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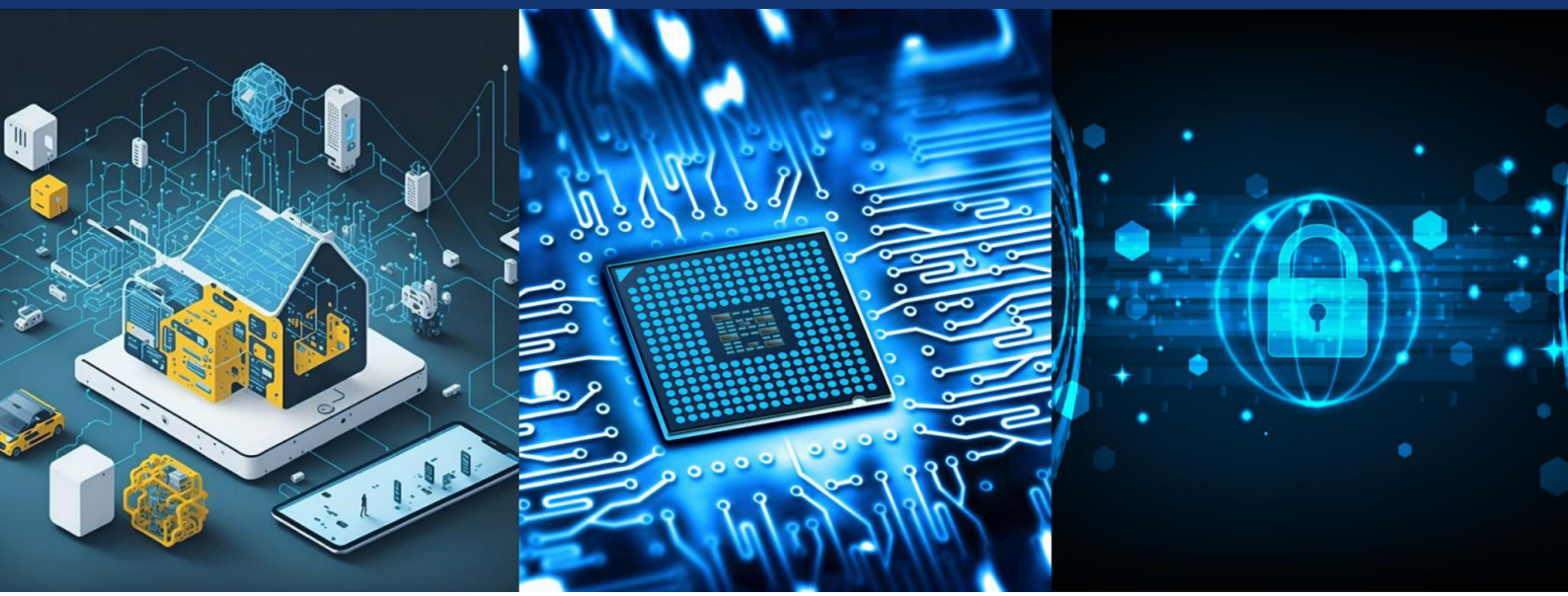

International Journal of Innovative Research in Computer and Communication Engineering

