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Human Identification Using Finger Image

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Abstract- The proposed paper is about avoiding the manual checking by the security guards of people entering in the organizations. It's a method and system for identifying and tracking a person using RFID. There are many places where only authorized people can enter and in that situations in order to identify the person who is entering into the restricted areas like R & D, Bank Lockers, secret agency group etc is needed to identify and permit the person. And there are many situations where the identity of the person is to be identified. If this is performed manually by security guards it will be hectic to identify each person and errors may occur. If the authorized people themselves wants to enter into the particular place then they have to undergo the identification every time which would be time consuming and too hectic. To avoid these problems there is a need of developing the system that can identify the person using RFID. The RFID tags will be issued to respective authorized persons; the people have to carry RFID tags so that they can use it to access the particular room they want to enter. The system detects him based on his RFID and it will give the access. This has more security and too simple. This is VB application based project. The VB application is used to store the data base of the person details.

Keywords- RFID (Radio Frequency IDentification), VBA (Visual Basic Application), DLL (Dynamic Link Libraries), IAP (In-Application Program), LCD (Liquid Crystal Display)

I. INTRODUCTION

Fingerprint-based identification is one of the most important biometric technologies which have drawn a substantial amount of attention recently. Fingerprints are believed to be unique across individuals and across fingers of same individual. Even identical twins having similar DNA, are believed to have different fingerprints.

A fingerprint is the pattern of ridges and valleys on the surface of fingertip. Fingerprint recognition can be categorized into identification and verification. Fingerprint identification is the process of determining which registered individual provides a given fingerprint. Fingerprint verification, on the other hand, is the process of accepting and rejecting the identity claim of a person using his fingerprint.

Fingerprint recognition can also be categorized into minutiae extraction based and spectral features of the image based. All technologies of fingerprint recognition, identification and verification, minutiae extraction based and spectral features based, each has its own advantages and disadvantages and it may requires different treatments and techniques. The choice of which technologies to use is application specific.

Several biometrics technologies are susceptible to spoof attacks in which fake fingerprints, static palm prints, static face images can be successfully employed as biometric samples to impersonate the identification. At the highest level, all fingerprint recognition systems contain two main modules feature extraction and feature matching.

Feature extraction is the process that detects singular and all other minutiae points which are ridge ending and ridge bifurcation which differentiate one fingerprint from another which impart individuality to each fingerprint.

The problem of fingerprint recognition is one of much broader topics in scientific and engineering so called pattern recognition. The goal of pattern recognition is to classify objects of interest into one of a number of categories or classes. The objects of interest are generically called patterns and in our case are images of fingerprints matrix called vectors codes or fingercodes.

These fingercodes are extracted from an input image using the techniques described in the later section. The classes here refer to individual person. Since the classification process in our case is applied on extracted features, it can be also referred to as feature matching. This project demonstrates how fingerprint identification can be released with a spike neural network as matching process, but before the minutiae image of the fingerprint was converted into a vector code, also called fingercode, by using Gabor filter bank.

II. PROBLEM STATEMENT

A spike neural network is to be designed and trained to recognize the finger code of the databases that are actually used. An imaging system that converts each minutiae image obtained from a fingerprint image in finger code or minutiae matrix code by using a bank of bor filters. The result is that each fingerprint image is represented as a vector of 256 real values. Finally, results obtained by spike neural network will be compared to those obtained by SVM and RBF.

III. BIOMETRICS CURRENTLY IN USE ACROSS A RANGE OF ENVIRONMENTS

A. Fingerprint Recognition

Fingerprint is the pattern of ridges and valleys on the tip of a finger and is used for personal verification of people. Fingerprint based recognition method because of its relatively outstanding features of universality, permanence, uniqueness, accuracy and low cost has made it most popular and a reliable technique and is currently the leading biometric technology. There is archaeological evidence that Assyrians and Chinese ancient civilizations have used fingerprints as a form of identification since 7000 to 6000 BC. Henry Fauld in 1880 laid the scientific foundation of the modern fingerprint recognition by introducing minutiae feature for fingerprint matching. Current fingerprint recognition techniques can be broadly classified as Minutiae-based, Ridge feature-based, Correlation-based and Gradient based.

