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Biometric ATM Using Constraint Based Finger-Vein Access

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Abstract: ***In the current world of technology, we humans are provided with a sophisticated lifestyle in several cases. Similarly, there exist several ways to duplicate or malfunction someone's belonging. It is our responsibility to ensure our security, by upgrading ourselves along with various technical advancements. In this paper, the enhancement in ATM security has been proposed. Here, there are three approaches that have been concentrated. I- Personalizing ATM access using the finger-vein authentication. Sensors to capture the finger-vein can be used, since there is no chance of duplicating the vein format of a person. II- Providing enhanced around the clock surveillance system to efficiently utilize the resources. It reduces the effort of human security as the system is equipped with automated door-lock and an alarm system. III- Applying constraints to reduce the utilization time and maintain the sensor performance. Not all the users are intended to use their biometrics as it maybe a waste of time, for a balance enquiry or for lower amount of transactions.***
Index Terms: Finger-Vein authentication; round the clock Surveillance; Constraint based authentication; ATM Security; Biometrics.

I. INTRODUCTION

This paper deals with an essential security issue of recent times. In India, the awareness on having a bank account is spread widely and most of our subsidiaries are provided by the government through banks. In a country with world's second highest population, it is difficult to utilize the banks for each and every transaction we make. Thus we are provided with the ATM machines here and there. ATM machines are secured with surveillance cameras, human securities, etc. To access the ATM machines, each bank account holders are provided with a debit/credit card and a corresponding 4-digit PIN number. Each user's PIN is unique and it can be difficult to remember by some users. Thus they store the unique code in some ways, which maybe stolen by the intruders. Similarly the ATM cards may also be lost or stolen. These identities are misused and the user gets affected. To enhance the security, biometrics came into existence. Biometrics are the identity of the individuals which are formed in nature or by behavior. Some examples of biometrics are fingerprint, face recognition, iris, etc. These biometrics are widely used now-a-days, even in our aadhar cards. But still there prevails certain security issues. As the PIN number is spied using silicon sheets, the fingerprint impression can also be duplicated. Fingerprint sensors are also not well furnished to scan the fingerprint ignoring the scars and cuts in the finger. Moreover biometrics are valid even if the organ is dead. The only biometric, that works only when the cell is alive is the Vein. Thus in our project, we use the finger vein scanner to access the account. This scanner scans the vein pattern of the user, which is impossible to duplicate. Authenticating each user using this process may consume more time for the people standing in large queues outside the -ATM. Thus, the vein scanner acts as the secondary stage of authentication, only under certain constraints. The LCD display specifies the number of transactions made per day. The user requires vein authentication, if the transaction limit applied per day exists and also if the amount of transaction exists more than 2000 or as per the norms. Also round the clock security is provided to the ATM centers through automatic alarm system and the door lock feature, that perform under unauthenticated conditions. And also a alert message is received by the user's registered mobile number. The detailed description about the system architecture and the modules are stated below.

II. EXISTING SYSTEM

A. Surveillance System

In the existing system, a camera is attached with the ATM room or surroundings, records and transfers the video tap to the main server of the bank. Round the clock, this manual surveillance utilizes a lot of bandwidth for transmission. Here the memory is wasted and the response at the emergency situations are low. Human securities may be inefficient under some ca Human securities

may be inefficient under some circumstances.

B. Biometric Authentication:

The biometrics that are being used are, the fingerprint, iris, face recognition, voice recognition, etc. Fingerprint scanners are the most widely used form of biometrics. Most of the existing ATM machines use fingerprint and iris recognitions. These biometrics are unique but can be used even after the cells are dead. Fingerprints can be mimicked using various techniques and thus the efficiency to be secured is low.