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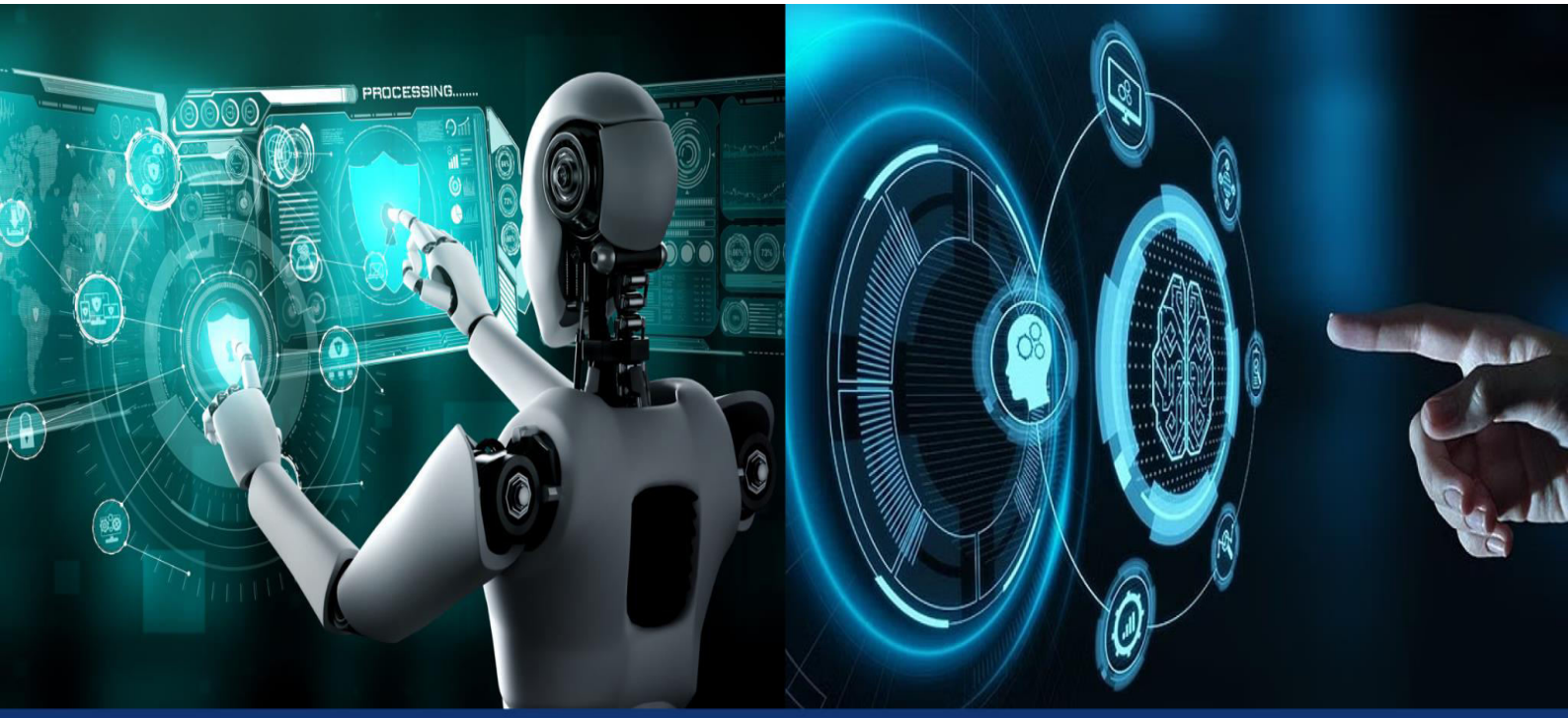

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Design and Implementation of Front Door Security System with Face Recognition and Remote Guest Authorization

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ABSTRACT - The "Home Security Monitoring and Mail Alert System" is an advanced security solution designed to detect unauthorized individuals and provide instant alerts to homeowners. It uses to monitor activity around the house, triggering a camera to capture images of any detected person. To enhance its effectiveness, the system employs a facial landmark detection algorithm, which identifies key facial features for precise recognition and differentiation between known and unknown individuals. Once an unauthorized presence is detected, the system sends these captured images to the homeowner's email through an automated mail alert system. This ensures homeowners are immediately informed of potential threats, even when they are away from home. The system operates in real-time, providing swift and reliable communication for quick action. It is equipped with local image storage for future reference and investigation. The integration of camera modules allows for effective monitoring with minimal interference. The mail alert system works efficiently, ensuring notifications reach the homeowner regardless of internet connectivity. The solution is cost-effective, compact, and easily integrable into existing home setups. this system enhances home security by offering proactive alerts and protection against unauthorized intruders.

KEYWORDS: Home Automation, Real-time Alerts, Email Notifications, Surveillance System, Intruder Detection, Security Camera
Domain: Artificial Intelligence

I. INTRODUCTION

The "Home Security Monitoring and Mail Alert System" is an innovative and advanced solution designed to enhance home security by detecting unauthorized individuals and providing immediate alerts to homeowners. By utilizing camera, the system monitors activity around the house and automatically triggers a camera to capture images of any detected presence. These images are promptly sent to the homeowner's email through an automated mail alert system, ensuring timely notifications even when the homeowner is away. Operating in real-time, the system delivers swift and reliable communication, enabling quick responses to potential threats. With features such as local image storage for future reference and the efficient integration camera modules, this compact and cost-effective solution ensures effective monitoring with minimal interference.

II. LITERATURE REVIEW

In recent years, the integration of facial recognition technology into home security systems has gained significant attention for enhancing safety and surveillance. Several studies have demonstrated the effectiveness of using algorithms like Haar Cascade, LBPH, and deep learning models such as CNN and MTCNN for real-time face detection and recognition. For instance, Ijaradar and Xu (2022) proposed a cost-effective Raspberry Pi-based system using OpenCV for home monitoring, while Uddin et al. (2022) integrated facial recognition with a mobile app for smart home access.