B. Face Recognition

Face recognition for its easy use and non intrusion has made it one of the popular biometric. A summary of the existing techniques for human face recognition can be found in various papers. A number of algorithms have been proposed for face recognition. Such algorithms can be divided into two categories: Geometric feature-based and Appearance-based.
Appearance-based methods include: Eigenfaces, Fisherfaces, Independent Component Analysis (ICA), Kernel Principal Component Analysis (KPCA), Kernel Fisher Discriminant Analysis (KFDA), General Discriminant Analysis (GDA), Neural Networks and Support Vector Machine (SVM).

C. Iris Recognition

The iris is a thin circular diaphragm, which lies between the cornea and the lens of the human eye. Iris recognition is considered to be the most reliable and accurate biometric identification system available. Iris recognition system captures an image of an individual's eye, the iris in the image is then meant for the further segmentation and normalization for extracting its feature. The performance of iris recognition systems depends on the process of segmentation. Segmentation is used for the localization of the correct iris region in the particular portion of an eye and it should be done accurately and correctly to remove the eyelids, eyelashes, reflection and pupil noises present in iris region.
Daughman's Algorithm segmentation method is the one of algorithm for Iris Recognition. In this algorithm Iris images are selected from the CASIA Database, then the iris and pupil boundary are detected from rest of the eye image, removing the noises. The segmented iris region was normalized to minimize the dimensional inconsistencies between iris regions by using Daugman's Rubber Sheet Model. Then the features of the iris were encoded by convolving the normalized iris region with 1D Log-Gabor filters and phase quantizing the output in order to produce a bit-wise biometric template. The Hamming distance was chosen as a matching metric, which gave the measure of how many bits disagreed between the templates of the iris. A survey on the current iris recognition technologies is available in many research works.

D. Hand geometry recognition

Hand geometry refers to the geometric structure of the hand that is composed of the lengths of fingers, the widths of fingers, and the width of a palm, etc. The advantages of a hand geometry system are that it is a relatively simple method that can use low resolution images and provides high efficiency with great user's acceptance. An algorithm developed by Ching-Liang SU for hand geometry uses object-extracting technique to extract – thumb, index, middle, ring, and small fingers from hands.
The algorithm developed in this study can find precise locations of fingertips and finger-to-finger-valleys. The extracted fingers contain many useful geometry features. One can use these features to conduct the person identification. Geometry descriptor is used to transfer geometry features of fingers to another feature-domain for image-comparison.
Image subtraction is used to exam difference of two fingers. This study uses the fingers as features to recognize different persons. A brief survey of reported systems for hand-geometry verification can be found in many other research works.

E. Palmprint Recognition

Palmprint is the region between the wrist and fingers. Palmprint features like ridges, singular points, minutia points, principal lines, wrinkles and texture can used for personal verification. There are two types of palmprint verification systems: High resolution and low resolution. High resolution system employs high resolution images, while low resolution system employs low resolution images. In high resolution images, ridges, singular points and minutia points are used as features. In low resolution images, it is principal lines, wrinkles and texture that are used as features. Palmprint verification techniques can be mainly divided into four categories: (1) Line based, (2) Texture based, (3) Orientation based and (4) Appearance based.
A method proposed by Goh Kah Ong Michael presents a contactless hand-based biometric system to acquire the palm print and palm vein features. Palm prints refer to the smoothly flowing pattern formed by alternating creases and troughs on the palmar surface of the hand. Three types of line patterns are clearly visible on the palm. These line patterns are known as the principal lines, wrinkles, and ridges. Principal lines are the longest, strongest and widest lines on the palm. The principal lines characterize the most distinguishable features on the palm. Most people have three principal lines, which are named as the heart line, head line, and life line.

F. Speaker / Voice Recognition

Speaker Recognition has been studied actively for several decades. Speaker recognition refers to recognizing persons

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from their voice. Speaker/voice verification combines physiological and behavioral factors to produce speech patterns that can be captured by speech processing technology. Inherent properties of the speaker like fundamental frequency, nasal tone, inflection etc. are used for speech authentication. Speaker recognition systems are classified as text-dependent (fixed-text) and text-independent (free-text). The text-dependent systems generally perform better than text-independent systems because of the foreknowledge of what is said can be exploited to align speech signals into more discriminant classes.

