Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 4, April : 2024

FACE DETECTION OF LOST PERSON & CRIMINALS USING IMAGE PROCESSING

Sainath Balkawade [1], Pratik Nikam[2], Dipak Machanna[3], Sarthak Mahadik4 *Students of Department of Computer Engineering, Trinity, Pune, India[1,2,3,4]*

Prof. Amruta Sarudkar *Prof. Department of Computer Engineering, Trinity, Pune, India[5]*

***ABSTRACT*: The "Lost Criminal Person Identification System" embodies a sophisticated amalgamation of computer vision and artificial intelligence methodologies aimed at bolstering public safety and security measures. Employing cutting-edge image recognition algorithms, the system operates on a multifaceted approach to monitor public spaces, focusing on the identification of individuals both lost and with criminal backgrounds. Through real-time surveillance and analysis of camera feeds, the system effectively matches facial data against databases of missing persons and known criminals. This advanced capability not only aids in the prompt reunification of lost individuals with their families but also facilitates the swift apprehension of potential threats to community safety. By seamlessly integrating face recognition technology with criminal identification protocols, the system empowers authorities to proactively address security concerns, ultimately fostering a safer and more secure environment for society at large.**

KEYWORDS: Face Detection, Mask Detection, Criminal Person, Lost Person, Image Processing, Surveillance System

I. INTRODUCTION

In an era defined by heightened concerns for public safety and the imperative for technologically-driven solutions, the conception of a sophisticated system for Lost Person and Criminal Identification emerges as a pivotal endeavour. This project signifies the fusion of state-of-the-art computer vision and deep learning methodologies to address multifaceted challenges prevalent in contemporary society. In a landscape characterized by evolving security threats and the imperative for efficient health compliance measures, the development of a system capable of swiftly identifying lost individuals, locating potential criminals, and enforcing mask adherence represents a critical stride towards enhancing societal safety and security.

Moreover, this project harnesses the transformative potential of artificial intelligence and surveillance technology to not only bolster mask detection capabilities but also to proactively identify individuals of interest and mitigate security risks. By amalgamating these functionalities, the system presents a holistic solution for augmenting public safety measures, particularly pertinent in a global context where such concerns are paramount. [4] This project narrative delves into the intricate development process, meticulous implementation strategies, and comprehensive performance evaluation of the innovative Lost Person and Criminal Identification System, underscoring its capacity to address the nuanced challenges confronting contemporary society.

Within the realm of technological advancements geared towards public safety and security, the integration of Lost Person and Criminal Identification functionalities emerges as a pivotal advancement. Against the backdrop of a persistent global health crisis necessitating stringent adherence to mask mandates, coupled with escalating concerns surrounding public safety, the imperative for automated detection systems becomes increasingly pronounced. Simultaneously, the exigency for swift and precise identification of lost individuals and potential threats underscores the indispensability of intelligent surveillance solutions. This project endeavours to explore and elucidate the development trajectory of a comprehensive system amalgamating facial recognition precision with cutting-edge algorithms, with the overarching goal of realizing an adept Lost Person and Criminal Identification System poised to meet the multifaceted challenges of contemporary society.

II. **RELATED WORK**

The task of lost criminal person identification poses several challenges, particularly in scenarios where faces may be scaled, illuminated, or occluded. Traditional face detection methods like MTCNN have shown dependable performance on unconstrained faces but struggle with these variations. [1] To address these challenges, recent advancements have been made, leveraging large-scale datasets such as MS-Celeb-1M and WIDER FACE to develop more robust algorithms. Two-stage detectors have shown accurate performance but suffer from low speed, prompting the exploration of faster approaches.

One such approach is the single-stage detector, exemplified by the YOLO algorithm, which achieves rapid detection by dividing the image into cells and locating objects within each cell.

However, YOLO's reliance on constant receptive area feature maps limits its effectiveness for small objects, including faces. In response, the Single Stage Headless (SSH) face detector was developed, leveraging multi-scale detection and image pyramids to achieve scale invariance. Additionally, the Face Attention Network (FAN) employs an anchor point attention mechanism to enhance recall, particularly for occluded faces, while maintaining a low false positive rate.

