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Fingerprint Based File Encryption-Decryption System

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Abstract: *The emerging digital security threats require strong data protection methods to provide confidentiality, integrity, and accessibility of sensitive documents. Conventional password-based security solutions are vulnerable to attacks like weak passwords, lost credentials, and unauthorized access. To overcome such shortcomings, this paper proposes a Fingerprint-Based File Encryption-Decryption System, combining biometric verification and cryptographic encryption to offer an extremely secure and easy-to-use file security solution. The system to be developed utilizes fingerprint identification to act as the encryption and decryption key so that only authorized users can read files. It uses AES (Advanced Encryption Standard) for encryption and takes advantage of biometric-based dynamic generation of keys for additional security. In contrast to systems that traditionally use static passwords, this method reduces the vulnerability of data breaches and key compromises. A user-friendly Python Tkinter-based graphical user interface (GUI) adds usability, providing real-time authentication feedback, encryption status feedback, and error handling facilities. Arduino-based fingerprint sensors are included in the system through serial communication, giving biometric verification accurately. Multithreading also allows smooth, responsive operation. With biometric security, cryptographic encryption, and interactive user interface, this system enhances protection of data and eradicating password weaknesses, thus making it suitable for corporate settings, legal document protection, and individual data security.*

Keywords: Biometric Security, Fingerprint Authentication, Cryptographic Encryption, AES Encryption, Secure File Management, Data Protection

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