SECURE BIOMETRIC AUTHENTICATION SYSTEM FOR EMERGENCY

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Abstract — The tracking system is mainly used to find a human anywhere. Missing human, thief and dead people details and those who met with an accident. Here we have applied data analysis algorithm to analyze the data from the database. A created mobile application to track the database and to get the details about the people using secure authentication with the help of thumb scan. Once we trace the details then it is possible to find a nearest Police Station, nearest Blood Bank, Ambulance service using area mining. Then it tracks and forwards the information immediately. Location tracker is very useful to help the remedies of the particular situation

Index Terms— Applied Data Analysis, Android application, Authentication, Biometric, Finger print recognition, Mat lab, Morphology, Thumb Scan, Tracking System.

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1 INTRODUCTION

Biometrics is automated methods of recognizing a person based on a physiological or behavioral characteristic. Among the features measured are face, fingerprint, hand geometry, iris, retinal, signature, and voice. Biometric technologies are becoming the foundation of an extensive array of highly secure identification and personal verification solutions. As the level of security breaches and transaction fraud increases, the need for highly secure identification and personal verification technologies is becoming apparent.

Biometric-based solutions are able to provide for confidential financial transactions and personal data privacy. The need for biometrics can be found in federal, state and local governments, in the military, and in commercial applications. Enterprise-wide network security infrastructures, government IDs, secure electronic banking, investing and other financial transactions, retail sales, law enforcement, and health and social services are already benefiting from these technologies.

Biometric-based authentication applications include workstation, network, and domain access, single sign-on, application logon, data protection, remote access to resources, transaction security and Web security. Trust in these electronic transactions is essential to the healthy growth of the global economy. Utilized alone or integrated with other technologies such as smart cards, encryption keys and digital signatures, biometrics is set to pervade nearly all aspects of the economy and our daily lives [1]. Utilizing biometrics for personal authentication is becoming convenient and considerably more accurate than current methods (such as the utilization of passwords or PINs). This is because biometrics links the event to a particular individual (a password or token may be used by someone other than the authorized user), is convenient

(nothing to carry or remember), accurate (it provides for positive authentication), can provide an audit trail and is becoming socially acceptable and inexpensive. The security field uses three different types of authentication:

• A password, PIN, or piece of personal information (such as your mother's maiden name)

• A card key, smart card, or token (like a Secure ID card)

• A biometric matter will need to create these components, incorporating the applicable criteria that follow.

2 FINGER PRINT RECOGNITION

2.1 INTRODUCTION

In the system analysis, fingerprint recognition is one of the most important biometric technologies based on fingerprint distinctiveness, persistence and ease of acquisition. In fingerprint recognition process, the important step which effects on system accuracy is matching between template and query fingerprint. Biometric data mining (BDM) is the application of knowledge discovery techniques to biometric information with the purpose to identify unique patterns. In this process two main areas are being linked together to obtain the required output. The image has to be captured by a mobile phone camera and is sent for further process by means of an android application which is present inside the mobile phone [1]. Further the image is sent to the server where the processing of the captured image is done. And then the processed image is sent to the centralized data base in order to match the image inside the database exactly and then to provide the user with the details of the identified person. The obtained details are used by the user

to alert the victim's family members, nearby police station, ambulance and any other services in the future. The design and architecture of the system is strategically planned for providing emergency service to the user. An image is forwarded from the mobile app to the system and if it matches with the database, it sends an immediate message through mail to the administrator [2].