III. LITERATURE SURVEY

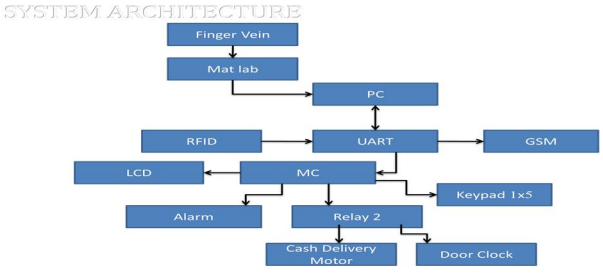
Fingerprint Warping Using Ridge Curve Correspondences by Arun Ross, Sarat C. Dass, and Anil K. Jain. The performance of a fingerprint matching system is affected by the nonlinear deformation introduced in the fingerprint impression during image acquisition. A technique is presented to estimate the nonlinear distortion in fingerprint pairs based on ridge curve correspondences. The estimated average deformation is then utilized to distort the template fingerprint prior to matching it with an input fingerprint. The proposed deformation model based on ridge curves leads to a better alignment of two fingerprint images compared to a deformation model based on minutiae patterns. An index of deformation is proposed for selecting the "optimal" deformation model arising from multiple impressions associated with a finger. 2) Fingerprint matching by thin-plate spline modelling of elastic Deformations by Asker M. Bazen∗ , Sabih H. Gerez. A novel minutiae matching method that describes elastic distortions in fingerprints by means of a thin-plate spline model, which is estimated using a local and a global matching stage. After registration of the fingerprints according to the estimated model, the number of matching minutiae can be counted using very tight matching thresholds.

For deformed fingerprints, the algorithm gives considerably higher matching scores compared to rigid matching algorithms, while only taking 100 ms on a 1 GHz P-III machine. Furthermore, it is shown that the observed deformations are different from those described by theoretical models proposed in the literature. 3) Modelling Plastic Distortion in Fingerprint Images by R. Cappelli, D. Maio and D. Maltoni. A plastic distortion model to cope with the nonlinear deformations characterizing fingerprint images taken with online acquisition sensors. The problem has a great impact on several practical applications, ranging from the design of robust fingerprint matching algorithms to the generation of synthetic fingerprint images. The experimentation on real data validates the model and demonstrates its efficacy in registering minutiae data from highly distorted fingerprint samples. 4) A Minutia Matching Algorithm in Fingerprint Verification by Xiping Luo, Jie Tian and Yan Wu. Fingerprint matching is one of the most importunt problem in AFIS.

In general, we use minutiae such as ridge endings and ridge bifurcation to represent a fingerprint and do fingerprint matching through minutiae matching. In this paper, we proposed a minutia matching algorithm which modij?ed Jain et al.'s algorithm. Our algorithm can better distinguish two images from different fingers and is more robust to nonlinear deformation. 5) A Robust Fingerprint Matching Algorithm Using Local Alignment by Dongjae Lee, Kyoungtaek Choi, and Jaihie Kim. A minutiae-based fingerprint matching algorithm. Generally, a fingerprint image is nonlinearly deformed by torsion and traction when a finger is pressed on the sensor. This nonlinear deformation changes both position and orientation of minutiae and decreases the reliability of minutiae. Therefore, in matching algorithm using one reference minutiae pair, the reliability of a minutia decreases as the distance from the minutia to the minutia used for alignment increases. The proposed algorithm overcomes this problem by normalizing the distance between minutiae and using local alignment.

