Super Resolution for Fingerprint Recognition

Anila Raj[1], Athira Rajan[2], Harikrishnan K A[3], Sandhyamol S[4], Akhija Lakshmi R[5]
[1,2,3,4] *B.Tech Student, Mount Zion College of Engineering, Kadammanitta, Kerala, India*
[5]*Assistant Professor, Department of Computer Science and Engineering, Mount Zion College of Engineering, Kadammanitta, Kerala, India*

***Abstract*- Super-resolution (SR) technique reconstructs a higher-resolution image. For more than three decades SR has been developed, both multi-frame and single-frame SR have significant applications in our daily life.Finger print recognition system is used as an application of super resolution in forensic department. Latent fingerprints have been used as an important evidence to identify criminals in law enforcement agencies for more than a century. Prior to feature extraction, fingerprint enhancement is necessary to remove noises and enhance the clarity of ridge structures in latent fingerprints. First, the total variation model is applied to decompose into cartoon and texture components. The cartoon component with most of the nonfingerprint patterns is removed as the structured noise, whereas the texture component consisting of the weak latent fingerprint is enhanced in the next stage. A multiscale patch-based sparse representation method is used for the enhancement of the texture component. Gabor elementary functions use dictionaries to capture the characteristics of fingerprint ridge structure, and multiscale patch-based sparse representation is iteratively applied to reconstruct high-quality fingerprint image.**

Index Terms- Latent fingerprint enhancement, sparse representation

I. INTRODUCTION

To increase the native resolution of an input image interpolation algorithm is used. An obvious application of image interpolation is the reproduction of images captured by digital cameras for high quality prints in magazines, catalogs, wall posters, or even home use.

The interpolation based approaches are the basic image super-resolution methods, where currently the bi-linear interpolation and bi-cubic interpolation are still very popular in practice. Interpolation based approaches have high computation speed and tends to blur high frequency details if the up-scaling ratio is large and if the low-resolution image is generated with anti-aliasing operation. The learning-based approaches assume that the lost high frequency details in LR images can be retrieved and hallucinated from a dictionary of image patch pairs.

One of the important application of super resolution is latent fingerprint recognition. Fingerprint recognition is one of the best known and most widely used biometric technologies.Until recently, fingerprint recognition was used primarily in law enforcement applications.Latent fingerprints were manually matched against previously enrolled full (rolled or plain) fingerprints by latent examiners to find the suspects before introduction of automated fingerprint identification system (AFIS).Tremendous advances have been made on developing AFIS for full print to full print matching. Compared to the rolled and plain fingerprints, latent fingerprints are usually flow image quality, caused by unclear ridge structure, uneven image contrast, and various overlapping patterns such as lines, printed letters, handwritings or even other fingerprints, etc. Due to the low image quality, automatic feature extraction is still undesirable for latent fingerprints and features such as minutiae and singular points need to be manually marked by latent examiners for identification. However, manual markup of minutiae features is not only time-consuming but also short of repeatability and compatibility. First, the minutiae features in the same fingerprint marked by different latent examiners or by the same examiner but at different times may not be same, which results in making different matching decisions on the same latent-exemplar pair. Second, in current practice, minutiae features in latent fingerprints are manually marked while the minutiae features in enrolled fingerprints are automatically extracted, which may cause a compatibility problem. .Thus, manually

marking minutiae features is not the best solution for latent fingerprint identification. Before input to AFIS, latent fingerprints need to go through an enhancement stage which removes various overlapping patterns, connects broken ridges and separates joined ridges.

II. AIM

Objective for this project is listed below:

- To study the importance of fingerprint recognition in the current biometric authentication systems.
- To determine the factors affecting the fingerprint recognition system.
- To investigate the factors affecting the fingerprint recognition rate.
- To develop an effective algorithm for fingerprint recognition.
- To collect standard database of fingerprints.
- To develop MATLAB code for the effective fingerprint recognition algorithm.
- To determine the percentage of recognition from the developed code.
- To compare the recognition percentage with previous recognition rate of other researchers.

III. SCOPE

Honeywords are used in authentication system The main aim of project is to validating whether data access is authorized or not when abnormal information access is detected.