In the realm of face verification, which is integral to identifying lost criminal persons, significant progress has been made through the evolution of methodologies. Early approaches relied on techniques like Principal Component Analysis (PCA) for feature extraction and feed-forward neural networks for recognition. These methods were effective but limited in scalability and robustness.[2] Modern techniques, such as Deep Face and Face Net, have revolutionized face recognition by integrating 3D face modelling, affine transformations, and deep learning. Face Net, for instance, maps face images to a Euclidean space, generating embeddings that serve as a measure of similarity. Its unique online mining triplet approach enhances representational performance, leading to state-of-the-art results.

In summary, advancements in face detection and verification have greatly contributed to the development of systems for lost criminal person identification. [3] By leveraging large-scale datasets, innovative algorithms, and deep learning techniques, these systems offer enhanced accuracy, speed, and robustness in identifying individuals, even in challenging conditions such as illumination variations and occlusions.

III. PROPOSED METHODOLOGY

The proposed system operates through a comprehensive integration of advanced technologies to address critical issues during the pandemic period and beyond. Utilizing a setup equipped with TensorFlow, Kera’s, Inutile, NumPy, OpenCV-python, matplotlib, and SciPy libraries, the system is primed for real-time monitoring and detection in various public spaces like malls, airports, and bus stands.

For face mask detection, the system employs a multi-step approach. Initially, it captures input from cameras positioned strategically in public areas. These cameras feed video streams, which are processed using image processing and pre-processing techniques. Subsequently, the system utilizes

face detection algorithms to identify individuals within the frame. Upon detecting a face, it applies face recognition algorithms to match against stored data. Simultaneously, a Convolutional Neural Network (CNN) algorithm assesses whether the detected faces are wearing masks or not. If a person is found without a mask, the system promptly alerts the higher authorities for necessary action.

