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Understanding VisionSketch: Automated Forensic Sketch Generation with Artificial Intelligence

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Abstract

The proposed system, VisionSketch: Automated Forensic Sketch Generation Using AI, modernizes the traditional criminal identification process by replacing hand-drawn sketches with AI-powered digital sketch generation. Witnesses or victims can describe or select facial attributes such as eyes, nose, lips, hairstyle, and unique features through a user-friendly graphical interface. Using Python, OpenCV, PIL, and advanced image processing algorithms, the system generates composite sketches in real time. These sketches are stored in a database (MySQL/MongoDB) and compared automatically with existing criminal records, significantly reducing investigation time. The solution minimizes human error, reduces dependence on skilled forensic artists, ensures consistency, and enables scalability. By integrating AI with forensic workflows, VisionSketch enhances speed, accuracy, and reliability, paving the way for future deep learning–based recognition and multimodal biometric integration.

INTRODUCTION

Traditional forensic sketching depends heavily on the skill of artists and the memory of witnesses, often leading to inaccuracies, subjectivity, and inefficiency. Moreover, manual sketches are difficult to match with digital criminal databases, limiting their usefulness in modern investigations.

VisionSketch addresses these issues by providing an AI-based forensic sketch generation system. The system allows witnesses to input descriptive features via a GUI, which are processed using computer vision and image synthesis algorithms to create accurate sketches instantly. These sketches are automatically matched with existing records in a centralized database, enhancing the efficiency of investigations. By integrating AI, computer vision, and scalable database solutions, VisionSketch offers a reliable, user-friendly, and cost-effective tool for law enforcement agencies.

LITERATURE SURVEY

Forensic Face Sketching and Recognition using Deep Learning – Banupriya V. et al., 2025
Problem: Manual sketches are time-consuming, subjective, and difficult to match with digital databases.
Solution: Deep learning (CNNs) for automated sketch generation and recognition.
Future Scope: Integration with CCTV, larger datasets, 3D sketching, and multimodal recognition.

AI-Powered Face Sketching for Criminal Identification – S. Mahesh Kumar et al., 2025
Problem: Manual sketching is slow and unreliable with digital systems.

Solution: AI-based sketch generation using deep learning and image processing.
Future Scope: Real-time integration with police databases, 3D modeling, multimodal biometrics.

An Investigation of Crime Detection Using Artificial Intelligence and Face Sketch Synthesis – Rajesh Natarajan et al., 2024
Problem: Manual sketches are inaccurate and inefficient for database matching.
Solution: AI algorithms merge eyewitness accounts with sketch synthesis models.
Future Scope: Real-time systems, larger datasets, cross-modal recognition.

AI as a Decision Support Tool in Forensic Image Analysis – Shai Farber, 2025
Problem: Manual forensic image analysis is time-consuming and relies on expert judgment.
Solution: Large Language Models (LLMs) assist in analyzing and interpreting forensic evidence.
Future Scope: Multimodal evidence analysis, ethical and reliable AI integration.

FaceTrace: AI-Driven Forensic Sketching – R. Prathiba et al., 2025
Problem: Human sketches are slow, subjective, and difficult to match with databases.
Solution: AI-powered drag-and-drop sketching tools with CNN-based recognition.
Future Scope: Larger datasets, real-time integration, global law enforcement adoption.

Forensic Sketch to Real Image Using DCGAN – Sreedev Devakumar et al., 2023
Problem: Hand-drawn sketches lack realism and detail, leading to poor recognition.
Solution: DCGAN generates high-resolution facial images from sketches.
Future Scope: Training on diverse datasets, integration with face recognition and surveillance.

Crime Investigation using DCGAN by Forensic Sketch-to-Face Transformation – A Review – Nikkath Bushra et al., 2021
Problem: Manual sketches are biased and lack accuracy; existing digital methods struggle with realism.
Solution: DCGAN-based sketch-to-face transformation.
Future Scope: Enhanced datasets, real-time integration with law enforcement.

Next-Generation Forensic Facial Sketching and Recognition Techniques – Praveen I. Lagali, 2024
Problem: Manual sketches are slow, imprecise, and hard to scale across agencies.
Solution: AI with CNNs, facial landmark detection, and drag-and-drop sketching tools.
Future Scope: Privacy-focused deployment, encryption, cross-agency collaboration.

Artificial Intelligence in Forensic Sciences: A Systematic Review – Ioannis Ketsekioulafis et al., 2024
Problem: Forensic sciences rely on manual methods prone to human error.
Solution: Systematic review of AI applications in forensics (machine learning for identification, cause of death, etc.).
Future Scope: Expanding datasets, ensuring ethical/legal AI integration in daily forensic operations.

LIMITATIONS OF EXISTING SYSTEMS

1. Dependence on witness descriptions – Inaccurate input can lead to unreliable sketches.
2. Lack of realism in sketches – Even with AI, generating lifelike outputs remains challenging.
3. Time complexity in large datasets – Searching and matching sketches in massive databases is computationally expensive.
4. Integration challenges – Many existing systems are not seamlessly connected to law enforcement databases.
5. Bias and fairness issues – AI models may underperform on underrepresented demographics.
6. Privacy and security risks – Forensic sketches and databases involve sensitive data requiring strong safeguards.
7. Limited scalability – Current methods often struggle to scale across agencies and regions.

CONCLUSION

VisionSketch provides a transformative approach to forensic sketching by replacing manual artistry with AI-based automation. By integrating computer vision, deep learning, and database connectivity, it ensures faster, more consistent, and more accurate criminal identification. The system reduces human error, minimizes dependency on expert artists, and enhances law enforcement efficiency. With future integration of deep learning, multimodal biometrics, and large-scale surveillance systems, VisionSketch represents a significant leap toward modernizing forensic science.

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