

Criminal Recognition System by One To Many Matching Using Biometric Scanner

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Abstract :- It is quite obvious that the rates of crimes are increasing day by day in all societies in the world. Criminal investigation is the duty of police department. To serve the interests of justice it works with forensic scientists. The purpose of this paper is to design a system that will reduce the paper work with ease of acquiring the suspect's information and hence enhancing the fingerprints for efficient matching to derive at the conclusion whether the suspect is new criminal or already being convicted.

Keywords :- forensic, criminal, police station, optical fingerprint scanner, preprocessing, matching.

I. INTRODUCTION

As fingerprints are unique to each individual, they serve as a way for law enforcement agencies to identify a suspect, as well as help build a case in court. They can be used to identify missing persons, or as a safety precaution in immigration and military cases. In this paper the system improves the efficiency of investigation and recognition of criminal by reducing noise.

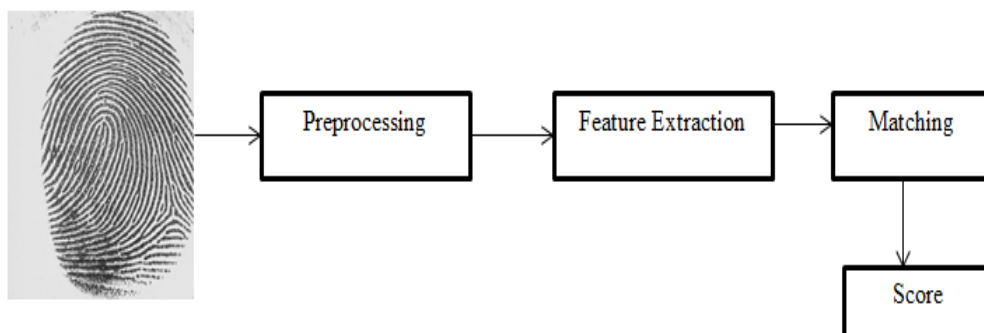


Fig 1: Basic fingerprint verification technique

III. PROPOSED SYSTEM

The proposed system will make use of few techniques of the existing system along with the additional improvements to hardware, software and the algorithms used.

Initially at the police station the suspect's fingerprints are acquired using fingerprint scanner which is of high resolution. This will eliminate the time consumption and misuse of the ink-on-paper technique by the suspect.

Our system is designed to allow the suspect to record his/her fingerprints at the police station using a fingerprint scanner. These fingerprints along with suspect's personal information are

provided to the forensic department for further investigation and preprocessing. Fingerprints of suspect being obtained are matched with the database record to conclude the suspect to be a new criminal or one being convicted before.

II. EXISTING SYSTEM

Fingerprints have been an important element in criminal investigations since the beginning of the twentieth century. The police station captures the suspect's fingerprints using ink-on-paper technique. This technique is prone to noise. This paper was then scanned on flatbed scanner and the results serve as input in forensic department. This input is matched with the database record which displays multiple results for the same. This results in the complexity and inaccuracy of the system.

The police station now forwards the suspect's fingerprints and the relevant personal information to the forensic department for further investigation. The forensic expert will have access to both the suspect's fingerprints and personal details. The authorized user from police station can access the information of any suspect by logging in to the system with defined security policies. All the information about the suspect is stored on database which is secured. The following preprocessing steps are applied to

the fingerprints to reduce noise and improve quality of image.

A. Normalization

Normalization is performed to remove the effects of scanner and gray level background due to finger pressure differences.

B. Binarization

Binarization converts a grey level image into a binary image to improve the contrast between the ridges and valleys in a fingerprint image which leads in the extraction of minutiae.

C. Thinning

Ridge thinning is to eliminate the redundant pixels of ridges till the ridges are just one pixel wide.

Once the preprocessing steps are applied the suspect’s fingerprints are compared with the ones stored in database. The system will generate either the matched results or minimize the number of matched results. Based on the result the forensic department can conclude whether the suspect is a new criminal or has been convicted before. This information is updated to the police station and hence appropriate section of law(s) is imposed on the suspect.

The core point detection and matching of fingerprint is based on Gabor filters.

A. Gabor filters

After preprocessing Gabor filtering is applied which produce filtered images.

B. Matching of Fingerprint Images

It depends on the Euclidean distance which is calculated based on the feature vectors obtained.

IV. IMPLEMENTATION

The fig2 shows the implementation of the proposed system using steps 1-4.

