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Vehicle Anti-Theft Detection and Protection with Shock Using Facial Recognition.

Ms.G.Indumathi, Mrs. K. Kalpana

Assistant Professor, Department of Electronics and Communication Engineering, V.R.S. College of Engineering and
Technology, Arasur, Villupuram, Tamil Nadu, India

Assistant Professor, Department of Electronics and Communication Engineering, V.R.S. College of Engineering and
Technology, Arasur, Villupuram, Tamil Nadu, India

ABSTRACT: The increasing cases of vehicle theft necessitate advanced security solutions beyond traditional locking mechanisms. This project proposes a real-time vehicle anti-theft detection and protection system integrating facial recognition and IoT-based notifications. The system utilizes a camera module and fingerprint sensor to capture and authenticate the driver's face using facial recognition technology. If an unauthorized person attempts to access the vehicle, the system triggers an alarm and activates a shock mechanism to deter theft. Simultaneously, an IoT-based notification is sent to the owner via a mobile application, providing real-time alerts on unauthorized access attempts. The proposed system enhances vehicle security by ensuring only authorized users can operate the vehicle while enabling remote monitoring and immediate response. This smart and proactive approach minimizes theft risks, offering an efficient and reliable security solution for vehicle owners.

KEYWORDS: Vehicle Anti-Theft Detection, Facial Recognition, IoT Notification, Shock Mechanism, Real-Time Security, Vehicle Protection, Unauthorized Access, Mobile Application.

I. INTRODUCTION

With the rise in vehicle theft cases, traditional locking mechanisms alone are no longer sufficient to ensure vehicle security. This project introduces a real-time vehicle anti-theft detection and protection system that integrates facial recognition and IoT-based notifications for enhanced security.

The system employs a camera module to capture and authenticate the driver's face, ensuring that only authorized users can access the vehicle. If an unauthorized person attempts to gain entry, the system triggers an alarm and activates a shock mechanism to deter theft.

Simultaneously, an IoT-based notification is sent to the vehicle owner through a mobile application, providing real-time alerts on unauthorized access attempts. This smart security solution offers remote monitoring and immediate response capabilities, significantly reducing the risk of vehicle theft and providing a reliable, proactive approach to vehicle protection.

II. LITERATURE REVIEW

The literature survey includes two studies on face recognition and vehicle tracking systems. The first study, titled "A Comparative Implementation of PCA Face Recognition" by Nicolas Moritz, Frédéric Aniel, Imed Dris, Hamed, and Thomase (2020), discusses the limitations of existing car anti-theft systems such as car alarms and flashing light techniques, which rely on electromechanical devices and cannot trace thieves. The study highlights advancements in microprocessor technology, enabling the use of multiple electronic sensors and improvements in GPS and GSM network software. The second study, "Face recognition using PCA, LDA, and ICA approaches on colored images" by Ömer Toygar and Adnan Acan (2021), explores a vehicle tracking system that integrates GPS and GSM technologies. This system, built on an embedded platform, allows vehicle owners to track their cars' movements and receive status updates on demand. These studies emphasize the evolution of security and tracking technologies with the integration of advanced sensors and communication systems.

III. EXISTING SYSTEM

The concept of a novel smart anti-theft system that is designed to enrich the usability of an electric bike and to inform the owner about the vehicle's location, is presented in this existing system. The starting point of the developed solution is based on the fixed nodes, which consist of ZigBee routers with predefined X and Y coordinates. As the fixed nodes have the ability to communicate with other devices, it allows the e-bike to join the network when it is detected within the range of the network.

When the e-bike is detected in the network, the RSSI of the received signal from the routers to the ebike is measured and this information is processed to find the position relative to the fixed nodes. RSSI of at least 3 fixed nodes are to be measured and sent to the base station to find the most accurate location of the bike using the trilateration method.

The use of IoT-based notifications enhances security by sending real-time alerts to the owner's mobile application whenever suspicious activity is detected. Additionally, a shock mechanism can be implemented to deter intruders physically. Real-time security features ensure continuous monitoring of the vehicle, leveraging GPS and GSM technology for precise tracking. These advancements provide enhanced vehicle protection and improve the effectiveness of theft prevention by integrating mobile applications for remote control and monitoring.

IV. DISADVANTAGES

- In this existing system track the vehicle locations if the vehicle is theft detection some particular border only because use RSSI signal strength.
- In this system there is no any control system to protect the vehicle from theft.

