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FINGERPRINT RFID RECOGNITION SYSTEM

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Abstract

Identification is essential in today society for every developed country. At the early stage, the people make personal identification using their id-card. Later, with the emerging technology, everyone can identify the other using different recognition systems such as face, speech, facial, iris, fingerprint recognition and many other biometrics. Among them, the easiest and cheapest recognition system is fingerprint. So the proposed system uses the fingerprint recognition for person identification. Another reason for choosing fingerprint is that its accuracy has also the acceptable rate with the combination usage of RFID. The system first trains the features of fingerprint for each. At the training stage, the system passes the preprocessed step and features extraction step. After getting the features of the fingerprint, the system stores these features into the database (MySQL) and also writes these data onto the RFID card (Mefair 1k) with the help of the RFID reader (SDK reader). When the user comes into the paperless identification system together with RFID card, the system identifies the person is authentic or not by matching the fingerprint features on the RFID card and system's generation of the fingerprint features with the real time usage. Here, the main point of the proposed system is to get the exact features of the fingerprint and then to get the correct reading of RFID card. So, the proposed system uses the correlation technique to get the accurate features based on five statistical approaches such as entropy, joint entropy, relative entropy, mutual information and smoothness. Finally the system evaluates the accuracy of the recognition rate with the existing methods.

Keyword: Keywords— id-card, RFID, MySQL, Mefair 1k and SDK

1.INTRODUCTION

Individual identification data incorporates individual's significant archives, for example, birth declarations, driver's licenses, and government disability cards. It additionally incorporates records like visas, guns licenses, travel papers, government and work I.D. cards, or essentially whatever other record that can formally be given to an individual. At the last, the people all over the world used these important documents like paper based card. However, these paper based cards will demolish in a brief timeframe with the power of water, fire and other natural atmosphere changes. Therefore, the developed country try to change the paper based identification card to contactless card for long term usage.

The most important thing is to get the accurate identification result for every reason. Now the advance in technology made different biometrics features for recognition. These different biometric recognition systems are based on human physiological and behavioral characteristics. So anyone can face difficult to attack and change the features of the biometrics. According to the physiological characteristics, there are fingerprints, height, weight, color and size of the iris, the retina, the shape of the hand, the shape of the ear, and the physiognomy of the face. With the behavioral characteristics, there are the vocal imprint, the writing, the typing style on the keyboard, the movements of the body, the style and the trend of the walk. The proposed system uses the physiological characteristics for achieving real time response.

RFID is a present moment for "radio-frequency identification" and is one kind of innovation whereby information encoded in RFID labels are captured by a reader by means of radio waves. The most significant thing is that RFID tag can be achieved outside the LOS (view) of the scanner. The processing flow of RFID is the same as the bar-coding. But RFID has several advantages over barcode system. The most valuable thing is that RFID tag can be read outside the LOS (line of sight) of the scanner [1].

The proposed system implements the personal identification system with the combination of biometric features and RFID technique. In this case, the system uses the fingerprint recognition for biometric features. The main aspect of the system is to achieve the accurate features of fingerprint. So the system applies the correlation technique for statistical methods. The system first evaluates the features for preprocessed fingerprint using the above mentioned five statistical methods. Then the system searches the relationship of these five statistical methods. Finally the system writes the encoded data onto the RFID card to get the fast and accurate identification system.

2. LITERATURE REVIEWS

Bharkad and Kokare [2] proposed discrete wavelet packet transform (DWPT) based feature extraction technique for unique matching. The wavelet packet transform is useful on miniature area of fingerprint image. The performance of wavelet bundle crumbling is assessed on the standard database accessible at the Website of Bologna University. The idleness of discrete wavelet packet transform is reduced without conciliating the meticulousness. The discrete wavelet packet transform with reduced idleness gives the improved performance over the discrete wavelet transform (DWT), Gabor filter and minutiae based method.

Wen, Qi, Li,Zhang, Gong and Cao [3] proposed a novel robust and efficient minutia-based fingerprint corresponding algorithm. There are two main contributions. Initially, apply a set of global level minutiae features, i.e., the behaviors that determine the reliabilities of the extracted minutiae and the area of overlapping regions among the query and template images of fingerprints. The achievement of these simple to-get minutiareliant highlights presents lucidness to the very much acknowledged fingerprint template standards. In addition, the logical of them results in the robustness to deprived quality fingerprint images. subsequently implement a hierarchical recognition strategy, which applies a method of global matching that improves the local matching resolution towards authentic result over the whole images .Additionally, the much improved accuracy, our algorithm also endorses the efficiency, because matches with other state-of-the-art matching approaches; it does not formulate the use of any time-consuming operations.

Sayeemuddin, PithadiaandVandra [4] proposed a extremely simple algorithm that uses Laplacian of Gaussian (LoG) filter, edge filter (LoG based) and morphological operations. This algorithm doesn't require square wise of mean and difference. The algorithm also takes benefit of the fact that most fingerprint images are vertical or within 45 degrees to the vertical. An algorithm is applied on FVC2004-DBl,DB2, DB3 and FVC2000-DB3 public database. The algorithm shows that it gives good output even for low quality images.

