

Fingerprint Recognition for Android Application Data Retrieval

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ABSTRACT

Smartphones play a major role in our lives nowadays, starting from social media to grocery shopping everything has its very own featured application. The data retrieval process in every application is the part where the application's actual features are defined. The fingerprint sensors have been in-built in the smartphones for authentication purpose alone. In this application, an external reader has been used to get the fingerprint images and store them in the database, later the FP images are used for efficient and fast data retrieval purposes.

Keywords: Fingerprint matching, Andorid Application, Data retrieval .

I. INTRODUCTION

Image processing is the method where images are converted into digital form and perform some operations on it, in order to get an enhanced image. Image processing has five major purposes as follows- Visualization, Image sharpening and restoration, Image retrieval, Measurement of pattern, and Image recognition. Image processing methods can be either Analog or Digital Image processing. Analog or visual techniques of processing are used for hard copies, while Digital image processing help in manipulation of the digital images by using computers.

Biometrics

These are the metrics related to human characteristics. It is used as a form of access control and for identification purposes. Biometric identifiers are classified as physiological and behavioral characteristics. Physiological are related to the shape of the body, which includes fingerprint recognition, face recognition, iris recognition, DNA, palm print, palm vein, hand geometry, retina and odor.

Fingerprint

The analysis of fingerprint involves the matching of patterns which includes the several features of ridges and the minutiae. The fingerprint is made of ridges and valleys, the ridges are represented by the dark areas and the valleys are represented by light areas. The basic pattern of fingerprints are classified as arch, loop and whorl. The

classifications that arise in the ridges are crossover, core, bifurcation, pore, delta, ridge endings and island. In the recent days, the most commonly used minutiae points are the bifurcations and the ridge endings, because these points can be detected by looking at the points surrounding them.



Fingerprint Processing

The processing has three primary functions: enrollment, searching and verification. The enrollment function captures the fingerprint image from the sensor, which is called live image. Regarding the verification function, here several techniques to match the fingerprints such as correlation-based matching, minutiae-based matching, ridge feature-based matching and minutiae-based algorithm.

Algorithms

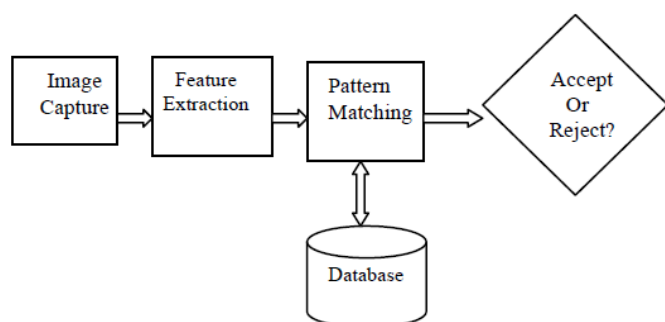
Matching algorithms are used to compare the fingerprint templates against the candidate fingerprints for authentication purposes. The two basic algorithms are Pre-processing and Pattern-based matching algorithms. The pre-processing algorithms help in enhancing the image by filtering and removing the unnecessary noises from the image. The pattern-based matching algorithms compare the basic patterns (arch, loop, and whorl) of the fingerprint.

II. LITERATURE SURVEY

The paper by Ravi Subban and Dattatreya P. Mankame describes that fingerprint identification is the most common among the biometrics because of their easiness in acquiring the fingerprint. The customary fingerprint patterns are as follows:

- 1) Plain Arch has the pattern that has ridges on one side, and make a rise on the other side and end on the other side.
- 2) Radial loops flow in the direction of the thumb.
- 3) Ulnar loops flow in the direction of the little finger.
- 4) Plain whorl consists of pattern with two deltas and at least one ridge will make a complete oval or circle shape.
- 5) Central Pocket loop whorl has a minimum of one re-curling ridge.
- 6) Double loop whorls are composed of two separate sets of shoulders and deltas.
- 7) Accidental whorls formed by two deltas alone, combine two or more patterns.