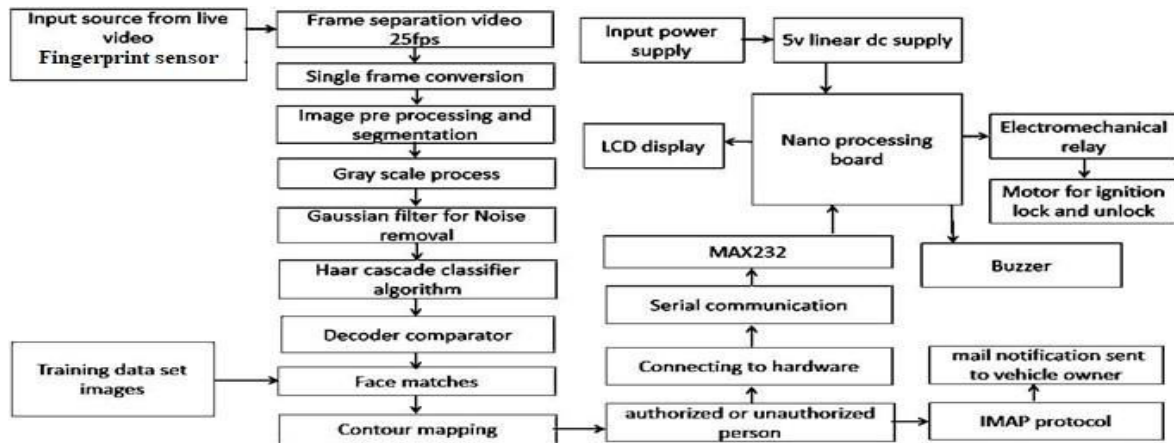
V. PROPOSEDSYSTEM

The proposed system is a real-time vehicle anti-theft detection and protection solution that integrates facial recognition and IoT-based notifications to enhance vehicle security. Simultaneously, an IoT-based notification is sent to the vehicle owner via a mobile application, providing real time alerts on unauthorized access attempts. The system also allows remote monitoring, enabling the owner to take immediate action if needed. By combining facial recognition, fingerprint sensing, IoT technology, and deterrent mechanisms, the proposed system offers a smart, proactive, and efficient security solution that significantly reduces the risk of vehicle theft.

ADVANTAGES

- Facial recognition and Fingerprint ensures only authorized users can access the vehicle.
- IoT notifications instantly inform the owner of unauthorized access attempts.
- Owners can monitor and control security from anywhere via a mobile app.
- Requires minimal up keep compared to conventional security systems.

VI. BLOCKDIAGRAM



Explanation of the block diagram (fig1.1) components:

Hardware Components:

1. **Camera** : Captures live video input.
2. **Nano Processing Board**: Handles face recognition and system control (e.g.,RaspberryPi, Arduino).
3. **MAX232**:Serial communication interface.
4. **LCD Display**:Displays access status (authorized/unauthorized).
5. **Electro mechanical Relay**: Controls motor activation.
6. **Motor for Ignition Lock/Unlock**: Locks/unlocks vehicle ignition.
7. **Buzzer**:Sounds an alert for unauthorized access.
8. **Power Supply (5V Linear DC)**: Provides power to the system.
9. **Fingerprint sensor**: Sensing authorized person thumps.

Software Components:

1. **Frame Separation(25fps)**: Extracts frames from video.
2. **Single Frame Conversion**: Converts video frames into images.
3. **Image Pre-processing and Segmentation**: Enhances image quality for recognition.
4. **GrayScale Processing**: Converts images to grayscale for efficient processing.
5. **Gaussian Filter for Noise Removal**: Removes noise to improve detection.
6. **Haar Cascade Classifier Algorithm**: Detects faces using a trained model.
7. **Decoder Comparator**: Compares detected faces with stored data.
8. **Training Data Set Images**: Database of authorized faces.
9. **Face Matches & Contour Mapping**: Identifies the person based on facial features.
10. **Serial Communication**: Enables data exchange between components.
11. **IMAP Protocol**: Sends e-mail notifications.
12. **Mail Notification System**: Notifies vehicle owner in case of unauthorized access.

VII. CIRCUITDIAGRAM

- Below the circuit diagram consist of components of LCD display, Raspberry pi 3B, Fingerprint sensor, Camera, input 12v power source, voltage regulator 5v, motor controller,, Relay, Buzzer.
- LCD display pin connection positive pin is connected to 5v supply, negative pin and ground pin is connected to GND, and data pins are connected to controller digital pins which has 6 pins they are connected to microcontroller.
- Input power supply is given to voltage regulator it converting 12v to 5 and then 5v connected to controller.
- Buzzer has 2pins, positive pin connected to controller digital, negative pin connected to ground.
- Motor driver board has VCC pin is connected to 5v supply, VSS pin is connected to GND and remaining data pins are IN1, IN2 connected to controller digital pins(in fig 2.1).

