IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Smart Alert System For Public Transport And Security

[1]C.Kalpana, [2]Dr.K.PremKumar, [3]Dusanapudi Sarayu, [4]P.Ishwarya Lakshmi, [5]P. Nivedha

[1]Assistant Professor, [2]Professor & Head, [3]Student, [4]Student, [5]Student

Computer Science and Engineering,

Sri Manakula Vinayagar aengineering College, Puducherry, India

Abstract: This project presents a Smart Alert System de- signed to enhance security in public transportation through automated detection and real-time alerts. Leveraging CCTV- integrated facial recognition and behavior analysis, the system identifies known criminals from a police-maintained database anddetects suspicious theft-related actions. Upon identifying potentialthreats, the system sends immediate alerts to nearby police stations, enabling swift intervention. By automating these security processes, the system reduces reliance on manual monitoring, improves response times, and contributes to safer, more reliable public transportation. This approach aligns with smart city initiatives, providing a scalable and efficient solution to urban transit security.

Index Terms - CCTV Integration Facial Recognition Criminal Database Police Alerts Real-time Monitoring Suspicious Behavior Detection Theft Detection

1. INTRODUCTION

This project introduces a smart alert system designed to enhance security within public transportation systems through real-time monitoring and automated alerts. With public trans- port increasingly at the heart of urban life, ensuring the safety of commuters has become essential. This system leverages CCTV surveillance integrated with advanced facial recognition and behavior analysis to detect potential criminal activities and alert law enforcement in real-time. By automating the detection of known criminals and theft behaviors, the system aims to provide a proactive approach to crime prevention in public spaces.The system operates through two main modules. Module1 employs facial recognition technology to match faces captured on CCTV against a police-maintained database of known offenders, instantly notifying authorities if a matchis found. This allows law enforcement to respond swiftly to potential threats, enhancing deterrence and ensuring a safer environment. Module 2 focuses on identifying theft-related behaviors within transport systems, sending alerts to policewhen suspicious actions occur, further contributing to a secure and reliable transit experience.This smart alert system not only supports public safetybut also illustrates how advanced surveillance and machine learning technologies can be applied for practical security so- lutions in public infrastructure. Through automated recognition and alert mechanisms, the system empowers law enforcement to act quickly and efficiently, making it a valuable asset for modern urban security.

2. OBJECTIVES

The primary objective of the Smart Alert System for Public Transport Security is to enhance safety within public transportation by automating the detection and notificationof potential security threats. Given the vast number of daily commuters, manual monitoring is insufficient for real-time identification of risks. This system seeks to address that gap by utilizing advanced facial recognition and behavioral analysis, ensuring that public transport remains a secure environment. The system specifically aims to improve response times and crime prevention efforts by immediately alerting police sta- tions of potential threats, allowing for quick and efficient intervention.

A key objective is to facilitate the proactive identification of known criminals in public transport. Module 1 focuses on this by using CCTV footage paired with a police-maintained criminal database. The system scans and matches faces of passengers in real time, generating an alert if a match is found with an individual in the database. This proactive measure aims to prevent incidents before they escalate by ensuring thatknown offenders are quickly identified and monitored. The objective is to make public transportation a safer space by deterring potential offenders and providing law enforcement with real- time data.

Another objective is to detect and address theft in public transportation through Module 2, which is designed to identify behaviors indicative of theft. Theft is one of the most common crimes in public transport systems, but it is also challenging to detect in crowded environments. By using behavior analysis, the system monitors actions within the transport system, identifying movements and actions associated with theft and alerting the authorities when suspicious behavior is observed. This enables law enforcement to act quickly to prevent losses and protect passengers' belongings, further promoting trust in public transportation as a safe mode of travel.

A broader goal of this system is to support public safety efforts within urban areas by integrating with citywide surveil- lance networks. The smart alert system contributes to the overarching vision of smart cities, where technology aids in the management of public spaces, creating safer environments through data-driven insights. The integration of this system into existing police databases and CCTV networks serves not only public transport security but also enhances the city'soverall security capabilities. By building on infrastructure that is already in place, this system optimizes resources and createsa cohesive framework for urban safety.

In conclusion, this smart alert system aims to reduce crime rates in public transportation, create a deterrent effect for potential offenders, and enable quick response times through automated alerts. It reflects a forward-thinking approach to urban security, leveraging artificial intelligence and real-time data processing to support public safety. The overall objective is to make public transportation not just a more efficient means of travel, but a secure one, reinforcing public confidence and contributing to the larger goals of smart city initiatives.