The text-dependent systems, however, require a user to repronounce some specified utterances, usually containing the same text as the training data. Tomi Kinnunen and Haizhou Li give an overview of automatic speaker recognition technology, with an emphasis on text-independent recognition. They give an overview of both the classical and the state-of-the-art methods starting with the fundamentals of automatic speaker recognition, concerning feature extraction and speaker modeling. And an elaborate advanced computational techniques to address robustness and session variability. The recent progress from vectors to super vectors. It opens up a new area of exploration and represents a technology trend and discusses the evaluation methodology of speaker recognition systems.

G. Signature Recognition

Handwritten signature is one of the first accepted civilian and forensic biometric verification technique in our society. Human verification is normally very accurate in identifying genuine signatures. Signature verification systems use the distinctive behavioral features of a signature (such as speed, pressure and stroke order) to verify the identity of the user, as opposed to a simple physical crosscheck of one signature and another. The signature verification problem can be classified into two categories: Offline and Online. Off-line method identifies signatures using an image processing procedure whereby the user is supposed to have written down completely the signature onto a template that is later captured by a CCD camera or scanner to be processed. On-line signature verification involves the capturing of dynamic signature signals such as pressure of pen tips, time duration of whole signature and velocity along signature path.

On-line systems use special input devices such as tablets, while off-line approaches are much more difficult because the only available information is a static two-dimensional image obtained by scanning pre-written signatures on a paper; the dynamic information of the pen-tip (stylus) movement such as pen-tip coordinates, pressure, velocity, acceleration, and pen-up and pen- down can be captured by a tablet in real time but not by an image scanner.

The Off-line method, therefore, needs to apply complex image processing techniques to segments and analyze signature shape for feature extraction. Hence, on-line signature verification is potentially more successful. Nevertheless, off-line systems have a significant advantage in that they do not require access to special processing devices when the signatures are produced.

H. Knuckle Crease Recognition

The image pattern formation from the finger-knuckle bending is highly unique and makes this surface a distinctive biometric identifier. Damon L. Woodard, Patrick J. Flynn gave a novel approach for personal identification and identity verification which utilizes 3D finger surface features as a biometric identifier. Using 3D range images of the hand, a surface representation for the index, middle, and ring finger is calculated and used for comparison to determine subject similarity. They used the curvature based shape index to represent the fingers surface. Gallery and probe shape index signatures are compared using the normalized correlation coefficient to compute a match score.

A large unique database of hand images was taken. The data sets obtained over time to examine the performance of each individual finger surface as a biometric identifier as well as the performance obtained when combining them. Both identification and verification experiments were conducted. In addition, probe and gallery sets sizes are increased to further improve recognition performance experiments. Though their approach yields good results for a first-of-its-kind biometric technique, this approach warrants further research.

IV. DESIGN METHODOLOGY

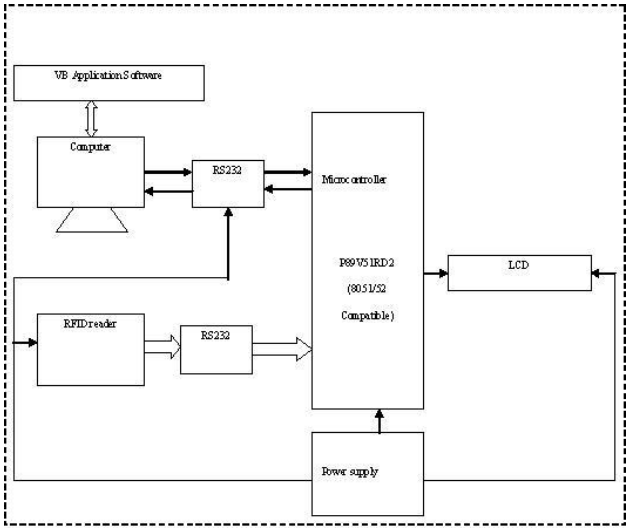

Figure1: Block Diagram of the proposed methodology

The block diagram consists of the following blocks.

