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FINGERPRINT RECOGNITION SYSTEM USING MATLAB

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Abstract - *Human fingerprints are in details called minutiae, which can be used as identification marks for fingerprint verification. The goal of this thesis is to develop a complete system for fingerprint verification through extracting and matching minutiae. To achieve good minutiae extracting in fingerprints with varying quality, preprocessing in the form of image enhancement and linearization is first applied on fingerprints before they are evaluated. Many methods have been combined to build a minutia extractor and a minutia matcher. Minutia –marking with false minutiae removal methods are used in the work. An alignment-based elastic matching algorithm has been developed for minutia matching. This algorithm is capable of finding the correspondences between input minutia pattern and the stored template minutia pattern without restoring to exhaustive search. Performance of the devolved system is then evaluated on a database with fingerprints from different people.*

Keywords- *GUI, ROI, DSP,IP, IR, APL,IPTD.*

I. INTRODUCTION

Personal identification is to associate a particular individual with an identity. It plays critical role in our society, in wh ich questions related to identity of an individual such as “is this the person who he or she claims to be?”, “has this applicant been here before?”, “should this individual be given access to our system?” “ Does this employee have authorization to perform this transaction?” etc are asked millions of times every day by hundreds of thousands of organizations in financial services, health care, electronic commerce, telecommunication, government etc. With the rapid evolution of information technology, people are becoming more and more electronically connected. As a result, the ability to achieve highly accurate automatic personal identification is becoming more crictical.A wide variety of systems require reliable personal authentification scheme to either confirm or determine the identity of individuals requesting their services. The purpose of such schemes is to ensure that the rendered services are accessed by a legitimate user, and anyone else. Examples of these systems include secure access to buildings, computer systems, laptops, cellular phones and ATM. In the absence of robust authentication schemes, these systems are vulnerable to the wiles of an impostor.

Traditionally, passwords (knowledge-based security) and ID cards (token-based security) have been used to restrict access to systems. The major advantages of this traditional personal identification are that

- They are very simple.
- They can be easily integrated into different systems with a low cost.

However these approaches are not based on any inherent attributes of an individual to make a personal identification thus having number of disadvantages like tokens may be lost, stolen, forgotten or misplaced; pin may be forgotten or guessed by imposters. Security can be easily branched in these system when a password is divulged to an unauthorized user or a card is stolen by a imposter; further, simple password are easy to guess(by an imposter) and difficult passwords are 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 .In the world of the computer security, biometrics refers to the authentication techniques are rely on measurable physiological individual characteristics that can be automatically verified .In other words, we all have unique personal attributes that can be used for distinctive identification purpose, including a fingerprint, the pattern of a retina and voice characteristics. Strong or two factor methods of something u know (for example, a password) ,have(for example , a swipe card) or is(for example a fingerprint)-is becoming more of genuine standard in secure computing environments. Some personal computers today can include a fingerprint scanner where u places your index finger to provide authentication. The computer analyzes your fingerprint to determine who you are and based on your identity followed by a pass code or pass phrase, allows u different levels of access. Access levels can include the ability to open sensitive files, to use credit card information to make electronic purchases, and so on .A biometric authentication is essentially a pattern-recognition that

makes a personal identification by determining the authenticity of a specific physiological or behavioral characteristics possessed by the user. An important issue is designing a practical approach to determine how an individual is identified .An authentication can be divided into two modules:

- Enrollment module
- Identification or verification module

II. IMAGE PROCESSING

Products image processing is a physical process used to convert an image signal into a physical image. The image signal can be either digital or analog. The actual output itself can be an actual physical image or the characteristics of an image. The most common type of image processing is photography. In this process, an image is captured using a camera to create a digital or analog image. In order to produce a physical picture, the image is processed using the appropriate technology based on the input source type. Digital image processing is the use of computer algorithm to perform image processing on digital images. As a subcategory or field of digital signal processing, digital signal processing has many advantages over analog image processing.