3. Literature Survey

The development of smart security systems in public trans- port is an area that has seen significant research, particularly with advancements in facial recognition and behavioral analy- sis technologies. The use of facial recognition (FR) systems for public safety has grown in popularity, as these systems provide reliable and automated identification of individuals in high- traffic environments. Numerous studies highlight the effective- ness of FR in enhancing security, with many researchers fo- cusing on refining facial recognition algorithms to handle real- world challenges such as varying lighting, facial occlusions, and different angles of view. For instance, studies employing deep learning techniques, particularly Convolutional Neural Networks (CNNs), have demonstrated notable success in im- proving the accuracy of FR systems. Such methods enhance the robustness of FR in dynamic environments like public transport, where consistent monitoring is challenging.

Behavioral analysis for crime prevention, especially for detecting theft, has also gained attention in recent years. Studies on theft detection systems focus on identifying patterns and behaviors typically associated with theft through ma- chine learning and computer vision. Research has shown that identifying

suspicious movements or interactions can be an effective way of flagging potential theft, especially in crowded public places. In public transportation, this is especially rele- vant, as pickpocketing and petty theft are common.

Machine learning algorithms, including Decision Trees, K- Nearest Neighbors, and Support Vector Machines, have been applied to identify suspicious behaviors, though their accuracy varies depending on the complexity of the environment and data availability.

Furthermore, the use of smart city technology has expanded to integrate public transportation and law enforcement systems for enhanced security. Many cities around the world have developed connected surveillance networks that utilize Internet of Things (IoT) and fog computing to enable faster, more efficient data processing at the edge of the network. Thisallows real-time analysis and minimizes latency in alerting law enforcement about potential security threats. Studies suggest that integrating IoT devices, like CCTV cameras, with real- time analytics at the network's edge is essential for scalable and reliable monitoring in public spaces. Such integration al- lows for a distributed approach to monitoring, making systemsmore resilient and responsive to incidents.

Several studies also highlight the importance of police- maintained criminal databases integrated with FR systems for effective monitoring. By providing up-to-date data on known offenders, these systems ensure law enforcement can react swiftly to potential threats. Research indicates that when databases are linked with FR systems, they enhance the overall capability of law enforcement to manage and respond to crime, particularly in crowded, transient spaces like public transportation. This integration enables instant recognition and response, which is critical for maintaining security and reducing crime rates in public spaces.

4.EXISTED SYSTEM

1. **CCTV Surveillance with Facial Recognition**
   - Cameras monitor public transport spaces.
   - Facial recognition scans individuals and compares them with a **police-maintained criminal database**.
   - If a match is found, an **alert is sent to the nearest police station**.
2. **Theft Detection via Behavioral Analysis**
   - Uses **machine learning algorithms** to identify suspicious behavior related to theft.
   - Unusual hand movements, closely following others, and loitering are flagged.
   - Alerts are sent with video evidence when theft-like behavior is detected.
3. **Communication & Integration**
   - **Real-time alerts** sent to law enforcement for rapid response.
   - **Cloud and edge computing** used for fast video processing and reduced latency.
   - System integrates with **city-wide surveillance and smart city infrastructure**.

5.PROPOSED SYSTEM

To address security concerns within public transport sys- tems, this project proposes a Smart Alert System that lever- ages real-time video analysis, facial recognition, and behavior monitoring to automatically detect and notify law enforcement of potential threats. The solution consists of two primary mod- ules designed to enhance public safety by identifying known criminals and detecting suspicious theft-related behaviors. This approach combines advanced machine learning, image pro- cessing, and real-time alerting, creating an automated security framework tailored to the high-traffic environment of public transportation.

Module 1: Criminal Identification via Facial Recognition The first module is built around a facial recognition system integrated with CCTV cameras across buses, trains, and trans- port stations. A central police-maintained database stores facial data of known criminals, and the CCTV cameras continu- ously analyze faces within the transport environment. Using advanced facial recognition algorithms, the system compares captured images to the stored criminal database in real time. If a match is identified, an immediate alert is generated and sent to the nearest police station, containing information such as the

location, time, and video evidence of the individual. This module allows for swift identification of high-risk individuals, enabling law enforcement to take preventive action before potential crimes occur.