- Power Supply 5v DC - 7805
- Micro controller - P89V51RD2
- MAX 232 - Serial communication
- LCD - (Liquid crystal display) 2 x16
- Buzzer - Freq-1 to 18 kHz (5v-12Vdc)
- RF Decoder (HT 12D)
- RF Card

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- Relay
- Keil µvision 3 IDE
- Embedded C
- Visual basic

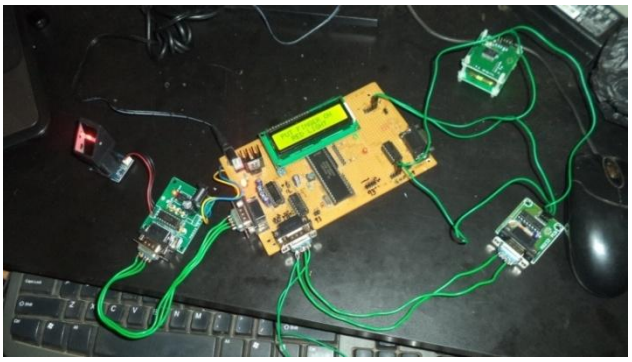

Figure 2: Circuit

A. Visual Basic for Applications (VBA)

It is an implementation of Microsoft's event-driven programming language Visual Basic 6 and its associated integrated development environment (IDE).
Visual Basic for Applications enables building user-defined functions (UDFs), automating processes and accessing Windows API and other low-level functionality through dynamic-link libraries (DLLs). It supersedes and expands on the abilities of earlier application-specific macro programming languages such as Word's WordBasic. It can be used to control many aspects of the host application, including manipulating user interface features, such as menus and toolbars, and working with custom user forms or dialog boxes.

VBA is built into most Microsoft Office applications, including Office for Mac OS X (apart from version 2008) and other Microsoft applications such as Microsoft MapPoint and Microsoft Visio, as well as being at least partially implemented in other applications such as ArcGIS, AutoCAD, CATIA and WordPerfect.

B. Microcontroller P89V51RD2

The P89V51RD2 is an 8051 microcontroller with 64 kB Flash and 1024 bytes of data RAM. A key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 8051 clock rate (12 clocks per machine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI.
The Flash program memory supports both parallel programming and in serial In-System Programming (ISP). Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The P89V51RD2 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running.

Figure 3: Microcontroller

Features:

- 80C51 Central Processing Unit
- 5 V Operating voltage from 0 to 40 MHz
- 64 kB of on-chip Flash program memory with ISP (In-System Programming) and
- IAP (In-Application Programming)
- Supports 12-clock (default) or 6-clock mode selection via software or ISP
- SPI (Serial Peripheral Interface) and enhanced UART
- PCA (Programmable Counter Array) with PWM and Capture/Compare functions
- Four 8-bit I/O ports with three high-current Port 1 pins (16 mA each)
- Three 16-bit timers/counters
- Programmable Watchdog timer (WDT)
- Eight interrupt sources with four priority levels
- Second DPTR register
- Low EMI mode (ALE inhibit)
- TTL- and CMOS-compatible logic levels

C. RS-232

It is the traditional name for a series of standards for serial binary single-ended data and control signals connecting between DTE (data terminal equipment) and DCE (data circuit –terminating equipment originally defined as data communication equipment). It is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors. The current version of the standard is TIA-232-F Interface between data terminal equipment and data circuit terminating equipment employing serial binary data interchange.

Figure 4: RS232

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D. Radio-frequency identification (RFID) Reader

It is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by and read at short ranges (a few meters) via magnetic fields (electromagnetic induction), and then act as a passive transponder to emit microwaves or UHF radio waves (i.e., electromagnetic radiation at high frequencies). Others use a local power source such as a battery, and may operate at hundreds of meters.
Unlike a bar code, the tag does not necessarily need to be within line of sight of the reader, and may be embedded in the tracked object.

Figure 5: RFID tags

E. Liquid Crystal Display (LCD)

This is a flat panel display or electronic visual display or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

F. Power supply

A power supply may be implemented as a discrete, stand-alone device or as an integral device that is hardwired to its load. Examples of the latter case include the low voltage DC power supplies that are part of desktop computers and consumer electronics devices.