The police station uses an optical scanner to acquire the 10 fingerprints of the suspect. The optical scanner allows streaming of fingerprint and then capturing it once in appropriate position. The desktop application at the police station will save the suspect’s information along with the 10 fingerprints in the database. The application forms designed are user interactive. The application forms are of 2 types:

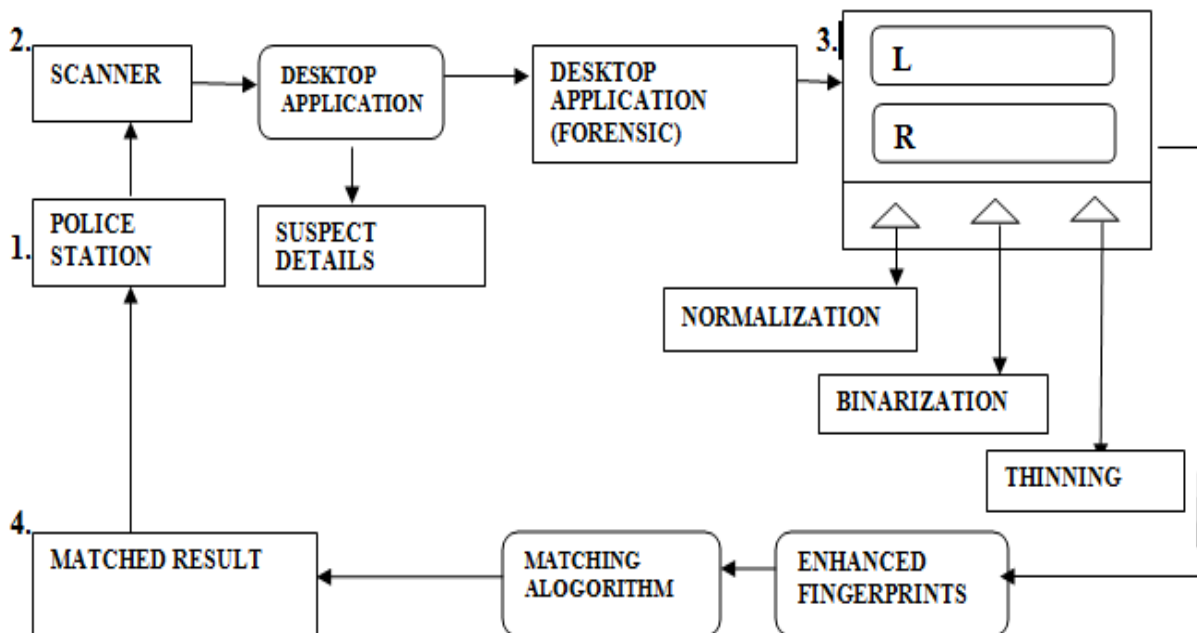


Fig 2: Block diagram of proposed system

A. Convicted

The convicted form contains all the information of the criminal being guilty under court of law. If the suspect is found to be convicted before then all the information regarding the conviction can be extracted using the unique identifier.

B. Arrested

The arrested form consists of all the information of the suspect who is found to be at the crime spot.

The forensic department and the police station share common database which provides easy access to the data. All details are accessible to the forensic department only by logging into the system. For further investigation the Forensic expert will download the details along with the 10 fingerprints of the suspect through the desktop application. The application will keep update of the new entry into it. All the 10 fingerprints thus obtained are enhanced using the preprocessing steps mentioned earlier. Thus enhanced fingerprints can be used for matching with the earlier database record. The database contains all the previous records of the criminals being convicted or arrested. The suspect's fingerprints are matched with multiple records from the database. The system will either give the exact match to the database record or will produce minimum number of matched results. The forensic department will then send the appropriate result to the police station informing whether the suspect is a new criminal or already has criminal record. The police station then updates and proceeds with further investigation.

V. EXPERIMENTAL RESULTS

A. Hardware

The optical scanner is used to acquire the suspect's fingerprints. Fingerprint scanner produces the 256*256 image dimension. The scanner has 600 DPI image resolution.



Fig 3.A Fingerprint scanner

B. Software

Frontend is build using angularjs 1.5 . Web pack is used as module bundler. Backend is Java app that is hosted on Google cloud's flexible app engine. MySQL database is used to store entries.