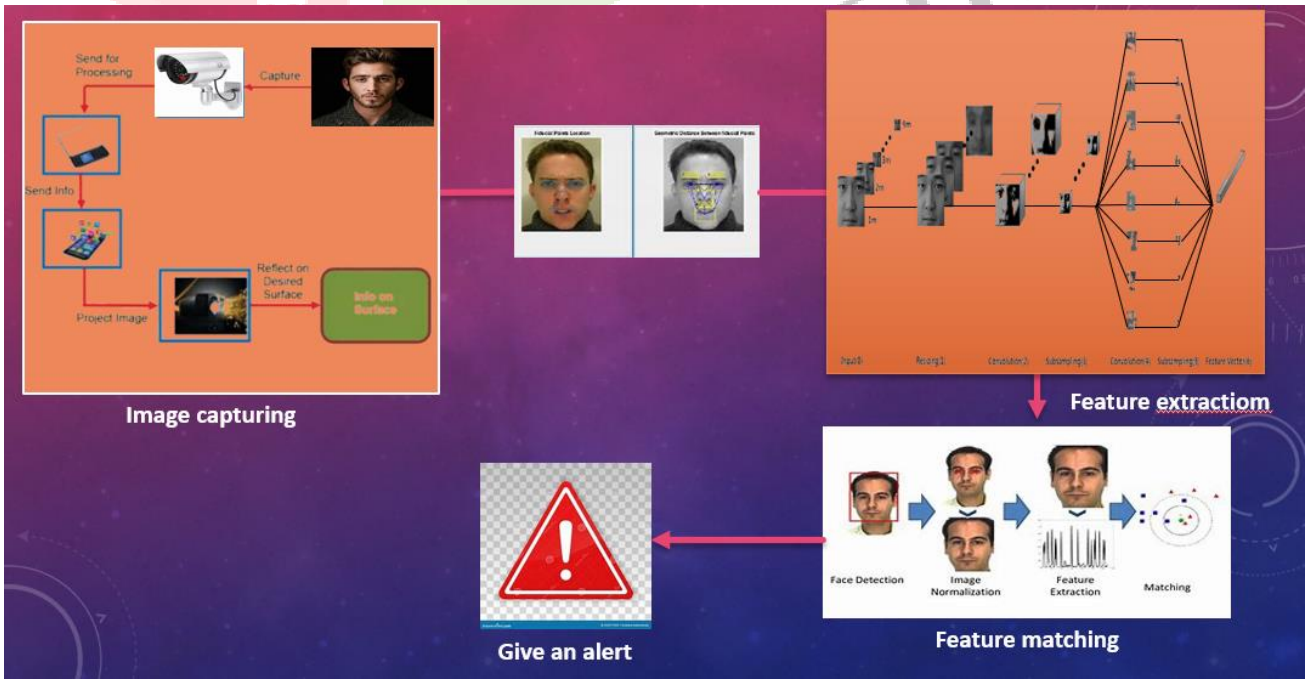
Module 2: Theft Detection via Behavior Analysis The second module focuses on identifying theft by analyzing the behavior of individuals within public transport settings. Using behavioral analysis algorithms, this module monitors patterns and movements that may indicate theft, such as unusual hand movements, closely following other passengers, or loitering in crowded areas. When the system detects suspicious behavior associated with theft, it triggers an alert to notify the police with specific details, such as location and timestamped video evidence. This capability is particularly valuable in crowded public transportation environments, where detecting theft manually can be challenging.

Integration and Communication Architecture The proposed system integrates with citywide police databases and CCTV infrastructure, enabling seamless sharing of data between transportation authorities and law enforcement. Alerts gener- ated by either module are relayed through a secure communi- cation channel, ensuring that law enforcement can receive and respond to notifications in real time. To enhance reliability and scalability, the system leverages cloud computing for data storage and processing, along with edge computing on-site to minimize latency and allow for fast, localized processing of video footage. This combination ensures the system can handle large volumes of data without compromising performance.

Benefits of the Proposed Solution The proposed Smart Alert System provides a robust, automated security solution that reduces the dependency on manual monitoring and enhances the ability of law enforcement to respond proactively. By com- bining facial recognition and behavioral analysis, the system not only deters crime but also creates a safer, more trusted environment for public transport users. Additionally, this solution aligns with smart city initiatives by optimizing existing infrastructure, minimizing human error, and contributing to a cohesive urban safety network.

