentication Mechanism grants or denies access. User receives feedback on authentication outcome.

WORKING MODEL

The powered module exhibits the configuration depicted below. The Raspberry Pi, GPS, GSM, and DC Motor display indications. Additionally, the LCD is illuminated.



Working model

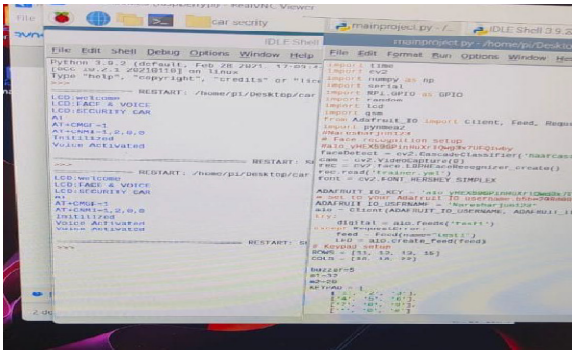
OTP GENERATION:

After successfully recognizing the face, the OTP is sent to the registered mobile number through the GSM modem, utilizing the SIM card in the SIM slot. Consequently, authorization is successfully granted in the Working Model with OTP Generation.

Working model with OTP Generation

After successfully recognizing the face, the OTP is sent to the registered mobile number through the GSM modem, utilizing the SIM card in the SIM slot. Consequently, authorization is successfully granted.

VOICE:



Working Model with Voice

Integrating voice authentication via Google Assistant in a vehicle entail combining the Google Assistant API with the vehicle's system. Users engage with the vehicle's voice interface, which interfaces with Google Assistant to authenticate. Once the user's voiceprint is successfully verified, access to vehicle functions is granted, ensuring both security and ease of operation.

VII. CONCLUSION

In conclusion, the integration of facial and voice recognition technology into vehicle security systems represents a significant advancement in safeguarding against theft and unauthorized access. Conventional methods relying on keys or remote controls are vulnerable to duplication or compromise, highlighting the need for more sophisticated security measures. By leveraging biometric authentication, IoT connectivity, and real-time monitoring capabilities, the proposed system offers enhanced security features and user

convenience. However, challenges such as false positives in authentication and limitations in remote security measures must be addressed to ensure the system's effectiveness. Overall, the adoption of facial and voice recognition technology holds immense potential in revolutionizing vehicle security, providing owners with greater control and peace of mind over their assets.

VIII. FUTURE SCOPE

The future trajectory of vehicle security systems utilizing facial and voice recognition technology entails ongoing enhancements in recognition accuracy and speed, ensuring seamless authentication processes. Integration with anti-theft systems will bolster security measures, deterring theft attempts effectively. Moreover, robust data privacy protocols will safeguard user information, while exploration of cloud-based solutions will facilitate scalable data management. These advancements will collectively shape the landscape of vehicle security, fostering heightened protection and user confidence in the evolving automotive landscape.

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