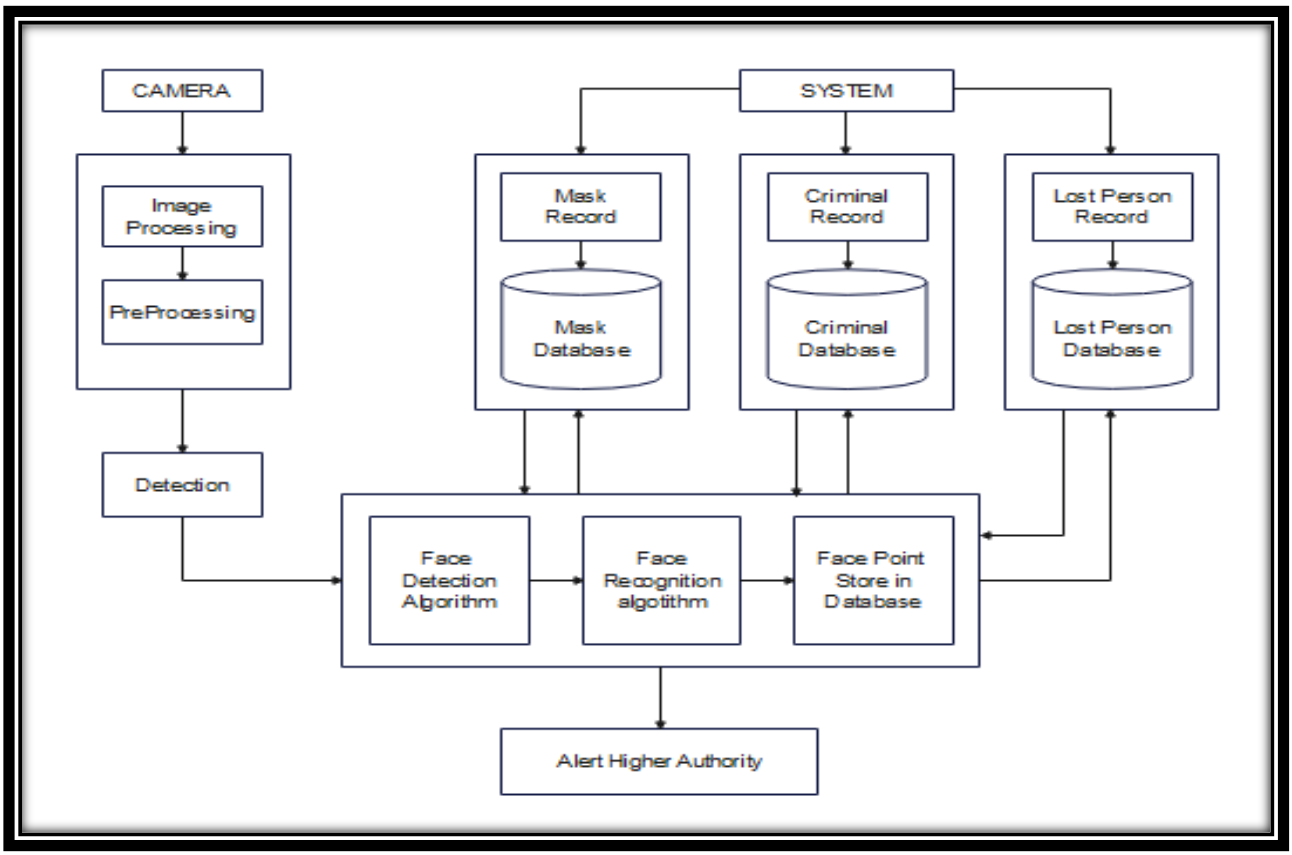


Fig 1. Proposed System Architecture

In criminal detection, the system follows a similar methodology. Again, input is captured through camera feeds and processed accordingly. The captured data undergoes comparison with stored information to identify potential matches with criminal records. If a match is found, indicating the presence of a wanted individual, the system promptly alerts the authorities, facilitating swift action to ensure public safety.

Lastly, for lost person detection, the system employs a similar workflow. Camera feeds provide the input, which undergoes processing and comparison with stored data to identify lost individuals. Upon detection, the system generates alerts to notify the higher authorities or family members, facilitating reunions and ensuring the well-being of those separated from their loved ones.

In essence, through the integration of advanced algorithms and real-time monitoring capabilities, the proposed system offers a robust solution for addressing key challenges during the pandemic period, including enforcing mask mandates, identifying criminals, and reuniting lost individuals with their families. By leveraging cutting-edge technologies, it contributes to enhancing public safety and security in diverse public settings.

The system for lost criminal person identification operates by initially capturing input from cameras positioned in public areas such as malls, airports, and bus stands. These cameras feed video streams which undergo image processing and pre-processing techniques. The processed data is then compared with stored information to identify potential matches with criminal records. Simultaneously, face detection algorithms are employed to locate individuals within the frame, while face recognition algorithms aid in matching against stored data. If a match is found indicating the presence of a wanted individual who is also lost, the system generates alerts to notify the higher authorities for immediate action. This comprehensive approach ensures that both the criminal and lost status of the individual are addressed concurrently, enhancing public safety and facilitating swift resolutions to critical situations.

IV. WORKING MODULE

The proposed methodology harnesses advanced image processing techniques to create a robust Face Mask Detection System integrated with Lost Person and Criminals Detection capabilities. By leveraging computer vision algorithms, the system enables real-time identification of individuals wearing or not wearing masks, thereby ensuring compliance with pandemic safety measures. Concurrently, it employs facial recognition technology to detect lost persons and potential criminals within crowded environments. Through intricate image analysis, the system swiftly matches facial features against extensive databases, assisting law enforcement agencies in locating missing individuals and apprehending suspects. This innovative solution not only reinforces public health measures by enforcing mask mandates but also significantly enhances public security by efficiently managing individuals of interest across diverse settings.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 4, April : 2024