1. Confusing the attacker with fake information.
2. This protects against the misuse of the user's real data.
3. Here, we propose a different approach for securing the cloud using decoy information technology, that we have come to call fog computing.
4. We use this technology to launch disinformation attacks against malicious insiders, preventing them from distinguishing the real sensitive customer data from fake worthless data.

IV. RELATED WORKS

A. Latent Fingerprint Enhancement via MultiScale Patch Based Sparse Representation Manhua Liu, Xiaoying Chen, and Xiaoduan Wang

They have proposed a latent fingerprint enhancement algorithm, which effectively combines the TV model and the multi-scale patch based sparse representation for removing noises and improving the clarity of ridge structure. Each latent image is decomposed into cartoon and texture components by the TV model and the multi-scale patch based sparse representation is iteratively applied on the texture component to reconstruct the high quality fingerprint image.

B. A Practical Approach to Super-Resolution: By SinaFarsiu , Michael Elad, PeymanMilanfar

Theoretical and practical limitations usually constrain the achievable resolution of any imaging device. Super Resolution (SR) methods are developed through the years to go beyond this limit by acquiring and fusing several low-resolution (LR) images of the same scene, producing a high-resolution (HR) image. The early works on SR although occasionally mathematically optimal for particular models of data and noise, produced poor results when applied to real images.

C.FingerprintRecognition using MATLAB by Zain S. Security can be easily breached in these systems when a password is divulged to an unauthorized user or a card is stolen by an impostor; further, simple passwords are easy to guess (by an impostor) and difficult passwords may be hard to recall (by a legitimate user).Therefore they are unable to satisfy the security requirements of our electronically interconnected information society. The emergence of biometrics has addressed the problems that plague traditional verification.

V. SYSTEM CONFIGURATION

A. System Overview

The basic system requirements would be enough for the smooth functionality of the program since there is no use of hardware components. The basic operating system that the device should be having is Windows 10. The operating system helps in ensuring the smooth running of the program with the essential Integrated Development Environment Tool(IDE).

B. MATLAB

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non interactive language such as C or Fortran.

C. MySQLite

MySQLite JDBC is a relational database management system which is open source. MySQL is used SQLite is very widely used, and despite the fact that built-in support for SQLite is included in Matlab (for its internal use), MathWorks has chosen not to expose any functionality or wrapper function that would enable end-users to access it.

VI. PROPOSED SYSTEM

The goal of this project is to develop a complete system for fingerprint verification through extracting and matching minutiae..Human fingerprints are rich in details called minutiae, which can be used as identification marks for fingerprint verification. A biometric authentication is a pattern-recognition system makes a personal identification by determining the authenticity of a specific physical or behavioral characteristic possessed by the user. An authentication can be divided into two modules:

a.) Enrollment module

b.) Identification or Verification module

Enrollment Module

In enrollment, a biometric system is trained to identify a specific person.

Identification or Verification module

In identification systems, the step after enrollment is to identify who the person is. In verification systems, the step after enrollment is to verify that a person is who he or she claims to be i.e., the person who enrolled. Unlike verification systems, no identifier is provided

Steps in Fingerprint Recognition

ENHANCEMENT - Fingerprint enhancement is necessary to remove various noises, and enhance the clarity of ridge structures in fingerprints.

TEXTURE & CARTOON- The cartoon component used to find fingerprint structured noise. The texture component consisting of the weak latent fingerprint is reconstructed in the next stage.

ORIENTATION-Area around the core point has been employed as an area of interest for determining the orientation feature map

DICTIONARY- Dictionary should characterize all kinds of image structures and details .Gabor functions have both frequency and orientation.

RECONSTRUCTION-In this step all the broken valleys, ridges and minutiae are reconstructed and full fingerprint is obtained.

VII. CONCLUSION

There is a scope of further improvement in terms of efficiency and accuracy which can be achieved by improving the hardware to capture the image or by improving the image enhancement techniques. So that the input image to the enhanced stage could be made better, this could improve the future stages and the final outcome. This is mainly used in forensic department.

ACKNOWLEDGEMENT

The authors would like to thank everyone for having given us this opportunity to conduct this study. We would also like to thank Mount Zion College of Engineering and APJ Abdul Kalam Technological University for giving us this platform.

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