The basic biometric system consists of the following:



The paper by Koichi Ito, Ayumi Morita, Takafumi Aoki, Hiroshi Nakajima, Koji Kobayashi, and Tatsuo Higuchi proposes an efficient algorithm by combining phase-based image matching and feature-based image matching. Here, phase-based image matching by Phase-Only Correlation or phase correlation function (which is known as POC) is

used. When two images are similar, the POC gives a distinct sharp peak. And when two images are unique, the POC peak decreases significantly. The height of the peak gives a good measurement for similarity between the images. The POC function has been modified to improve the matching performance, which is known as Band-Limited Phase-Only Correlation function (BLPOC) dedicated to fingerprint matching. The feature-based image matching algorithm compares the registered image with input image and obtains the matching minutiae pairs between them by block matching using BLPOC function. The algorithm has four steps which are as follows: (i) minutiae extraction, (ii) minutiae pair correspondence, (iii) block matching using BLPOC and (iv) matching score calculation.

The paper by Ying Hao, Tieniu Tan, Yunhong Wang describes that in automated fingerprint identification systems (AFIS) fingerprint matching is the one of the most vital stages. Firstly, ridge information and Hough transformation are adopted to obtain the minutiae pairs and the common region between the two fingerprints. Then, the Matched Set which consists of the corresponding and the surroundings are established. Finally, the process is subsequently followed by the error propagation process where the errors found between each unmatched minutiae pairs are eliminated. The fingerprint matching based on error propagation has the following steps: (i) correspondence estimation, (ii) common region estimation, (iii) initialization of matched set and (iv) matching based on error propagation.

III. METHODOLOGIES

Android studio

Android studio is the official IDE (Integrated Development Environment) for android application development. It works based on IntelliJ IDEA. It provides tools for customized for Android app developers which includes exclusive code editing, debugging, testing and profiling tools. The features based on IntelliJ IDEA are as follows: (a) instant run, (b) intelligent code editor and (c) fast and feature code editor.

XAMPP

It is the free and open source cross-platform web server solution stack package, which was developed by Apache friends. It consists mainly of the Apache HTTP Server, MariaDB database, and written in the PHP and Perl programming languages for the interpreter scripts. XAMPP stands for Cross-Platform, Apache, MariaDB, PHP and Perl. It is a simple Apache distribution, which makes easy for developers to develop a local host for testing purposes. It also cross-platform, which means it works well on Linux, Mac and Windows OS. It makes transition from local test server to live server extremely easy.

Open CV

Open CV is Open source Computer Vision, which was developed aiming at real time computer visions. It is an Intel research initiative aimed at CPU-intensive applications, which is a library of programming functions. It is written in C++ and supports Python, Java and MATLAB/OCTAVE. This library is a cross-platform and it is free for user under the open-source BSD license.

Open CV4 Android

It is available as an SDK with set of samples and Java documentations for Open CV Java API. The following should have been installed in advance for this to work properly- JDK, Android SDK and NDK.

Android API 6 sensor

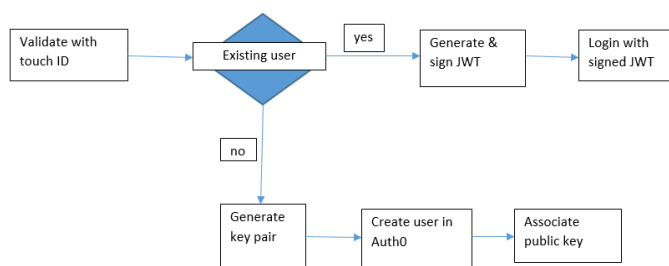
The sensor used is an ultrasonic sensor, in which an ultrasonic pulse is transmitted over the finger placed on it, some of the pulse is bounced back to the sensor and some is absorbed based on the unique features of each finger.

IV. PROPOSED SYSTEM

The proposed system provides an effective way to access the data from the web server of the android application through fingerprint identification by the android API 6 sensor. The application works as follows:

1. First, the scanned copy of the license of an individual is stored in the server. Along with it, the fingerprint of the respective individual is also stored in the server.
2. The fingerprint of the individual will be registered through the android API6 sensor of the smartphone.
3. Next time, when the input fingerprint is received it compares it with the registered templates and then displays the respective user's license details.

The overall process that takes in the fingerprint identification is as follows:



V. CONCLUSION

The proposed application provides an efficient way to access the android application storage. The application also provides a way to keep the license details in hand all the time. This application helps in avoiding the individuals to pay fine due to misplacement of the license.

VI. FUTURE SCOPE

- 1) Further the RC book details of the vehicle can be updated to the storage, along with the vehicle registration number.
- 2) A notification from a month's time before the expiry of the license can be given to user.

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