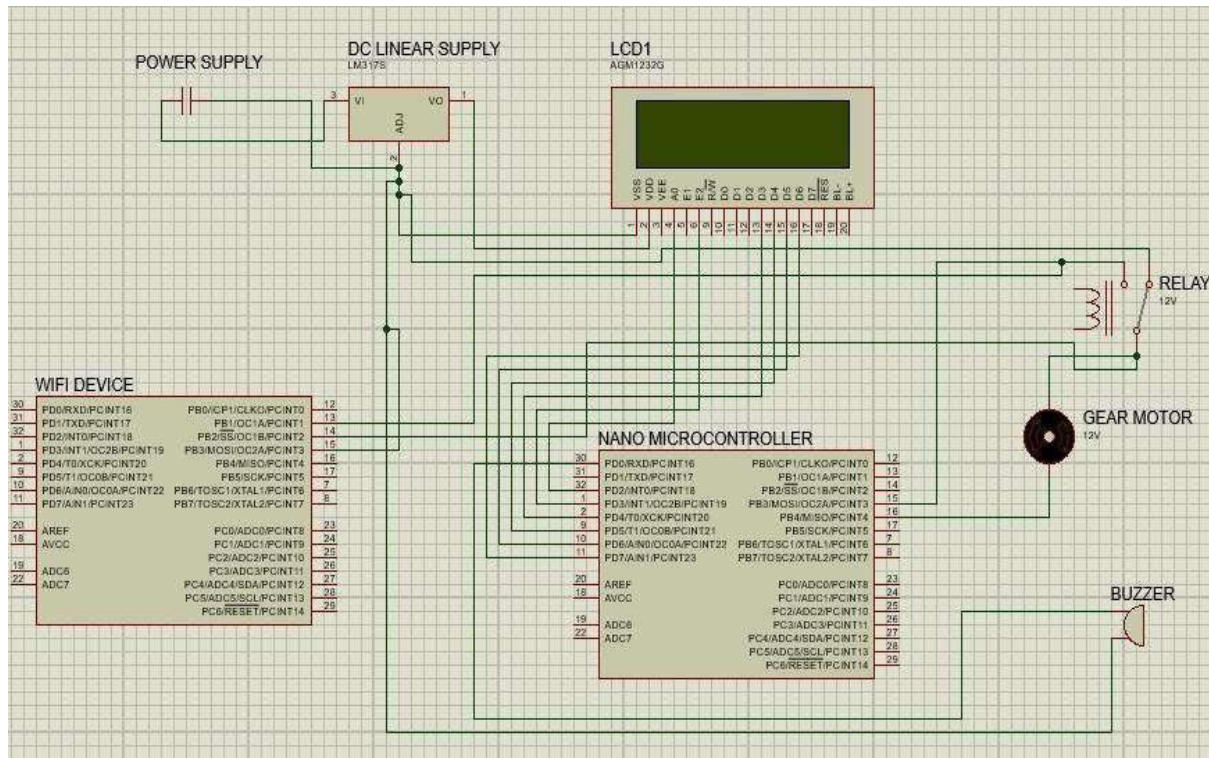


Fig 2.1

VIII. APPLICATION

The vehicle anti-theft detection system integrates facial recognition; IoT notifications, a shock mechanism, and real-time security to provide advanced protection. By utilizing AI powered facial recognition, the system ensures that only authorized users can access the vehicle. If an unauthorized person attempts entry, the system automatically locks the ignition, triggers an alarm, and activates a shock deterrent to prevent theft. The use of IoT- based notifications ensures that the vehicle owner receives instant alerts via a mobile application, email, or SMS, allowing for quick response in case of suspicious activity.

The real-time security feature enhances vehicle monitoring by providing live video streaming and GPS tracking, enabling the owner to keep track of their vehicle's location and surroundings at all times. Additionally, vibration and tamper sensors can detect forced entry attempts and immediately trigger protective measures. The mobile application acts as a central control system, allowing users to remotely lock/unlock the vehicle, receive alerts, and track the vehicle's movements, offering convenience and enhanced security.

This system is particularly beneficial for personal vehicle security, fleet management, smart parking solutions, and law enforcement applications. By combining AI, IoT, and real-time monitoring, it provides a proactive approach to vehicle protection, significantly reducing the risk of unauthorized access and theft. Future advancements may include voice recognition, biometric authentication, and geo fencing alerts, further improving the effectiveness of the system. Ultimately, this technology driven solution ensures maximum security, quick response times, and complete control over vehicle access.