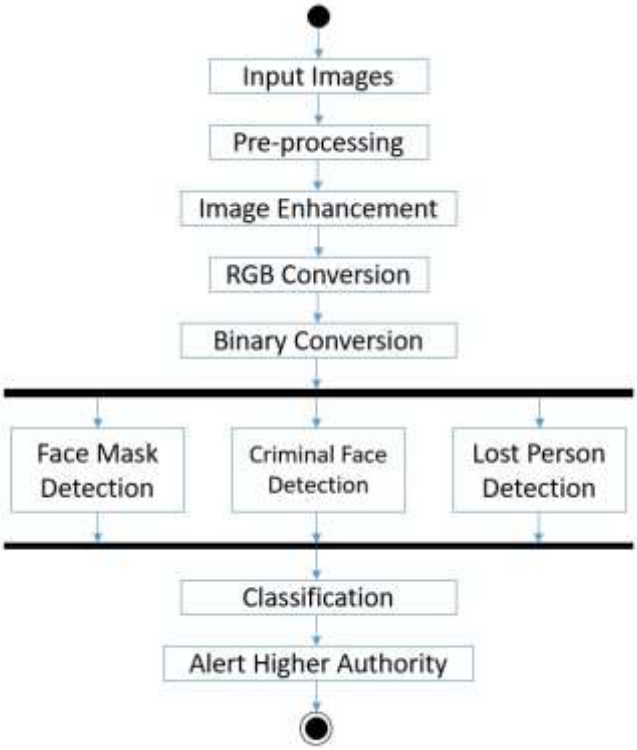


Fig 2: Working Flow Diagram

Central to the methodology is the use of facial recognition systems, sophisticated electronics capable of accurately identifying human faces from digital images or television frames against comprehensive databases. These systems play a pivotal role in authenticating individuals through ID verification services, leveraging precise facial feature identification and measurement from captured images. Additionally, the methodology extensively utilizes Image Processing techniques to transform digital images into actionable data, enabling the extraction of valuable insights or enhancements from visual information. By processing images in various ways, the system can extract pertinent information crucial for face detection, mask identification, and facial recognition tasks.

OpenCV, a powerful open-source library for computer vision, machine learning, and image processing, forms the cornerstone of the proposed methodology. With its extensive capabilities, OpenCV facilitates the processing of images and videos to identify objects, faces, and even handwriting. The library's cross-platform nature enables the development of versatile computing applications, particularly focusing on tasks like face detection and object recognition. Leveraging

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 4, April : 2024

OpenCV's features, the proposed methodology empowers the system to conduct real-time analysis of camera feeds, enabling rapid detection of individuals without masks, lost persons, or potential criminals. Through the integration of OpenCV with other components, the system achieves a comprehensive solution for enhancing public safety and security across various public spaces.