IV. PROPOSED SYSTEM

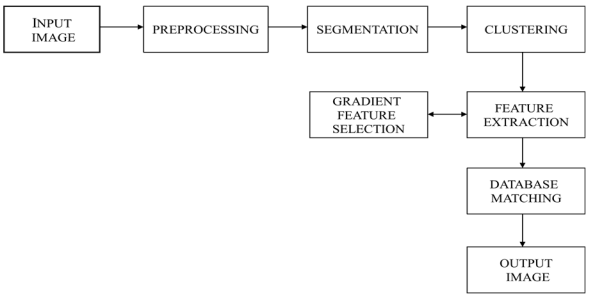
A. System Architecture



1) *Matlab:* It is the development environment with a high level languages .in this project this used to show the simulation of finger vein scanner.
2) *Rfid Reader:* It is the network connected device .it is used read the card number in code and it acts like access point for rfid tagged items.
3) *UART:* It is universal asynchronous receiver/ transmitter. Its is usually an individual integrated circuit(ic) and also used for communication purpose over a computer.
4) *GSM:* Using such kind of gsm modems, we are going to warn the user on unauthenticated access of their account through text messages sent to their registered mobile number.
5) *LCD:* It is the liquid crystal display technology used for displays in notebook and other smaller computers.
6) *Microcontroller*: Microcontroller is a kind of all-rounder device. Here it is the base component used to handle the sub-components like lcd, alarm, gsm, etc.
7) *Relay:* Relay is a switch used to access the electronic devices. Here, it is used to control the cash delivery motor and door clock system.

B. Module Description

Preprocessing
Segmentation
Clustering
Feature extraction
Gradient feature selection



C. Preprocessing

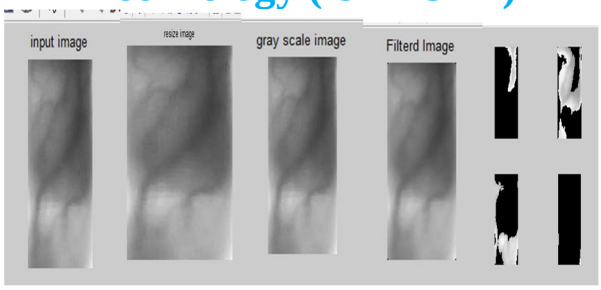
Preprocessing images commonly involves removing low-frequency background noise, normalizing the intensity of the individual particles images, removing reflections, and masking portions of images. Image preprocessing is the technique of enhancing data images prior to computational processing**.**

D. Segmentation

Ime segmentation is the process of partitioning a digital image into multiple segments.
The goal of segmentation is to simplify to analysing whole image into a small image.
Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images.
More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics. Clustering can be considered the most important unsupervised learning problem; so, as every other problem of this kind, it deals with finding a structure in a collection of unlabeled data**.**

E. Feature Extraction

One of the important module, it get the information from the previous block of segmentation and clustering.
Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately
The collected number of feature will be difficult to judge which is reality one.
Through the gradient algorithm we are taking decision by using three parameter
Scalability (pixel density of the region)
Integrity (parameters of finger vein)
Flexibility (probability decision)



(a) (b) (c) (d) (e)

F. Algorithm Used

hog- histrogram of gradient features.

Definition: Histogram: the graphical representation of pixel intensity of an given image. The intensity level is gradually changes based on three parameters like,

ngle, magnitude and gradient features.

Angle is defined as in image in two directional views .. X and Y directions.

X represents in Ix

Y represnts in Iy

Angle is =atan(Ix/Iy);

Gradient The samples of pixels varied in two types same intensity level and different values of intensity.

Represents, sqrt(Ix^2 + Iy^2) Magnitude:

Saturation of contrast level among different region in image.. It can be obtain through angle and magnitude values . For that we take 8 x 8 patch and analyze the values.. Get back the overall magnitude features.

G. Sensor Performance

The regular biometric sensors are being used widely and lots of spoofying techniques also exists. In the growing criminal records, even our finger may be cut and the dead fingerprint can be accessed. The infrared rays used in the iris scanner is harmful to the human tissue. Haemoglobin absorbs the infrared rays and thus the finger- vein sensor tracks the blood flow in the fingers and obtain the input pattern for checking the authentication.

V. SCOPE AND CONCLUSION

The finger- vein recognition system eliminates the process of duplicating the biometrics and spending more time by standing in the queues of biometric ATMs. Since Finger vein access control makes important information available only to authenticated users, no unauthorized and unauthenticated individual can misuse or otherwise destroy valuable data after gaining access to it unethically. Apart from other security measures implemented in ATM finger vein access control can be used to add an additional layer of security to the premises, hence protecting the entire area and important information that it contains from unauthorized individuals. In all, finger vein access control can be considered as a best solution to limit accessibility to sensitive data to the authorized individuals. In this paper, a new biometric finger vein based user identification system is developed which enhances the security drawback of available ATM's. Finger vein pattern authentication technology developed by Fujitsu was being used in a wide range in Japan. If this technology spreads in our country we can solve many problems such as password protection in ATM, security in various fields. Surely this technology will bring a revolution in the field of science and technology in the near future.

