

Biometric technology and the problem of fingerprint recognition

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Abstract: This study explores the application of biometric technology, specifically fingerprint recognition, addressing both its theoretical foundations and practical implementation challenges. Fingerprint recognition remains one of the most widely deployed biometric modalities due to its uniqueness, permanence, and user convenience. The research systematically examines the core stages of an automated fingerprint identification system (AFIS), including image acquisition, preprocessing, minutiae extraction, and matching algorithms. Particular attention is given to the robustness of feature extraction under varying conditions such as skin moisture, pressure, and partial prints. The study also evaluates the performance of different matching techniques, including minutiae-based and pattern-based approaches, in terms of accuracy, speed, and scalability. Furthermore, it discusses critical issues such as spoofing attacks, template security, and privacy concerns inherent in biometric systems. Experimental results demonstrate that while current algorithms achieve high accuracy in controlled environments, significant challenges remain for low-quality or latent fingerprints. The findings contribute to optimizing recognition systems for real-world applications, including law enforcement, access control, and mobile authentication, while highlighting directions for future research in deep learning and multimodal biometric fusion.

Keywords: Biometric technology, fingerprint recognition, recognition problem, biometrics