Tao Liet. al(2010):Comparing with the classical barcode system, RFID extends the operational distance from inches to a number of feet (passive RFID tags) or even hundreds of feet (active RFID tags). Their remote transmission, handling and capacity abilities empower them to help the full automation of many stock administration works in the business. Monitoring a large set of RFID tags and identifying the missing ones the objects that the missing are associated is difficult. In view of probabilistic strategies, structure of a progression of missing-label distinguishing proof conventions that utilize novel systems to lessen the execution time is made. Proposed convention lessens the ideal opportunity for recognizing the missing labels by 88.9% or more, when contrasting and existing convention [5].

Kamaran Ahsan(2010):RFID innovation can adequately improve oneself assistance and the assortment the board, which correspondingly prompts improving the benefactors' fulfillment with utilizing the library. An essential RFID framework comprises of three modules: Tags, Readers and Antennas. A RFID Tag is comprised of a coupling component and a chip; each tag has an interesting electronic code, appended to the item used to recognize the objective. RFID captures are gadgets that are utilized to recover and compose the data on RFID labels. There are handheld and fixed captured. Handheld captures planned that demonstration like handheld standardized identification scanners and fixed captures are mounted to peruse labels consequently as things pass close by them. The reception apparatus radiates radio signs to enact the tag and to peruse and compose information to it [6].

According to the literature survey, there are many fingerprinting recognition but it needs to get better accuracy with quick processing time. So the proposed system implements the combination of new fingerprint

recognition system based on statistical correlation with RFID technique.

3. BACKGROUND THEORY

This section describes the general knowledge of the methods used in fingerprint identification system. It presents about biometrics recognition, RFID technique
Biometrics Recognition
Biometrics is the specialized term for body measurements and calculations. It refers to metrics related to human characteristics. There are two types of biometrics namely physiological characteristics and behavioral characteristics. Physiological characteristics based on human's pattern. Behavioral characteristics based on behavior of human. The proposed system uses the physiological characteristics especially fingerprinting.

Fingerprint recognition is one of the physiological characteristics. Fingerprinting is one of the most notable biometrics, and it is by a long shot the most utilized biometric answer for verification on computerized frameworks. The explanations behind fingerprinting being so famous are the simplicity of acquisition, built up use and acknowledgment when contrasted with different biometrics, and the way that there are various (ten) wellsprings of this biometric on every person.
The three essential examples of fingerprinting are the arch, the loop, and the whorl. An arch is where the edge enters one side of the finger, at that point ascends in the middle shaping a curve, and exits on the opposite side of the finger. With a loop the ridge enters one side of the finger, at that point frames a bend, and exits on a similar side of the finger from which it entered. Loops are the most well-known example in fingerprints. At long last a whorl is the example that has when edges structure circularly around a main issue. Refer to the images on the right for examples of each pattern.

Figure 1. Basic Pattern of Fingerprint

Acquisition There exist four main types of fingerprint reader hardware:

1. Optical readers are the most widely recognized kind of fingerprint readers. The kind of sensor in an optical reader is an advanced camera that obtains a visual image of the unique fingering. Focal points are that optical readers start at extremely modest costs. Dissatisfactions are that readings are affected by messy or marked fingers, and this sort of fingerprint reader is simpler to trick than others.
2. Capacitive readers, additionally called to as CMOS readers, don't read the unique fingerprint utilizing light. Rather a CMOS reader utilizes capacitors and therefore electrical flow to frame a picture of the unique mark. CMOS readers are more costly than optical readers in spite of the fact that they despite everything come generally modest with costs beginning great beneath 100 euro's. A significant preferred position of capacitive readers over optical readers is that a capacitive reader requires a genuine unique finger impression shape instead of just a visual picture. This makes CMOS readers harder to deceive.
3. Ultrasound readers are the latest sort of fingerprint readers, they utilize high frequency sound waves to enter the epidermal (external) layer of the skin. They read the unique fingerprinting on the dermal skin layer, which takes out the requirement for a clean, unscarred surface. Every kind of fingerprint readers are a picture of the external surface, along these lines expecting hands to be cleaned and liberated from scars before read-out. This sort of fingerprint reader is definitely more costly than the initial two, anyway because of their exactness. Thermal readers sense, on a contact surface, the distinction of temperature in the middle of fingerprint ridges and valleys. Thermal fingerprint readers have various detriments, for example, higher power utilization and a performance that relies upon the environment temperature [7].