2.2 EXISTING SYSTEM

ICE Unlock Fingerprint application is one of the existing models developed by Diamond Fortress Technologies Inc. The following are its features, capturing the image using the rear camera and mainly the application is used to lock and unlock the mobile phone for security purposes. The noteworthy point is that this application is free of charges. It involves the usage of flash of the camera but the flash remains on for a longer duration unnecessarily .The main drawback of ICE Unlock Fingerprint application is that it would not work if the mobile does not possess the auto focus feature by default. Takes an average of six times to get a match [2]. Also the application shuts down quite regularly, it also consumes more time duration for providing the matched image. It also interfere the privacy of the mobile user by forcing the user to use the startup features of its own and interrupts the user frequently by its password notifications while using other applications.
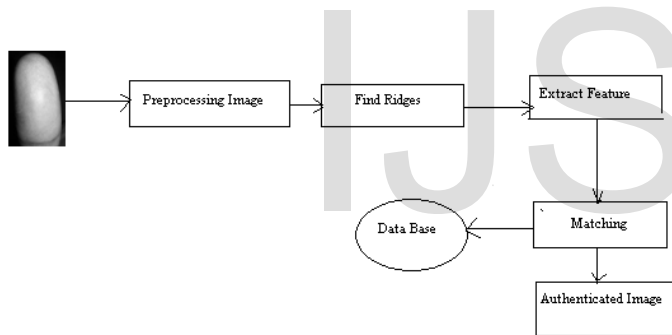

Fig 1. Process Flow of existing model

2.3 PROPOSED SYSTEM

In this proposing system, a new secure biometric authentication system for emergency is being proposed. In this system an android application that helps the user to capture the fingerprint image easily is being used and the captured image can be saved and sent through the application to the server mail. Further the administrator gets the captured image from the user and uploads it into the Mat lab software, where the image is being converted into grey scale image, binary image, normalized image and finally it undergoes preprocessing. After the completion of all these vital process the image matching is carried out and it matches with the images in database. Finally the matched

percentage is displayed in the command window and once it gets matched the details of the victim is being forwarded to the user's mail successfully [3].

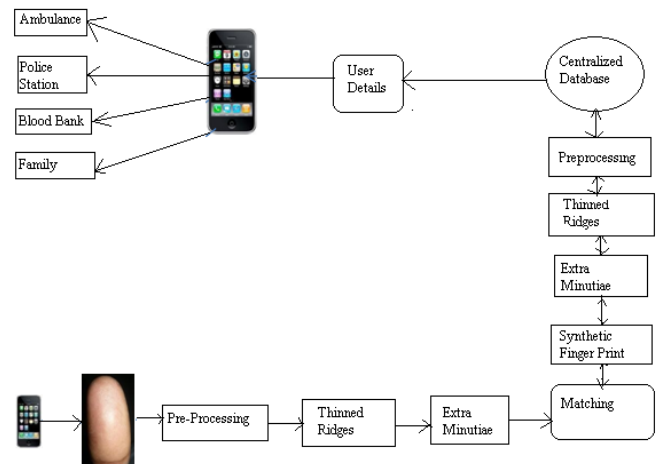## 2.4 PROPOSED ARCHITECTURE DIAGRAM

Fig 2. Proposed Block Diagram

The Android Application will be applicable in all smart phones. The existing application does not support every mobile phone. In the proposed system the combination of finger print, footprint and palm recognition can be used. The main focus of the proposed model is to overcome several demerits of ICE unlock fingerprint application such as perfect capturing of image. To use the application mainly for emergency service in accident cases, theft cases, missing person cases and so on. Our application is completely secured and user friendly [3].

3 ALGORITHM

The input images of fingerprint, from which the proposed model creates a new fingerprint image, which contains features (ridge line and minutia) of the original ones. The model includes the following steps: (1) Pre-processing fingerprint image: for each image fingerprint area, thinned ridge lines and extract minutiae are recognized. (2) Finding and adjusting parameter sets: A fingerprint which has the largest fingerprint area as mean image is chosen. Then Genetic Algorithms taken from "Fingerprint matching by genetic Algorithms" are used to find the transformation between mean image and others. (3) Synthesizing fingerprint: With the transformations in previous step, parameters" value (to get exact value for parameters) are re-calculated, add supplement ridge lines and minutiae to mean fingerprint. (4) Post-processing: This step will help to remove noise.

3.1 TECHNIQUES INVOLVED

3.1.1 STANDARDIZED FINGERPRINT MODEL

A fingerprint is the reproduction of a fingertip epidermis, produced when a finger is pressed against a smooth surface. The most evident structural characteristic of a fingerprint is its pattern of interleaved ridges and valleys. Ridges and valleys often run parallel but they can bifurcate or terminate abruptly sometimes. The minutia, which is created when ridges and valleys bifurcate or terminate, is important feature for matching algorithms. The fingerprint pattern contains one or more regions where the ridge lines create special shapes [3]. These regions may be classified into three classes: loop, delta, and whorl. Many fingerprint matching algorithms pre-align fingerprint images based on a landmark or a center point which is called the core. The equations are an exception to the prescribed specifications of this template. You will need to determine whether or not your equation should be typed using either the Times New Roman or the Symbol font (please no other font). To create multileveled equations, it may be necessary to treat the equation as a graphic and insert it into the text after your paper is styled.