V. PRINCIPAL OF OPERATION

A RFID CARD reader with a micro Controller will be designed and connected to the entrance of the company. We can use this RFID Card for door accessing, payment calculation etc., When people comes to the door & keep the card in front of that reader, ID card comes in contact with the 125 kHz RF field generated by the RF receiver, will convert the 125khz to voltage and then this voltage helps to generate the code stored to the RF field. Since the receiver is already generating the field will receive this code and send to the micro controller the micro controller is programmed in such a way that it will decode the code and compares the ID with data base ID nothing but an External EEPROM.

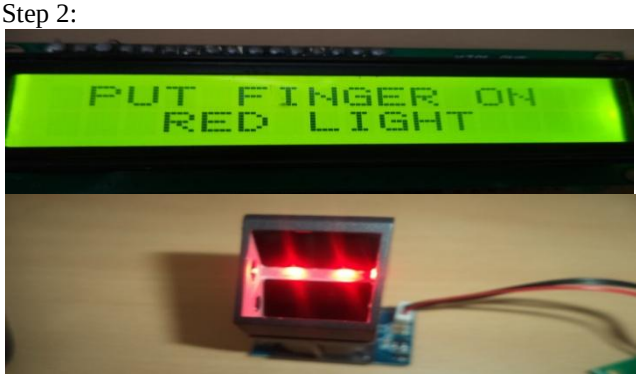
If comparison is true then micro controller will switch on the relay. If ID is invalid microcontroller will display "ACCESS DENIED" with buzzer sound. If some other person tries to enter, the micro controller checks with database & if it is wrong it displays in the LCD as "ACCESS DENIED".

Procedure:

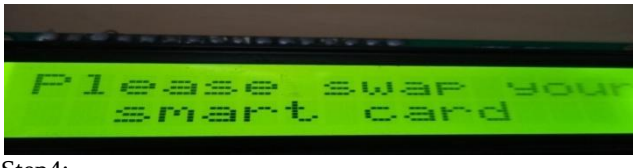
- Starts, Switching on the power supply
- LCD displays- 'WELCOME, HUMAN IDENTIFICATION USING FINGER IMAGES'
- Put finger on red light
- If the thumb impression matches LCD will display 'MATCHES FOUND'
- RFID sensor sens the RFID card number
- LCD will display 'MATCHES FOUND' otherwise it will display 'INVALID ENTRY'
- Thank you

Step1:

Step 2:



Step 3:



Step4:

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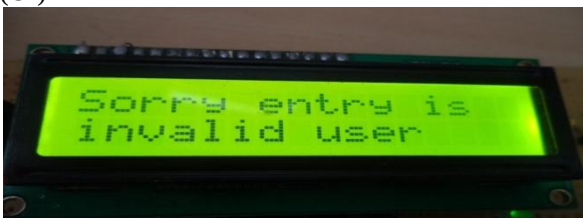
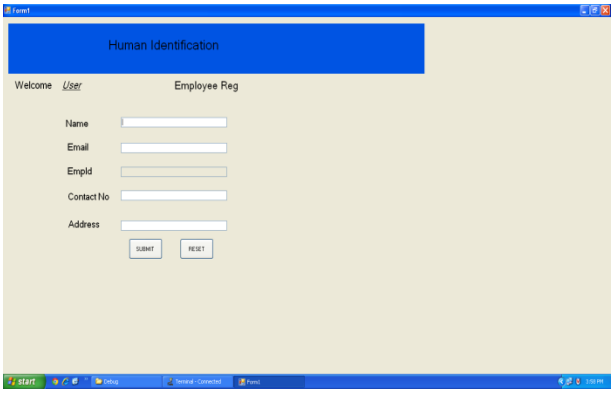
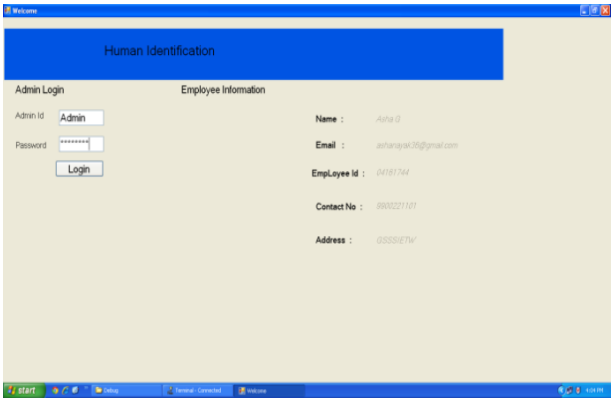
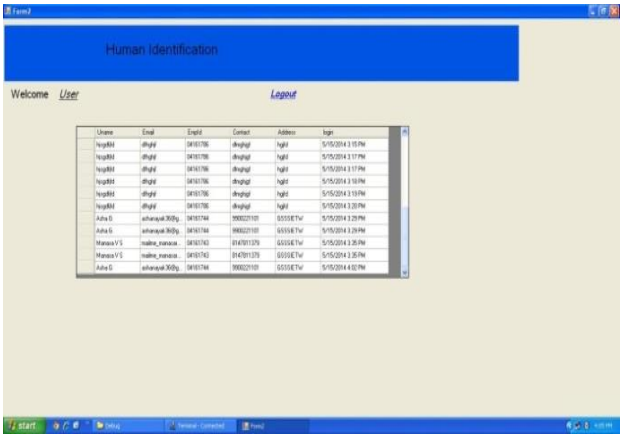
(Or)