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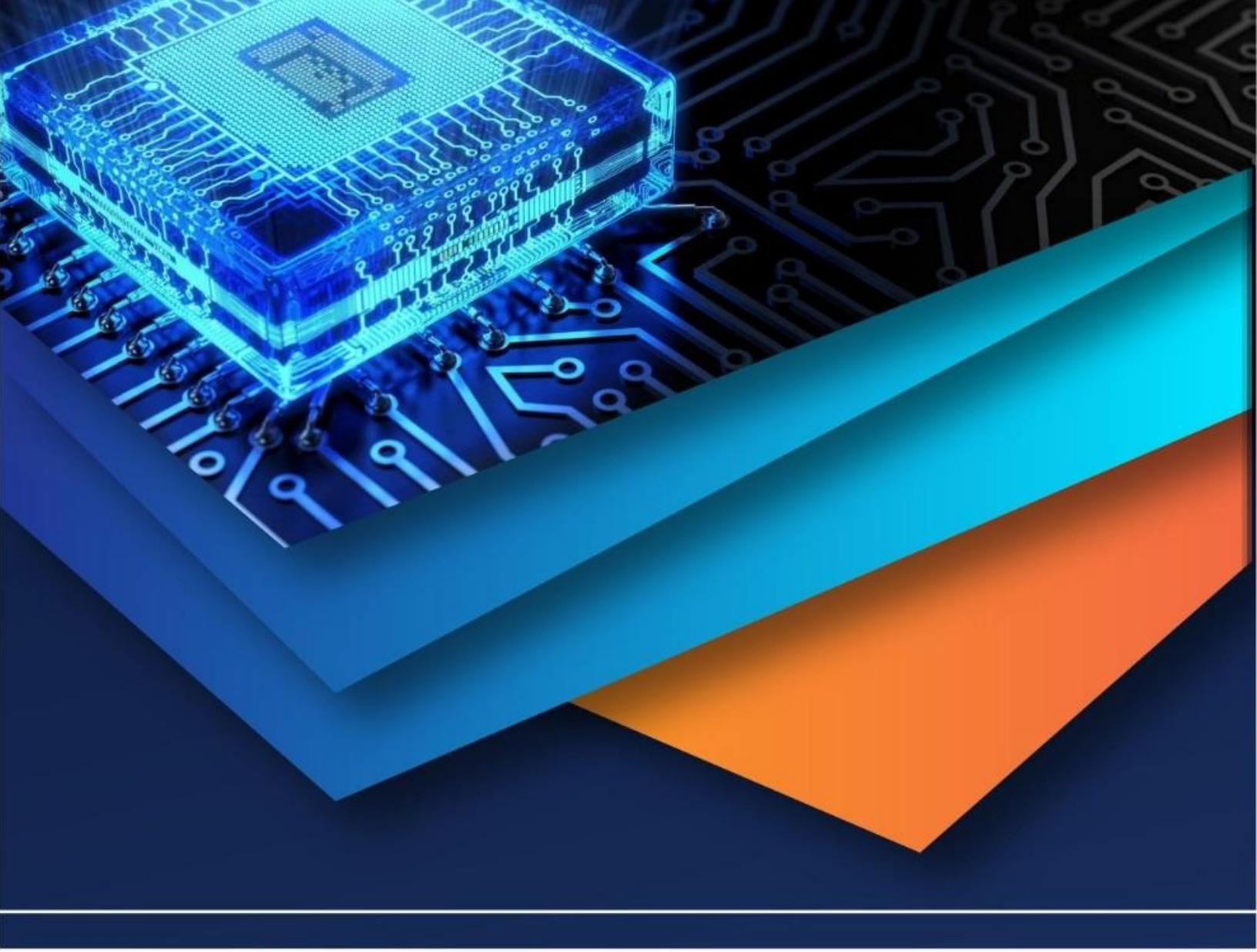

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