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"Arduino Based Smart Home Warning System" The development of home safety systems the use of the ESP32CAM and Blynk software has won widespread attention in recent years. A literature survey on this subject matter exhibits various tactics and techniques proposed by using researchers to enhance domestic security the usage of those technologies

"A Smart Security System with Face Recognition" This paper introduces a smart security solution that combines face recognition with a novel adaptive learning mechanism. The key innovation lies in how the system enhances its facial recognition capabilities over time. Initially, the model is trained using facial images retrieved from social networks like Facebook. These images are often diverse in lighting, angle, and expression, which helps build a robust training set. The adaptive learning model continuously improves by interacting with users and learning from new input data captured by the home security system itself.

"Smart Home Security Using Facial Authentication and Mobile Application" In this study, the authors present a comprehensive smart home security solution integrating facial authentication with a mobile application interface, ensuring both real-time detection and user accessibility from remote locations. The system leverages widely used facial detection and recognition techniques—Haar Cascade Classifier for detecting faces and Local Binary Pattern Histogram (LBPH) for recognizing them. These algorithms were chosen due to their simplicity, speed, and accuracy, especially in environments with limited computational resources.

The authors built a mobile application that communicates with the camera system installed at the door. When a face is detected, it is compared against a locally stored dataset of known individuals. If recognized, access is granted or a notification is sent. If unknown, the system not only denies access but also sends an alert with the captured image to the homeowner's mobile device.

III. METHODOLOGY

A. EXISTING SYSTEM

Home security has always been a top priority for individuals and families, as safeguarding personal property and ensuring the safety of loved ones is paramount. These solutions offer some degree of support for users looking to improve their well-being, manage stress, or make important life decisions.Traditional home security systems have been in place for decades, primarily relying on manual surveillance methods, basic alarm systems, and standard CCTV cameras. While these conventional systems have served their purpose, they present several limitations that can compromise the effectiveness and efficiency required to address modern security challenges. Many existing home security systems still rely heavily on manual monitoring. This requires homeowners or security personnel to consistently observe surveillance feeds to detect suspicious activities,This approach is not only labor-intensive but also increases the likelihood of human error, such as missed incidents due to inattentiveness or fatigue.

B. PROPOSED SYSTEM

The proposed "Home Security Monitoring and Mail Alert System" is a smart security solution that enhances traditional home surveillance through automation and artificial intelligence. It is designed to detect unauthorized individuals around a home by using a camera module that actively monitors the premises. Upon detecting motion or the presence of a person, the system captures images and processes them using a facial landmark detection algorithm. This advanced technique enables the system to distinguish between known residents and unfamiliar faces with greater accuracy, significantly reducing false alarms.Once an intruder or unknown individual is identified, the system initiates an automated email alert that includes the captured image. This email is instantly sent to the homeowner, ensuring they are promptly informed of any potential security threat, regardless of their location. The system's real-time alert mechanism allows for quicker response times and better decision-making during security events. Furthermore, captured images are stored locally, which can later serve as evidence or for further investigation if necessary.

C. ADVANTAGES

1. The proposed "Home Security Monitoring and Mail Alert System" offers a modern approach to safeguarding homes by combining and cameras for effective monitoring.
2. It provides real-time alerts through email, ensuring homeowners are instantly informed of any unauthorized activity, even when away. The system is cost-effective, compact, and easily integrates with existing home setups, making it an accessible solution for a wide range of users.
3. Additionally, it includes local image storage, allowing homeowners to review past incidents for investigation or evidence. With its minimal reliance on internet connectivity, the system ensures reliable performance, offering enhanced security and peace of mind.

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D. DESIGN OF THE SYSTEM

The design of the "Home Security Monitoring and Mail Alert System" focuses on achieving a balance between functionality, reliability, and ease of integration within a residential environment. The system architecture comprises several key components working in tandem to provide real-time surveillance and immediate threat notifications.

At the core of the system is a motion detection module or human detection algorithm, which continuously monitors the surrounding area using a camera module. When motion or the presence of a person is detected, the camera is activated to capture high-resolution images. These images are processed using a facial landmark detection algorithm, which identifies distinct facial features to distinguish between authorized individuals and potential intruders. This algorithm enhances accuracy by focusing on specific facial points, ensuring that false positives are minimized.