V. RESULTS

User and Admin login

Admin login

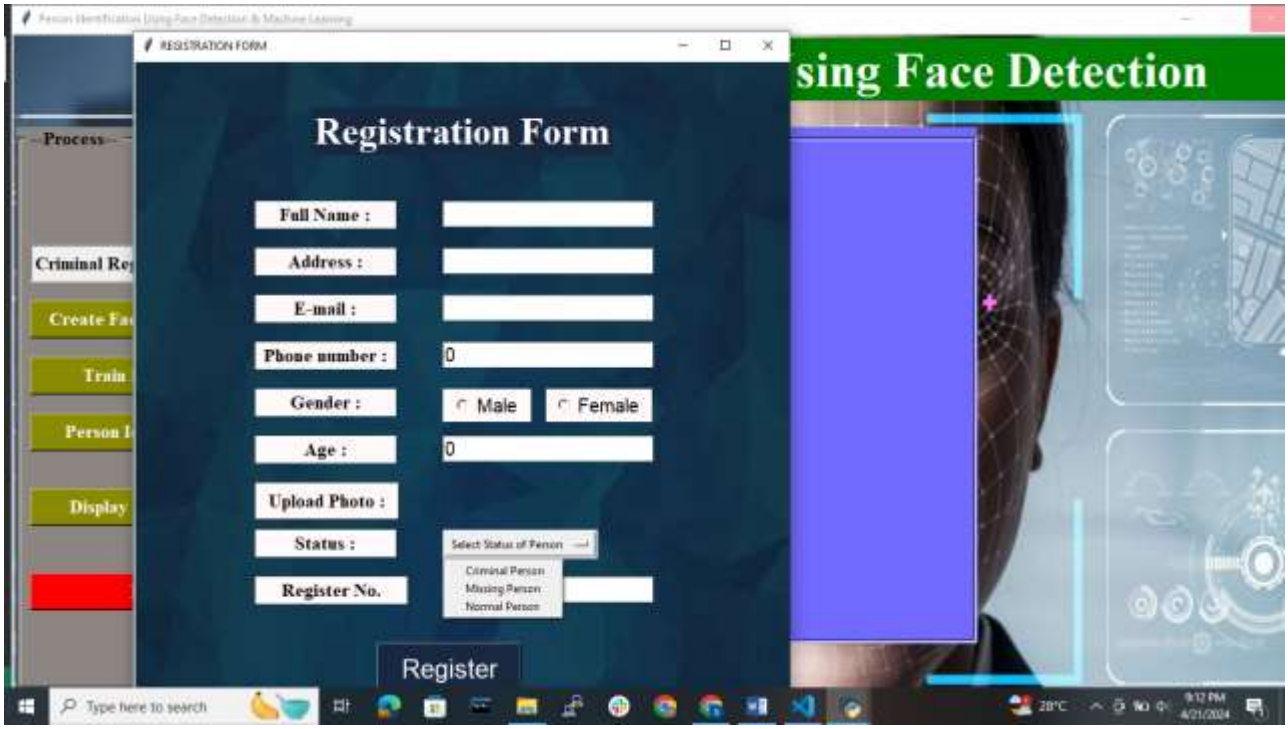
Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 4, April : 2024

Records at admin side

Person identification

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 4, April : 2024

Criminal registration



VI. CONCLUSION

In summary, the integration of Face Mask Detection System with Lost Person and Criminals Detection through image processing epitomizes a ground breaking advancement in the realm of public safety and security technology. Through seamless amalgamation of mask compliance surveillance with the identification of lost individuals and potential criminals, the system not only ensures strict adherence to health protocols amidst the ongoing pandemic but also significantly bolsters law enforcement endeavours. Its adeptness in real-time, precise detection furnishes indispensable support to authorities, fortifying public safety measures and expediting responses to exigent situations. This pioneering solution underscores the transformative potential of image processing technologies in addressing multifaceted challenges, thereby fostering safer and more secure communities.

REFERENCES

1. Nurul Azma Abdullah, Md. Jamir Saidi and Nurul Hidayah Ab Rahman "Face recognition for criminal identification: An implementation of principal component analysis for face recognition "The 2nd International Conference on Applied Science and Technology 2017 (ICAST'17)
2. Apoorva, Ramesh and Varshitha.M.R "Automated criminal identification by face recognition using open computer vision classifiers" Third International Conference on Computing Methodologies and Communication (ICCMC 2019).
3. Ramanagaram, K.Kumarasiri, S.D.D, Tharuka, W. A. D. Samaranayake, N. Samarasinghe and P. Siriwardana "CIS: An Automated Criminal Identification System". 2018 IEEE International Conference on Information and Automation for Sustainability (ICIAfS)R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.
4. Mantoro, T., Ayu, M. A., & Suhendi. (2018)." Multi-Faces Recognition Process Using Haar Cascades and Eigenface Methods" 2018 6th International Conference on Multimedia Computing and Systems (ICMCS).
5. Chang L , Yang J, Li S, Xu H, Liu K & Huan, C. (2018). "Face Recognition Based on Stacked Convolutional Autoencoder and Sparse Representation". 2018 IEEE 23rd International Conference on Digital Signal Processing (DSP).