e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 11, November 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

© 2024 IJMRSET | Volume 7, Issue 11, November 2024| DOI: 10.15680/IJMRSET.2024.0711065

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Finding Lost People by Machine Learning

Manish Borse[1], Tejas Barhate[2], Ujjwal Amodkar[3], Sumit Borse[4], Prof.N.L.Bhale[5]

Department of Computer Engineering, Matoshri College of Engineering and Research Centre, Nashik, India

ABSTRACT: Efficient management of residential complexes is essential for enhancing living standards and operational efficiency. A Residential Management System powered by Machine Learning offers a transformative approach to managing modern residential communities. This system leverages ML techniques to automate and optimize key aspects such as security, maintenance, resource management, and resident engagement.

The proposed RMS integrates intelligent features like predictive maintenance to identify potential equipment failures, occupancy pattern analysis to optimize resource usage (e.g., electricity and water), and anomaly detection to enhance security through surveillance. Additionally, it employs natural language processing (NLP) to facilitate smooth communication between residents and management through chatbots and digital assistants. The system also utilizes recommendation algorithms to suggest community activities or services tailored to individual preferences.

By analyzing historical and real-time data, the ML-driven RMS reduces operational costs, improves decision-making, and provides a personalized experience for residents. This paper outlines the architecture, ML models, and deployment strategies of the system, emphasizing its potential to streamline residential management in smart cities.

I. INTRODUCTION

The integration of machine learning (ML) with surveillance systems has emerged as a revolutionary approach to address societal challenges, including the search for missing persons. In today's world, Closed-Circuit Television (CCTV) systems are widely deployed in public spaces, institutions, and private areas, generating massive amounts of visual data. Despite their ubiquity, these systems often remain underutilized due to the immense resources required to monitor and analyze footage manually.

The rising urban population and increasing human mobility have amplified the likelihood of individuals going missing. Traditional methods for locating lost persons, such as issuing public alerts, distributing flyers, or conducting manual searches, are time-intensive and often yield limited success. This gap in efficiency calls for technological interventions that can automate the process and enhance the likelihood of reuniting families with their loved ones.

Machine learning, particularly in the domains of facial recognition and object detection, offers a promising solution to this challenge. By processing live CCTV footage and leveraging pre-trained deep learning models, it becomes possible to identify lost individuals in real time. Such systems can analyze vast amounts of visual data continuously, reducing the time and effort required for manual surveillance while improving accuracy and response times.

II. LITERATURE SURVEY

Title: A Survey on Facial Recognition Techniques for Missing Person Detection
Author: Zhang, Y., Li, W., & Zhang, S.
Description: This study explores modern CNN-based facial recognition methods to identify missing persons from CCTV footage. It provides insights into the advancements in convolutional neural networks (CNNs) for facial recognition and their application in solving real-world problems such as missing person detection..
Title: A Novel Approach of Women Safety Assistant Device with Biometric Verification in Real Scenario.

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Title: Real-Time Surveillance System for Missing Person Detection Using CNNs
Author: Wu, J., & Tan, Z.
Description: This paper proposes a real-time surveillance system integrating live CCTV feeds with convolutional neural networks (CNNs) to efficiently detect missing persons. The system aims to enhance the accuracy and speed of detection, showcasing the potential of real-time machine learning applications in surveillance**.**

Title: Machine Learning for Video Analytics: A Study on Missing Person Detection
Author: Sundararajan, V., & Sivakumar, R.
Description: This research combines facial recognition with behavioral analysis to improve the accuracy of missing person detection in diverse environments. The study highlights the effectiveness of integrating multiple machine learning techniques to address challenges in video analytics.

III. PROBLEM STATEMENT

The increasing urbanization and mobility of populations have led to a rise in the number of individuals going missing. Traditional methods of locating missing persons, such as issuing public alerts, distributing flyers, or conducting manual searches, are slow, resource-intensive, and often ineffective in rapidly finding lost individuals. These methods are not scalable and require substantial human effort, making it difficult to respond quickly to such critical situations.