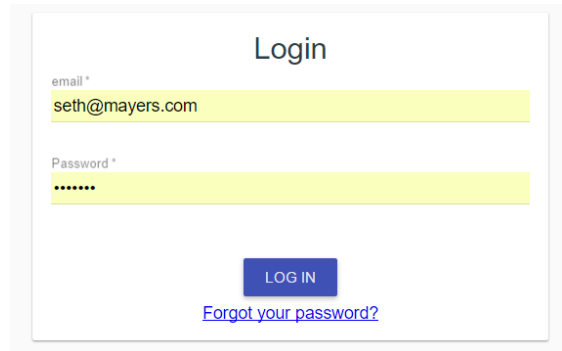


Fig 4 . Login Panel

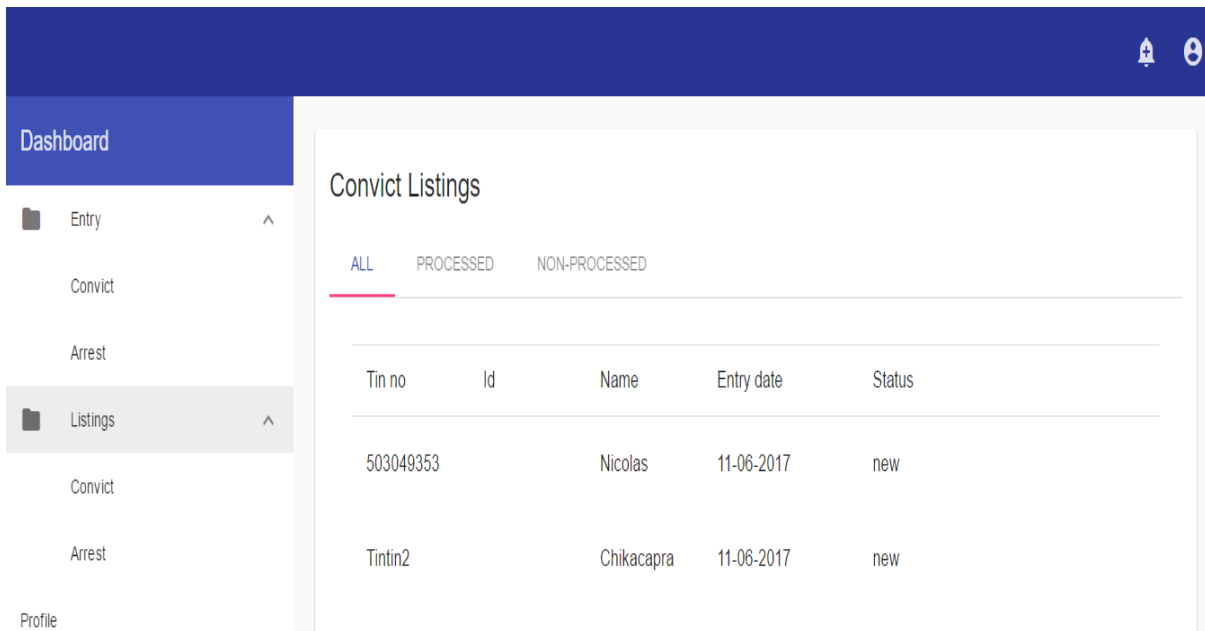


Fig 5. Front end for police station

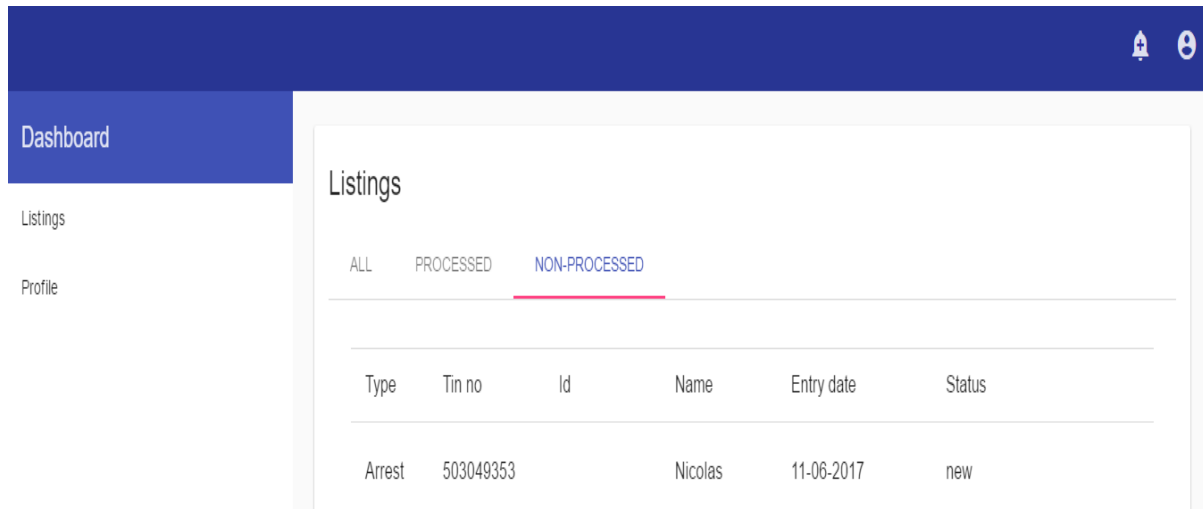


Fig 6. Front end for forensic department

VI. CONCLUSION

The system is easy to use and saves much of the human work. It reduces the most of the paper work. The optical scanner used reduces the noise and improve the fingerprint quality. Its feature provides streaming and capturing of the fingerprints. The enhancement of the fingerprint image provides better results while matching. The system provides security to the data both at police station as well as forensic. Only the authorized user can access the system for the investigation process.

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