6.ARCHITECTURE

The proposed architecture integrates cutting-edge image processing techniques and machine learning algorithms. It captures real-time images through surveillance cameras, processes them using convolutional neural networks (CNNs), and identifies potential threats by comparing facial features against criminal databases. Additionally, behavioral analysis detects suspicious activities such as theft, enabling proactive interventions.



1. Image Capturing (Left Section)

- **Capture Process:**
  - A surveillance camera captures real-time images or videos in public spaces**.**
- **Sending for Processing:**
  - Captured data is transmitted to a processing unit (e.g., servers or cloud-based systems).
- **Projection:**
  - Processed information, such as alerts or analysis results, is projected onto a surface (e.g., a monitoring dashboard or interface) for easy visibility by operators.

2. Facial Analysis (Middle Section)

- **Face Point Localization**:
  - Key facial features are identified, such as eyes, nose, and mouth.
  - A geometric analysis calculates distances between facial points to create a unique facial signature.
- **Feature Extraction**:
  - The processed face image passes through a **Convolutional Neural Network (CNN)**:
    - **Input Layer**: Receives the image data.
    - **Convolution Layers**: Extract detailed features like patterns and textures.
    - **Subsampling Layers**: Reduces the dimensionality of data while retaining essential features.
    - **Feature Vector**: Produces a numerical representation of the face for further analysis.

3. Feature Matching (Bottom Right Section)

- **Face Detection and Normalization**:
  - Detected faces are aligned and normalized to a standard format for consistency.
- **Feature Comparison**:
  - Extracted facial features are compared with a **criminal or authorized database** using advanced matching algorithms.
- **Matching Results**:
  - If a match is found, the system flags the individual for further investigation.
- **Alert Generation (Bottom Left Section)**
- If suspicious activity or a database match is detected:
  - An **alert is generated** and sent to the relevant authorities.
  - Alerts are often accompanied by contextual information, such as the location, timestamp, and relevant images or video.

7.CONCLUSION AND FUTURE WORKS

The Smart Alert System for Public Transport and Security represents a significant advancement in enhancing safety and security for both passengers and the surrounding community. By leveraging modern technologies such as facial recognition and theft detection, the system provides real-time monitoring and rapid response capabilities.

Module 1 ensures that potential threats, such as individuals with criminal backgrounds, are swiftly identified through seamless integration with a police-maintained database, allow- ing for immediate alerts to law enforcement. Module 2 focuses on detecting theft in public transport environments, enabling quick intervention to prevent or minimize loss.

Together, these modules offer a proactive approach to secu- rity, making public transport safer for all. The system improves situational awareness, enhances law enforcement's ability to act promptly, and ultimately contributes to a more secure, efficient, and safer public transport experience.

8.REFERENCES

1.White D, Dunn JD, Schmid AC, Kemp RI. Error rates in users of automatic face recognition software. PLoS One. 2015; 10: e0139827. https://doi.org/10.1371/journal.pone.0139827 PMID: 26465631

2. Bobak AK, Dowsett AJ, Bate S. Solving the border control problem: Evidence of enhanced face matching in individuals with extraordinary face recognition skills. PLoS One. 2016; 11: e0148148. https://doi. org/10.1371/journal.pone.0148148 PMID: 26829321

3. Robertson DJ, Noyes E, Dowsett AJ, JenkinsR, Burton AM. Face recognition by metropolitan police super-recognisers. PLoSOne. 2016; 11:e0150036.https://doi.org/10.1371/journal.pone.0150036 PMID: 26918457

4.Sareen P. Biometrics—introduction, characteristics, basic technique, its types and various performance measures. Int J Emerg Res Manag Technol. 2014; 3: 109–119.

5. Bhatia R. Biometrics and face recognition techniques. Int J Adv Res Comput Sci Electron Eng. 2013; 3: 93–99.

6. Haffner P. What is machine learning–and why is it important. Interactions. 2016;

7. Gamaleldin AM. An introduction to cloud computing concepts. Egypt: Software Engineering Competence Center; 2013. https://doi.org/10.1016/j.aju.2012.12.001 PMID: 26579251

8. Singh Dilbag, Kumar Vijay, and Kaur Manjit. "Classification of COVID-19 patients from chest CT images using multi-objective differential evolution–based convolutional neural networks." European Journal ofClinical Microbiology Infectious Diseases (2020): 1–11.https://doi.org/10.1007/s10096-020-03901-z PMID: 32337662