At the same time, CCTV surveillance systems, which are widely deployed in public spaces, transportation hubs, and even private areas, generate vast amounts of footage. However, this footage is often underutilized when it comes to locating missing persons due to the sheer volume of data and the inability of human operators to review hours of footage in real-time.

IV. OBJECTIVES

The objectives of the system are

- To reduce manual work to great extent.
- To design system based on two-factor Authentication(2FA).
- To implement the discussion module for better understanding of problem and visitor management system for manage a visitor.
- To implement complaint management system for taking a complaint from member about secretory and staff.
- To test and validate the results.

V. PROPOSED SYSTEM

The proposed system is a Residential Management System enhanced with Machine Learning algorithms to provide an intelligent, automated, and efficient approach to managing residential complexes. The system is designed to address critical aspects like security, resource optimization, maintenance scheduling, and resident communication.
Key Features of the Proposed System:

Security Automation:
Utilizes facial recognition algorithms to monitor and grant access to authorized residents and visitors.
Employs anomaly detection models to flag unusual activities in surveillance feeds in real time.

Predictive Maintenance:
Implements ML-based predictive models to detect and forecast equipment failures (e.g., elevators, HVAC systems) before they occur.
Automates maintenance scheduling based on data from IoT sensors installed in the premises.

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Resource Optimization:
Analyzes occupancy patterns and resource consumption (e.g., electricity and water usage) to optimize utilities, reduce waste, and lower operational costs.
Suggests energy-efficient alternatives based on past consumption trends.

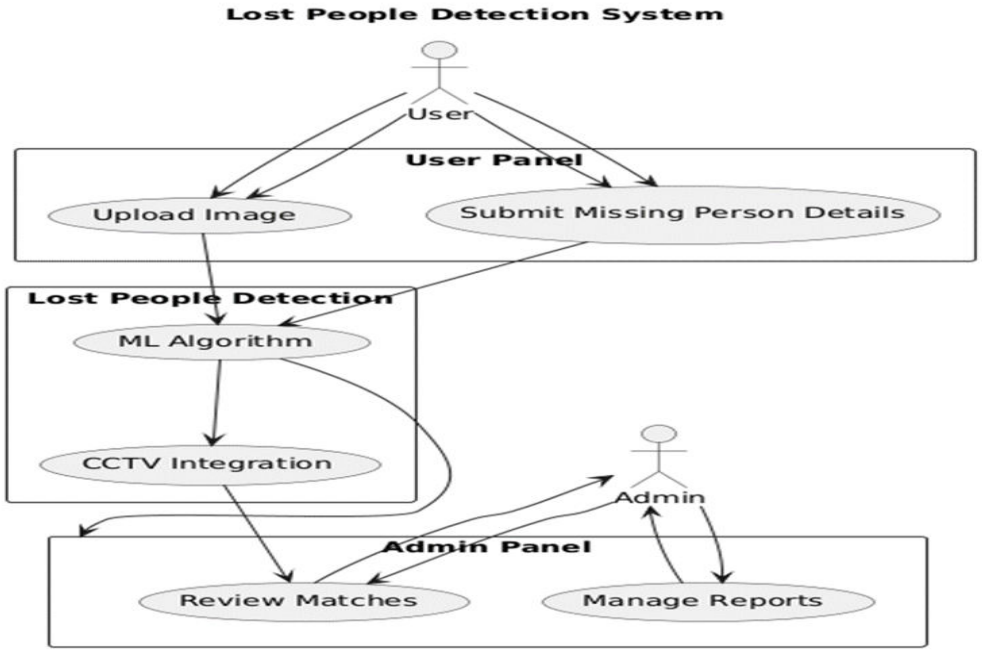
Resident Interaction:
Provides an AI-driven chatbot using Natural Language Processing (NLP) to handle resident queries and complaints seamlessly.
Recommends personalized community events and services through recommendation engines.