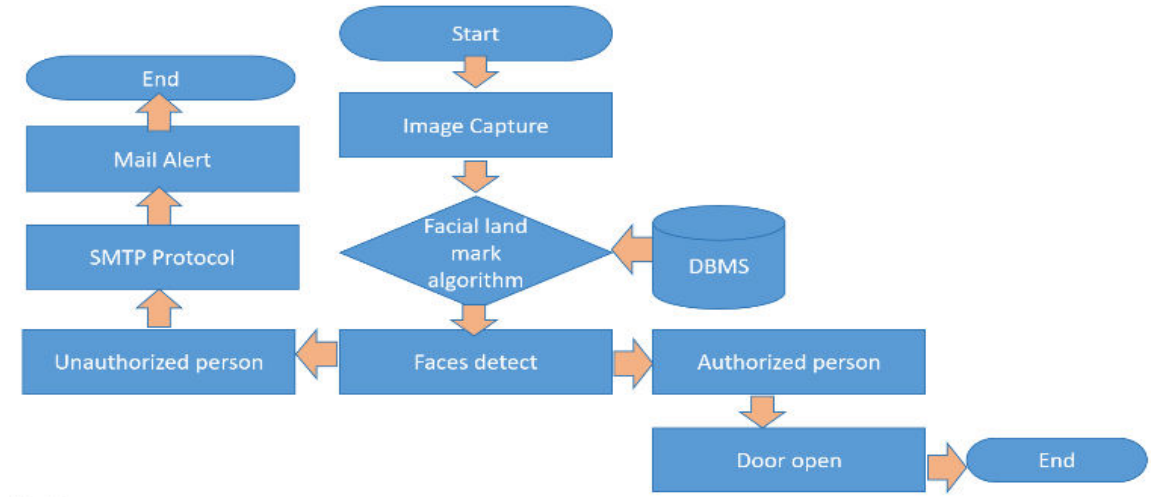

Fig.1

IV. IMPLEMENTATION

MODULE DESCRIPTION

1. Image preprocessing

Image preprocessing is a crucial step that enhances the quality of raw images captured by the security camera. This process involves several techniques such as noise reduction, resizing, and color adjustment, which help to clarify the image and make it suitable for further analysis. The goal is to improve the quality of the input image, ensuring that subsequent operations like face detection and recognition are accurate and effective.

2. Segmentation Process

Segmentation is the process of dividing an image into distinct parts or regions, each corresponding to different objects or areas of interest. In the context of the home security system, segmentation isolates the relevant parts of the image, such as a person's face, from the background. By focusing on the face or other important features, the system reduces computational complexity and enhances the accuracy of subsequent steps like facial landmark detection and comparison.

3. Facial Landmark Algorithm

The facial landmark algorithm is a vital component that analyzes the captured image to identify key facial features, such as the eyes, nose, mouth, and chin. This algorithm maps these features onto a set of predefined points that serve as a unique identifier for each individual. By extracting and comparing these landmarks, the system can distinguish between authorized and unauthorized individuals, facilitating accurate face recognition and verification in real-time.

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4.Database Management System (DBMS)

The Database Management System (DBMS) is responsible for storing and managing data related to authorized individuals. It holds facial recognition templates unique data sets derived from the facial landmarks of known individuals which are used for comparison during the recognition process. The DBMS ensures efficient retrieval of these templates, enabling the system to quickly identify or reject individuals based on their facial features. It serves as the backbone for storing all critical data securely and allows for quick updates and retrievals when needed.

5. Mail Alert Module

The Mail Alert Module is responsible for notifying homeowners when an unauthorized person is detected by the system. When the system identifies an individual who does not match any authorized facial templates, it triggers an alert by sending an email to the homeowner. This email includes important details, such as the captured image of the intruder, providing immediate and real-time information. The Mail Alert Module ensures that the homeowner is promptly informed, even if they are not at home, and helps them take necessary actions to enhance their security.

V. CONCLUSION

In conclusion, the "Home Security Monitoring and Mail Alert System" offers a comprehensive and innovative approach to home security by integrating real-time image capture, and automated email notifications. This system ensures that homeowners are promptly informed of potential security breaches, enabling swift action and enhancing overall safety. Its features, such as local image storage and minimal reliance on internet connectivity, add to its reliability and practicality. Compact, cost-effective, and easily integrable into existing setups, this solution provides a proactive and robust defense against unauthorized intrusions. By delivering immediate alerts and maintaining an accessible design, the system significantly improves the security and peace of mind of homeowners.

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