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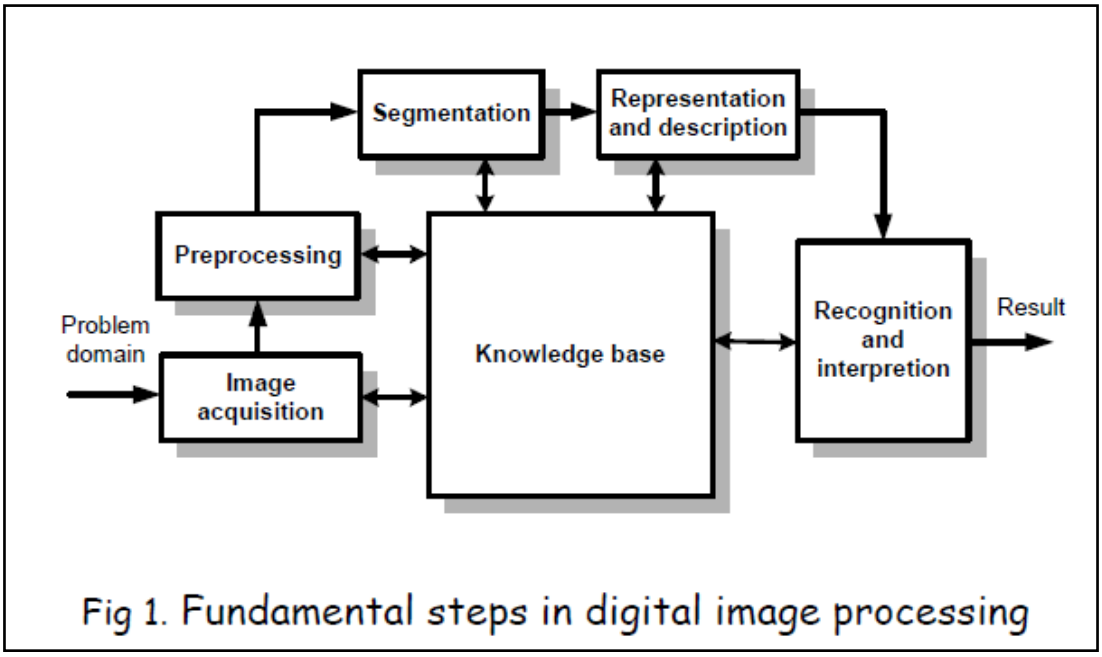

Fig 1. Fundamental steps in digital image processing

- Image acquisition; to acquire a digital image.
- Image processing; to improve the image in ways that is increase the chances of success of other processes.
- Image segmentation; to partitions an input image into its constituent parts or objects.
- Image representation; to convert the input data to a form suitable for computer processing.
- Image description; to extract features that result in some quantatitative information of interest or features that are basic for differentiating one class of object from another
- Image recognition; to assign a label to an object based on the information provided by its descriptors.
- Image interpretation; to assign meaning to an ensemble of recognized objects.

III.BIOMETRIC TECNOLOGY

To fully the enrollment module is responsible for enrolling individuals into the biometric system. During the enrollment phase, the biometric characteristic of an individual is first scanned by a biometric reader to produce a digital raw digital

representation of the characterstics.In order to facilitate matching, the raw digital representation is usually further processed by by future extractor to generate a compact but expansive repartition, called a template. Depending on the application, the template may be stored in the central database. Depending upon the application, the biometric can be used in one of the two modes: verification and identification. Verification also called authentication is used to verify a person's identify that is to determine who the person is. Although biometric technologies measure different characters tics in substantially differ ways. In enrollment, a biometric system is trained to identify a specific person. The person first provides an identifier, such as identity card. The biometric is linked to the identity specified on the identification document. He or she then presents the biometric (fingerprints, hand) to an acquisition device. The next step is verification, in verification system, the steps after enrollment is to verify that a person is who he or she claims to be further steps are identification and matches on the based of threshold settings.

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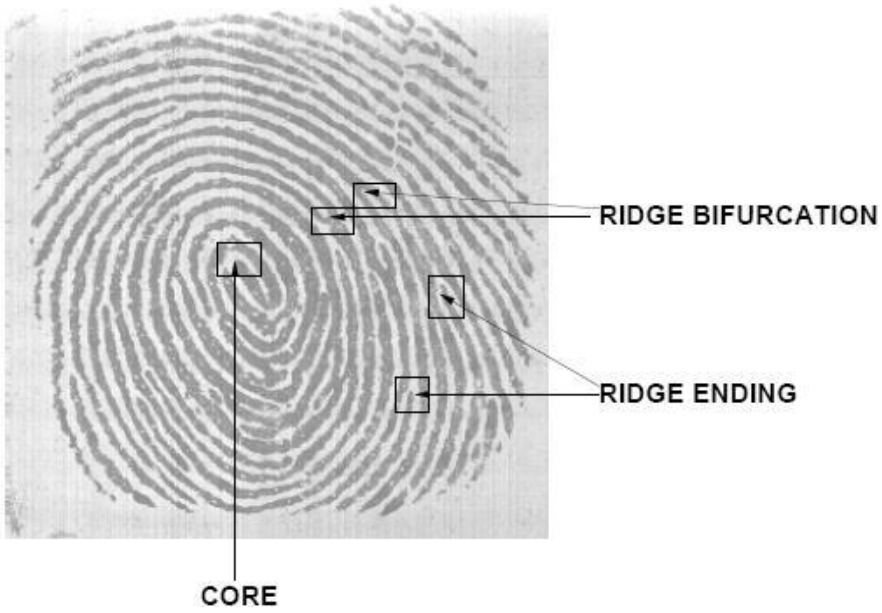