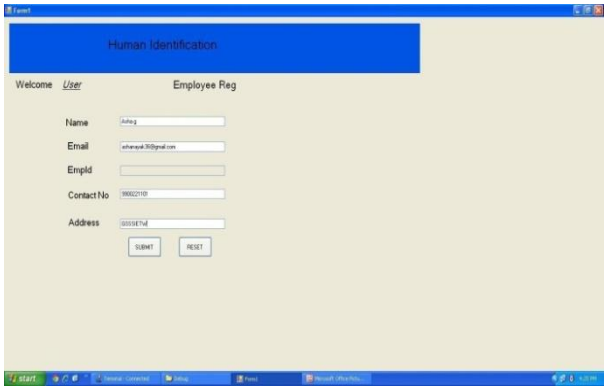


VB Observations:









Flowchart:

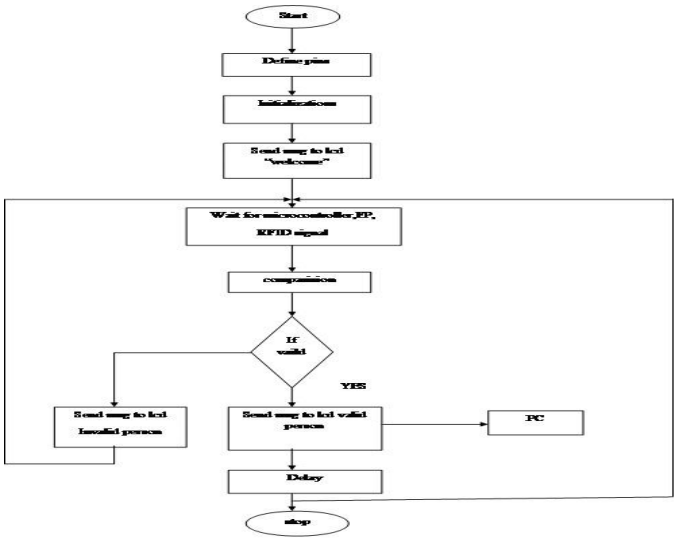


Figure 6: Flowchart of the proposed method

Merits

- More secure.
- Too simple and easy access.
- It's used by only one particular person.

Demerits

- Person wants carry RFID tags.
- Need to access the particular room or bay every time

Applications

- Organizations such as MNC's, Research institutions, Industries, Manufacturing Plants.
- Educational Institutes.
- ICU unit in Hospitals.

VI. CONCLUSION

The orientation of curved finger lines and creases are extracted as template, referred to as knuckle code, and employed for the human identification. Much more needs to be done and investigated as there exits lot of potential from finger knuckles for the human identification. There have not been any studies to ascertain the stability of finger knuckles with age, time, and varying medical and environmental conditions. Further work is also required to

ascertain the individuality of finger knuckles in large population (say more than 1000 subjects) and on the dermatoglyphics analysis to ascertain the variation of knuckle patterns across the population. This proposed methodology can be enhanced by adding RF camera, so that at the time of swiping camera will take photo of the person, in future the management can check the employee details with photograph. And we can also add GSM technology so that the user gets sms as soon as RFID is swiped.

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