IX. RESULTANDCONCLUSION

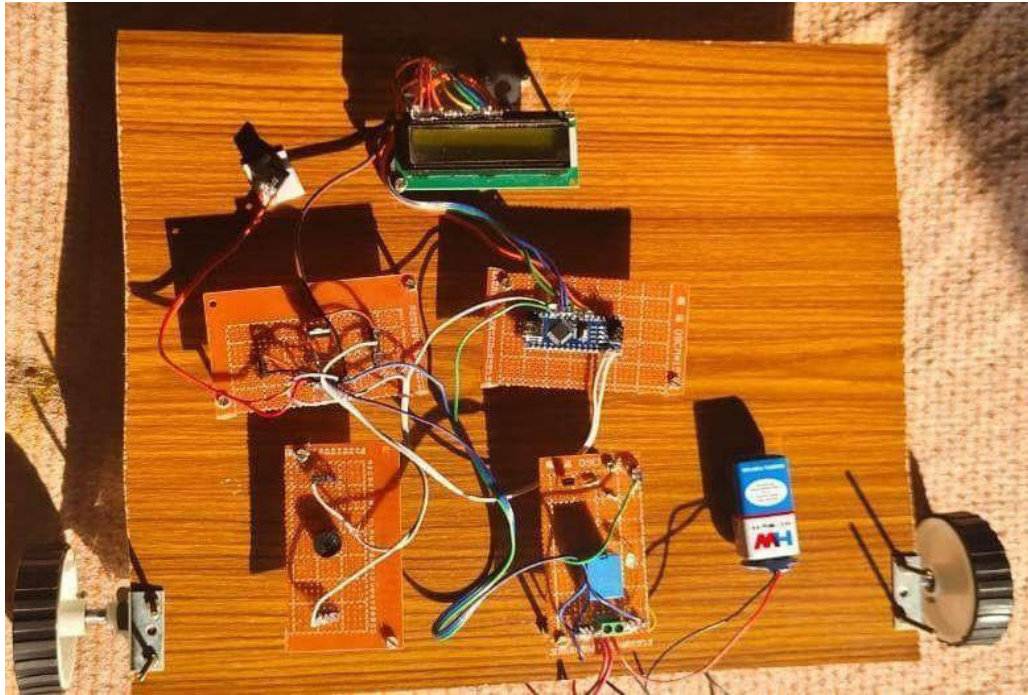


Fig2.1Finalkitoutput

The vehicle anti-theft detection system has successfully enhanced vehicle security by integrating facial recognition, IoT notifications, a shock mechanism, and real-time monitoring. Through AI- powered facial recognition, the system ensures that only authorized users can access the vehicle, preventing unauthorized entry. In case of a security breach, the system locks the ignition, triggers an alarm, and activates a shock deterrent, providing an effective first line of defense against theft attempts. Additionally, IoT-based notifications instantly alert the vehicle owner via mobile app, email, or SMS, ensuring quick response and intervention.

The system's real-time security features, including live video streaming, GPS tracking, and tamper detection, enable vehicle owners to monitor their vehicle remotely. The mobile application provides complete control, allowing users to lock/unlock the vehicle, receive alerts, and track its location in real time. This multi-layered security approach significantly reduces the risk of vehicle theft by providing continuous monitoring and instant threat detection.

Overall, the system has proven to be highly effective in ensuring vehicle protection by combining AI, IoT, and real-time security measures. Its applications extend beyond personal vehicle security to fleet management, smart parking solutions, and law enforcement. Future enhancements, such as biometric authentication, geo fencing alerts, and AI-based intrusion detection, will further strengthen its capabilities. This intelligent, technology-driven solution ensures maximum security, fast response times, and complete control over vehicle access, making it a reliable and efficient anti-theft system.

The implementation of a real-time vehicle anti-theft detection and protection system using facial recognition and IoT notifications enhances vehicle security significantly. By integrating facial recognition, unauthorized access can be effectively prevented; ensuring only registered users can start the vehicle. Additionally, the shock-based deterrent mechanism acts as an immediate response to unauthorized attempts, further strengthening security. The IoT-based notification system provides real-time alerts to vehicle owners, allowing them to take prompt action if theft is attempted. This system not only reduces vehicle theft incidents but also improves user confidence in vehicle safety. With advancements in AI and IoT, future enhancements could include improved recognition accuracy, GPS tracking, and automated emergency responses, making vehicle security more robust and intelligent.

X. FUTURESCOPE

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