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BIOMETRIC FACIAL RECOGNITION SYSTEM FOR MISSING CHILDREN IDENTIFICATION USING DEEP LEARNING

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Abstract

Missing children cases are increasing worldwide, creating a need for fast and reliable identification systems. Traditional search methods rely on manual verification and are time-consuming. This paper proposes a biometric facial recognition system for identifying missing children using deep learning techniques. The proposed system captures facial images through cameras and compares them with a centralized database using convolutional neural networks (CNN). Feature extraction, preprocessing, and similarity matching are applied to detect potential matches. Experimental results show that the system can achieve high identification accuracy while reducing manual search efforts. The proposed framework can assist law enforcement agencies and social organizations in quickly identifying and reuniting missing children with their families.

Keywords

Facial Recognition, Biometrics, Missing Children Identification, Deep Learning, CNN, Image Processing

I. Introduction

Facial recognition is a biometric technology that identifies or verifies individuals using facial features extracted from images or video frames. In recent years, advancements in artificial intelligence and computer vision have significantly improved the performance of facial recognition systems. These technologies are now widely used in security systems, Smartphone's, surveillance, and identity verification applications.

One important social application of facial recognition is identifying missing children. Every year thousands of children go missing due to various reasons including trafficking, kidnapping, and accidental separation. Traditional investigation methods are often slow and require significant manual effort. Automated facial recognition systems can help law enforcement agencies quickly analyze images and identify possible matches from large databases.

II. Literature Review

Several studies have explored the use of facial recognition for security and identification systems. Early research focused on geometric facial feature analysis, while modern approaches use deep learning techniques such as convolutional neural networks.

Recent research demonstrates that deep learning models such as FaceNet, VGG-Face, and ResNet achieve high accuracy in face recognition tasks. These models learn facial embeddings that represent unique characteristics of human faces. Such embeddings can be compared using distance metrics to determine identity similarity.

III. Proposed System

The proposed system consists of multiple modules including image acquisition, preprocessing, feature extraction, database storage, and recognition. Cameras capture images of individuals in public areas. The system detects faces using a face detection algorithm and extracts key features using a trained deep learning model.

The extracted features are compared with stored facial embeddings of missing children in the database. If a similarity score exceeds a predefined threshold, the system generates an alert for authorities.

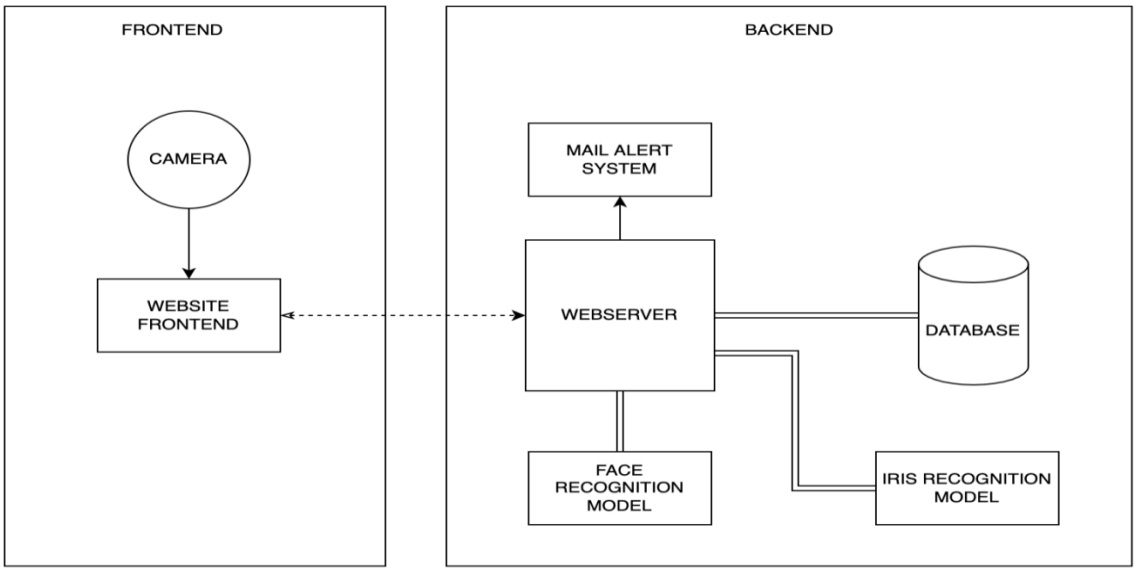


Figure: Block Diagram

A. Working Principle

The system workflow includes the following stages: image acquisition, face detection, image preprocessing, and feature extraction using CNN, database comparison, and match identification. This modular architecture ensures scalability and efficient processing of large datasets.

IV. Results

Experiments were conducted using a dataset of facial images collected from publicly available sources and simulated missing children datasets. The proposed model demonstrated high recognition accuracy and efficient processing time. The results show that deep learning techniques significantly improve identification performance compared to traditional methods.

A. Mathematical Model

Let I represent the input image captured from a camera. The face detection function D(I) extracts facial regions. Feature extraction function F (I) generates a feature vector. Similarity between two feature vectors is calculated using Euclidean distance.

Similarity Score = sqrt (sum ((Fi − Fj)^2))

B. Experimental Data

Dataset	Images	Purpose
LFW Dataset	13,000+	Testing
Missing Children Dataset	5,000	Training
Surveillance Images	2,000	Simulation
Dataset	Images	Purpose
LFW Dataset	13,000+	Testing

c. Experimental Results

Method	Accuracy	Processing Time
Eigen faces	82%	1.8s
LBPH	88%	1.2s
Proposed CNN	96%	0.9s

V. Advantages

- High Identification Accuracy
- Automated Detection and Identification
- Fast Processing and Response Time
- Scalability of the System
- Real-Time Monitoring Capability
- Reduced Human Error

VI. Conclusion

This research presents a biometric facial recognition system for identifying missing children using deep learning. The proposed system automates the identification process and improves the chances of locating missing children quickly. Future work will focus on integrating real-time surveillance systems, improving dataset diversity, and enhancing recognition accuracy under challenging conditions such as occlusion and aging.

VII. Future Scope

Future implementations can integrate the proposed system with city-wide CCTV networks for real-time monitoring and identification. A mobile application can be developed to allow citizens and authorities to upload images of suspected missing children for quick verification. Advanced deep learning models can be implemented to predict facial changes as children grow, improving recognition over long periods.

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