Real-Time Alerts and Notifications:
Delivers real-time alerts to management and residents in case of emergencies, such as fires, security breaches, or unusual activities.

VI. EXISTING SYSTEM

The existing residential management systems primarily rely on manual processes or basic rule-based automation for handling residential operations. While these systems provide fundamental management solutions, they lack intelligence, adaptability, and real-time optimization.
Inefficiency: Manual processes lead to delays in security checks, complaint resolutions, and maintenance activities.
Lack of Proactiveness: The system does not predict potential issues, such as equipment failures or resource shortages.
Data Underutilization: Existing systems fail to utilize historical and real-time data for actionable insights or optimization.
Limited Scalability: These systems often require significant manual intervention, making them less scalable for large or complex residential communities.
Resident Dissatisfaction: Delays in issue resolution and lack of personalized services negatively affect the resident experience.

VII. SYSTEM ARCHITECTURE



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The block diagram represents the architecture of a Lost People Detection System, which integrates Machine Learning algorithms and CCTV footage to facilitate the identification and location of missing individuals. It consists of three main components: the User Panel, the Lost People Detection Unit, and the Admin Panel. The User Panel allows users to interact with the system by uploading an image of the missing person and submitting relevant details such as their name, age, and last seen location. This information is processed in the Lost People Detection Unit, which employs advanced ML algorithms, such as Convolutional Neural Networks (CNNs), to perform facial recognition. The unit integrates with CCTV footage from various locations, enabling real-time and stored video analysis to identify potential matches.

The results are sent to the Admin Panel, where administrators verify the matches for accuracy and manage the reports. Admins review detected matches to ensure reliability and handle the database, while also communicating findings with families or law enforcement agencies. This system automates the detection process, reducing manual effort and speeding up the search for missing individuals. Its real-time integration with CCTV and streamlined report management make it a robust solution for addressing the challenges of locating missing persons effectively and efficiently.

VIII. CONCLUSION & FUTURE WORK

In conclusion, the Lost People Detection System leverages advanced machine learning algorithms and CCTV integration to provide an efficient, accurate, and automated solution for identifying and locating missing individuals. By incorporating user-uploaded data and real-time video analysis, the system significantly reduces manual efforts while enhancing the speed and precision of detection. The inclusion of an admin panel ensures proper verification and management of matches, fostering reliable communication with concerned parties such as families and law enforcement agencies. This innovative approach highlights the potential of technology to address critical societal challenges, offering a scalable and impactful solution for improving public safety and reuniting missing persons with their families.

Future Work:

The Lost People Detection System presents a robust foundation for addressing the challenges of locating missing individuals, but there are several opportunities for further enhancement. Future work can focus on improving system scalability by integrating more diverse data sources, such as public transport cameras, social media images, and crowd-sourced data from users. Advanced machine learning techniques like deep generative models or transfer learning could be explored to handle cases where images are outdated or of low quality, enhancing recognition accuracy.

- **Integration of Diverse Data Sources:**

Incorporate data from public transport cameras, social media platforms, and user-contributed images to expand detection capabilities.

- **Improved Image Handling:**

Utilize advanced techniques like deep generative models and transfer learning to improve recognition of outdated or low-quality images.

- **Multi-Modal Data Fusion:**

Combine facial recognition with other data types such as voice recognition, gait analysis, or behavioral patterns for enhanced detection accuracy.

- **Optimization for Low-Resource Environments:**

Adapt the system for edge devices and mobile platforms to ensure scalability and accessibility in under-resourced regions.

- **Enhanced Privacy and Security:**

Implement privacy-preserving techniques such as federated learning to protect sensitive user data and adhere to ethical guidelines.

- **Global Collaboration:**

Develop a network to connect systems across different regions for international-scale missing person detection.

- **Real-Time Alerts:**

Improve real-time notification mechanisms for faster response and coordination with families and authorities.

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- **AI Explainability:**

Enhance system transparency by implementing explainable AI methods to help users and admins understand decision-making processes.

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