3.1.2 PRE-PROCESSING FILTER UNIT

For each input image, we find fingerprint area and thin ridge line whose width is 1 pixel. P is a point on processed fingerprint image and pixel (P) is value of pixel at P:

- Pixel (P) = 1, if P belongs to ridge.

- Pixel (P) = 0, if P belongs to valleys.

- F_{list} is a processed fingerprint.

- Each minutia, we get in this step, contains the x- and y coordinates, the type (which is termination or bifurcation) and the angle between the tangent to the ridge line at the minutia position and the horizontal axis.

- Result of this step is a processed fingerprint called F_{list}.

3.1.3 FINDING AND ADJUSTING PARAMETER SET

To find the transformations between meanF and other parameters in F_{list} and recalculate the exact values of the parameters.

Find parameter set: $Yi = F(Xi) = s.R.Xi + T$, where s is the scale factor.

T= [tx,ty] is the vector of translation.

STAGE 1:

- INPUT: fingerprint template F_{list}.

- OUTPUT: parameter set paramlist.

1. meanF = fingerprint which has the largest fingerprint area.

2. Remove meanF from F_{list}.

3. For each fdata in F_{list}

   • Param = find the transformation between meanF and fdata.

   • Add param to paramlist.

STAGE 2:

Input: F_{List}, ParamList

Output: ParamList with real value of parameters. For each fData in F_{List}:

1. Find 2 minutiae A, B in fData and 2 minutiae C, D in MeanF in which A is corresponding to C and B is corresponding D .

2. Calculate the real value for parameters:

a. s = sign(old value of s)[(distance between C and D) /(distance between A and B)]

b. _ = sign(old value of _)[the angle between AB and CD]

c. tx = sign(old value of tx) |(xA- xC)|

d. ty = sign(old value of ty) |(yA-yC)|

3. Update new value for corresponding parameter of fData.

STAGE 3:

Synthesizing fingerprint:

It contains three steps:

1. Add ridges from original fingerprint to meanF.

2. Join supplement and original ridge lines.

3. Add minutiae from original fingerprint to meanF.

INPUT: Flist,paramlist

OUTPUT: newmeanF.

For each Flistk in F_{list}.

1. Using parameter k in paramlist to transform all pixel of Flistk to meanF space and save to pixellist.

2. For each pixel H in pixellist: If meanF does not have H" which d(H,H")< r and pixel of (H") = 1 then put H to temp pixellist .

3. For each pixel H in temp pixellist, set pixel(H) meanF = 1.

4 Join supplement and original ridge lines:

Input: FList, ParamList, meanF

Output: new meanF

1. For each fDatain FList

For each pixel K in meanF

If K is the terminated point (pixel(K) =1) and exist K" in fData(pixel(K") =1) which correspondent to K then:

- Find all pixels N (pixel(N)=1) connected to pixel K

- Transform these pixels to meanF" s space

- Put them to linkedPixelList

Fill all pixels in linkedPixelListto meanF.

Input: FList, ParamList, meanF, K'

Output: all pixels connected to pixels K"

1. Get all pixels, which is 8-neighbour of K" and pixels value is 1, save to connectedList

2. for each pixel M in connectedList

a. Set markedPixel= K"

b. Set startPixel = M

c. Repeat follows tasks:

Get pixel L, which is 8-neighbour of M, pixel(M) =1 and M is different to markedPixel, save to connectedList

markedPixel = M

startPixel = L

Until (can" t find L or exist L" in meanFcorresponding to L)

3.2 POST- PROCESSING

Synthesizing fingerprint step creates a fingerprint image that contains all features of fingerprint templates. However, some minutiae of the original fingerprint are not correct on meanF [4]. For example, M is termination minutia on fingerprint template but in meanF, it is not correct because of ridge line connection. In this step, we re-check all meanF" s minutiae and remove wrong minutiae.