Figure. 2- finger print representation

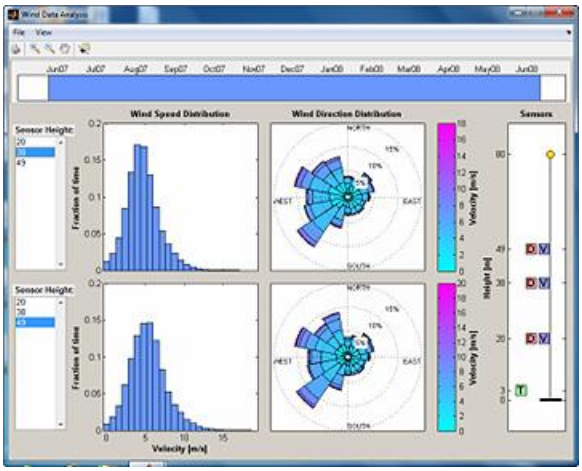


Figure.3 – creating a mat lab GUI program

IV. Communication set-up for Fingerprint reorganization system

Development Tools

GUI also known as graphical user interface provides point- and- click control of software applications, eliminating the need to learn a language or type commands in order to run the application.Matlab apps are self contained MATLAB programme with GUI front ends that automate a task or calculation.GUI provides tools for designing user interface for custom apps. Using the guide layout Editor, you can graphically design your UI. GUIDE then automatically generates the MATLAB code for constructing the UI, which you can modify to programme the behavior of your app.MATLAB contains built in functionality to help you create the GUI for your app.

Communication Software

MATLAB refers to matrix laboratory is a numerical computing environment and fourth generation programming language. The mat lab language supports the vector and matrix operations that are fundamental to engineering and scientific problems. Matlab provides three working enviournments:

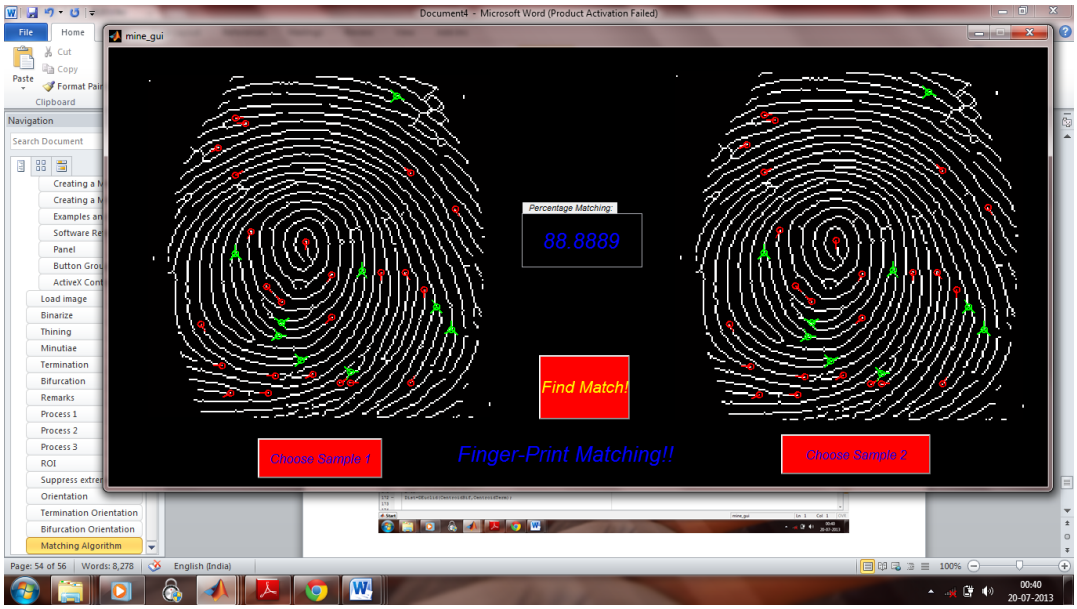
- Command window: For direct implementation of functions and numerical computing.
- Editor window: For creating and saving files for future use. It saves files with "m" extension.
- GUI: Graphical user interface for making user friendly softwares.It also provides deployment tools.

MATLAB include development tools that help in implementing algorithm efficiently. These include the following:

- MATLAB Editor:-Provides standard editing and debugging features, such as setting breakpoints and single stepping.
- Code Analyzer:-Checks your code for problems and recommends modifications to maximize performance and maintainability.
- MATLAB Profiler:- Records the time spent executing each line of code.
- Directory Reports:- Scan all the files in a directory and report on code efficiency, file differences, file dependencies, and code coverage.

V.MATCHING ALGORITHAM

We devised an algorithm to match the X and Y co-ordinates of both the termination points as well as bifurcations. We also match their orientations to ensure a perfect match if found. On discovery of a proper match, the match count is raised by one and at the end of the matching, the total number of matches is divided by the total number of samples matched. The final computed is then displayed in the edit box.



II. CONCLUSION

This "Finger-Print recognition by minutiae extraction using mat lab" is MATLAB based software which can be used by forensic experts in forensics or imaging laboratories. It is a basic bio-metric verification system aimed at easier user interface through GUI. It is easy to use and uses highly precise algorithms for minutiae extraction and matching with accuracies as high as 88.88% in exact matches. The aim of the thesis is to make user friendly software with advancements on existing technology and help professionals get a better view of images.

The option to develop a database based on saving the set of data in a database is open to the users for further enhancement. It is the cost effective and time saving software with several sublime features and seeks several future enhancements.

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