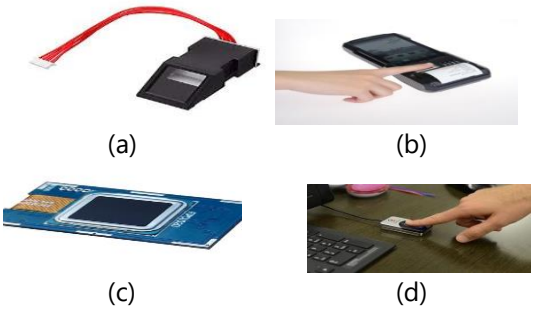

Figure 2. Different Types of Fingerprint Reader

After a fingerprint image is obtained by the fingerprint reader, this unique fingerprinting must be deciphered. It must be prepared so that read-outs can be productively looked at and coordinated against one another.
Generally speaking two types of matching software exist:

1. Minutiae matching relies on recognition of the minutiae points, this is the most widely used technique
2. Pattern matching simply compares two images to see how similar they are, often used in fingerprint systems to detect duplicates.

The proposed system uses the ultrasound fingerprint reader hardware and pattern matching software.
B. Radio Frequency Identification (RFID)
RFID (radio frequency ID) is a type of remote communication that works with the utilization of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic range to remarkably recognize an object, animal or person.

RFID Tag: a RFID label comprises of an incorporated circuit and an antenna. The tag is likewise made out of a defensive material that holds the pieces together and shields them from different natural conditions. The protective material relies upon the application. For instance, representative ID containing RFID labels are ordinarily produced using tough plastic, and the tag is inserted between the layers of plastic. RFID labels arrive in an assortment of shapes and size and are either passive or active. Passive tags are the most widely used, as they are smaller and less expensive to implement. Passive tags must be "powered up" by the RFID reader before they can transmit information. In contrast to passive tag, active RFID tags have an installed power supply (e.g., a battery), in this manner empowering them to transmit information consistently.

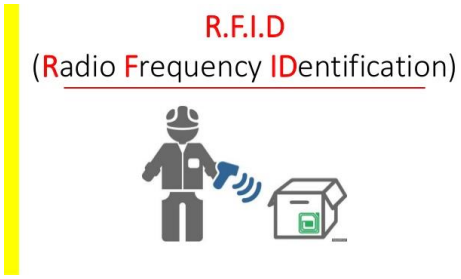

Figure 3. Tagging Form of RFID

RFID Reader: A RFID Reader is a device that uses radio-frequency waves to wirelessly transfer data between itself and a RFID tag/label in order to identify, categorize and track assets. At the point when joined with the right RFID programming, a RFID reader can distinguish objects, all the more precisely, at a diminished in general expense, and at different purposes of the item's lifecycle. RFID readers from the top brands are conveyed, including Alien, Impinj, Motorola, Intermec, TSL, and Zebra. The RFID Readers are offered in different structure factors with numerous capacities, for example, laser, imager, handheld, fixed, Bluetooth, USB, UHF, HF, iOS/Android Compatible and that's only the tip of the iceberg! [8].

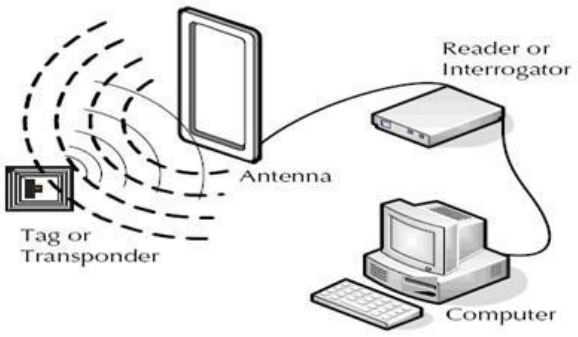

Figure 4. Processing Flow of RFID Tag and Reader

4. CASE STUDY FOR PROPOSED SYSTEM

The process of the proposed system is mainly composed of two parts, generating the features of fingerprint using statistical correlation and implementing the identification system using the hybrid of RFID and fingerprint recognition. To develop the first portion of

the proposed system, extracting features of fingerprint, raw data was pre-processed and feature selection, implementation of untrained model and train-test-evaluation are performed.

The proposed system includes the four portions:

- Preprocessing
- Edge Detection
- Segmentation
- Features Extraction

5. RESULTS AND PERFORMANCE EVALUATION

The whole design of the proposed system is implemented with C# programming language. This section is to evaluate the performance of the proposed system with the terms of feature extraction time (ms) by comparing the other existing methods.

Methods	Feature Extraction (ms)
DWT	115
LOG	140
Proposed	110

Figure 5. Comparison of Feature Extraction Time

6. CONCLUSION AND FURTHER EXTENSION

In the proposed system, feature extraction is the main logic. If the features are exact, the system can get the perfect identification system based on fingerprint recognition. The proposed system considers the 776 attributes as input image for 97 people. The system generates the features using correlation of five statistical approaches. According to the test results, the proposed system gains the faster execution time compared with other methods.

For further extension, the researchers can use other feature extraction methods to achieve the exact features for good identification system. Moreover, the researchers can utilize the other ready database system for getting more images.

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