Input: meanF

Output: meanF with minutiaeListwhich is removed wrong minutiae.

1. For each minutiae M in minutiae List of meanF

If type of M is termination minutia and pixel (M) = 1 and M is termination point then M is marked. If type of M is bifurcation minutia and pixel(M) =1 and M is not termination point then M is marked

2. Remove all un-marked minutiae from minutiae List.

4 SYSTEM MODELING AND DESIGN

The purpose of this design document is to explore the logical view of architecture design, sequence diagram, data flow diagram, user interface design of the software for performing the operations such as pre-processing, extracting features and displaying the minutiae present in the images. The scope of this design document is to achieve the features of the system such as pre-process the images, feature extraction, segmentation and display the image and send a message to the user. A flow diagram is a graphical representation of the flow of data through an information system. It can also be used for visualization of data processing.

A flowchart is described as "cross-functional" when the page is divided into different swim lanes describing the control of different organizational units. A symbol appearing in a particular "lane" is within the control of that organizational unit. Use case diagrams overview the usage of requirement for system. They are useful for presentations to management and project stakeholders, but for actual development you will find that use cases provide significantly more value because they describe "the meant "of the actual requirements [4]. Use case describes a sequence of action that provides something of measureable value to an action and is drawn as a horizontal ellipse. Activity diagram is a graphical representation of work flows of stepwise activities and action with support for choice, iteration and concurrency. The activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. Activity diagram consists of initial node, activity final node and activities in between

5 SOFTWARE REQUIREMENTS

MATLAB stands for Matrix Laboratory. It was originally developed as a user interface to call some FORTRAN matrix routines that were originally developed by the National Labs and were freely available in the public domain. Since there are already an abundance of tutorials on the Internet it seems that every user has written one if not a full-blown book, I will simply provide you with a few pointers. Mat lab is a both a powerful computational environment and a programming language that easily handles matrix and complex arithmetic. It is a large software package that has many advanced features built-in, and it has become a standard tool for many working in science or engineering disciplines. Among other things, it allows easy plotting in both two and three dimensions.

Matlab has two different methods for executing commands: interactive mode and batch mode .In

interactive mode, commands are typed (or cut and pasted) into the „command window .In batch mode, a series of commands is saved in a text file (either using Mat labs built in editor, or another text editor such as Emacs) with a „.m extension.

The batch commands in a file are then executed by typing the name of the file at the Matlab command prompt .The advantage to using a „.m" file is that you can make small changes to your code (even in different Matlab sessions) without having to remember and retype the entire set of commands. Also, when using Mat labs built in editor, there are simple debugging tools that can come in handy when your programs start getting large and complicated. More on writing .m files later..

6 Software develpoment platform

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. The name MATLAB stands for matrix laboratory. MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects, which together represent the state-of-the-art in software for matrix computation.

6.1 MATLAB working Environment

This is the set of tools and facilities that you work with as the MATLAB user or programmer. It includes facilities for managing the variables in your workspace and importing and exporting data. It also includes tools for developing, managing, debugging, and profiling M-files, MATLAB's applications.

6.2 MATLAB Software

This is a high-level matrix/array language with control flow statements, functions, data structures, input/output, and object-oriented programming features. It allows both "programming in the small" to rapidly create quick and dirty throw-away programs, and "programming in the large" to create complete large and complex application programs.

6.3 MATLAB Image Processing Toolbox

We have used MATLAB Image Processing Toolbox for the development of this software. Image processing involves changing the nature of an image in order to improve pictorial information of the image for human interpretation for autonomous human perception. The Image Processing Toolbox is a collection of functions that extend the capability of the MATLAB numeric computing environment. The toolbox supports a wide range of operations on the image.

6.3.1 Key Features:

• Image enhancement, including filtering, filters design, de-blurring and contrast enhancement.

• Image analysis including features detection, morphology, segmentation, and measurement.

• Spatial transformations and image registration.

• Support for multidimensional image processing.

• Support for ICC version 4 color management system.

• Modular interactive tools including ROI selection, histograms and distance measurements.

• Interactive image and video display.

• DICOM import and export.

7 ANDROID Introduction

Android is an open source and Linux-based Operating System for mobile devices such as smart phones and tablet computers. Android was developed by the Open Handset Alliance, led by Google, and other companies. Android offers a unified approach to application development for mobile devices which means developers need only develop for Android, and their applications should be able to run on different devices powered by Android [6]. The first beta version of the Android Software Development Kit (SDK) was released by Google in 2007 where as the first commercial version, Android 1.0, was released in September 2008.

7.1 System specifications

High Level Specifications

• MATLAB V.8.3(R2014a)

• Intel Dual core or core2duo, Intel I3XP based personal computer

• 2GB RAM recommended

• 8-bit graphics adapter and display (for 256 simultaneous colours). A 32-bit or 64bit OpenGL capable graphics adapter is strongly recommended.

7.2 Low Level Specifications

• Microsoft Windows supported graphics accelerator card, printer, and sound card.

• Microsoft Word 8.0 (Office 97), Office 2000.

• TCP/IP is required on all platforms when using a license server.

• Some license types require a license server running FLEXlm 8.0d, which is provided by the Math Works installer.

8 CODING AND TESTING

Once the design aspect of the system is finalizes the system enters into the coding and testing phase. The coding phase brings the actual system into action by converting the design of the system into the code in a given programming language .Therefore, a good coding styles has to be taken whenever changes are required it easily screwed into the system. Coding standards are guidelines to programming that focuses on the physical structure and appearance of the program [5]. They make the code easier to read, understand and maintain. This phase of the system actually implements the blueprint developed during the design phase. The coding specification should be in such a way that any programmer must be able to understand the code and can bring about changes whenever felt necessary. Some of the standard needed to achieve the above mentioned objectives are as follows:

Program should be simple, clear and easy to understand. The following points is to be kept in mind while carrying out the testing procedures

1. Naming conventions

2. Value conventions

3. Script and comment procedure

4. Message box format

5. Exception and error handling

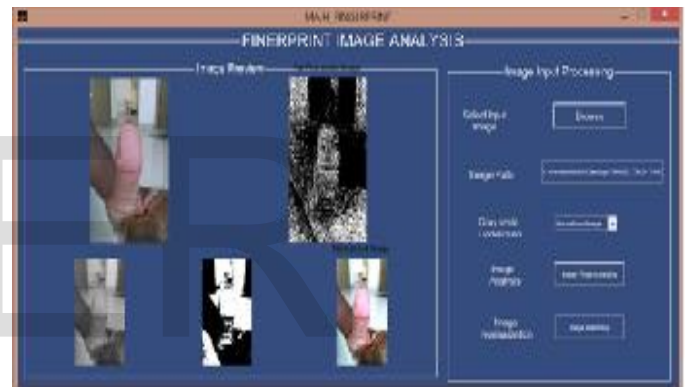| Epochs	Hiddenlayers	Config	Classification%
43	10	85-10-26	27.8
104	20	85-20-26	77.4
148	30	85-30-26	93.8
172	35	85-35-26	94.3
117	39	85-39-26	93.3
53	45	85-45-26	12.5
60	50	85-50-26	83.7
76	55	85-55-26	78.3
71	60	85-60-26	18
110	65	85-65-26	49.8
112	70	85-70-26	49.2

Table 1 Test results using Character Geometry

Fig 3 MATLAB Simulation results

9 CONCLUSION AND FUTURE WORK

In the project, fingerprint-matching approach has been proposed, which is based on standardized fingerprint model to synthesize fingerprint from original templates. From the fingerprint templates of finger in the database, a mean image is chosen and Genetic Algorithms are used to find the transformation among them. Then, these transformations are used to synthesize fingerprints (add ridges and minutiae from original template to mean fingerprint). Finally, matching between mean fingerprint and other templates is performed to show the capability of the model.

The future work is that the system can be used to recognize the entire palm and the entire foot of a human in lesser period of time. Now rather than having a fixed set of fingerprint images from a database, a frame

grabber can be used to capture a number of images, which possibly improves the recognition rate.

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