RESEARCH PAPER | Computer Science | Volume : 5 | Issue : 1 | Jan 2015 | ISSN - 2249-555X

An Efficient Palm Print Recognition Technique for Vehicle Security on Image Processing Context

KEYWORDS: Quantization, Types of Operations, Noise, Palm Print Recognition

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ABSTRACT *The digitization of image can be done by a scanner or by a camera connected to a server board in a computer. The images can be operated by various image processing operation if the image has been digitized once. Image processing operations can be roughly divided into three major categories, Image Compression, Image Enhancement and Restoration, and Measurement Extraction. In this, Image Compression involves reducing the amount of memory needed to store a digital image. In this paper we discuss about hand print which is mainly used for security purpose. We also present a current trend bio-metric technology called palm print recognition. Palm print is captured from the inner surface of a hand between the wrist and the top of the fingers, which contains the principal lines and ridges on the palm, finger and fingerprint. This method can be transferred for vehicle security. Except the owner, when someone try to start the vehicle by placing his palm on the accelerator, the hand print of the person and his photo is sent to the owner's mobile through MMS media and the area where the vehicle is moving is captured every 30 seconds and sent to the owner's cellular, by which the identification of thief may quicker and easier.*

Introduction
Imaging in the world has become completely digital. The transformation of visual imagery into mathematical constructs has made it commonplace for researchers to utilize computers for their day-to-day image analysis tasks. Along with this change comes the need to fully understand how image data is handled within a computer and how image processing methods can be applied to extract useful measurements and deeper understanding of image-based data.

In computer science, **image processing** is any form of signal processing for which the input is an image, such as photographs or frames of video; the output of image processing can be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it.

1.Digital image processing

Two major tasks focused by it,

Improvement of pictorial information for human interpretation.

Processing of image data for storage, transmission and represent for autonomous machine perception.

A digital image a[m,n] described in a 2D discrete space is derived from an analog image a(x,y) in a 2D continuous space through a sampling process that is frequently referred to as digitization. For now we will look at some basic definitions associated with the digital image. The effect of digitization is shown in Figure 1.

The 2D continuous image a(x,y) is divided into N rows and M columns. The intersection of a row and a column is termed a pixel. The value assigned to the integer coordinates [m,n] with {m=0,1,2,...,M-1} and {n=0,1,2,...,N-1} is a[m,n]. In fact, in most cases a(x,y)--which we might consider to be the physical signal that impinges on the face of a 2D sensor--is actually a function of many variables including depth (z), color (λ), and time (t).

1.1.Quantization
The image shown in Figure 1 has been divided into N = 16 rows and M = 16 columns. The value assigned to every pixel is the average brightness in the pixel rounded to the nearest integer value. The process of representing the amplitude of the 2D signal at a given coordinate as an integer value with L different gray levels is usually referred to as amplitude quantization or simply quantization.

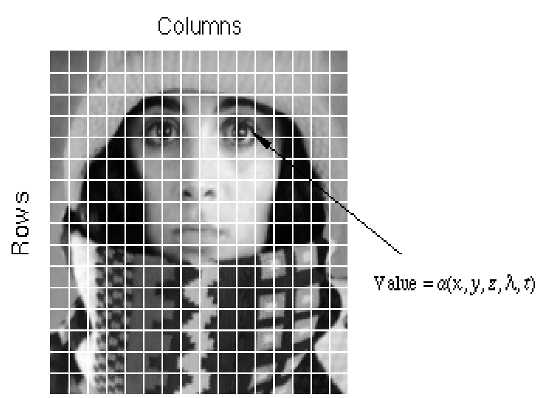


Figure 1: Digitization of a continuous image. The pixel at coordinates [m=10, n=3] has the integer brightness value 110.

1.2. Common Values
There are standard values for the various parameters encountered in digital image processing. These values can be caused by video standards, by algorithmic requirements, or by the desire to keep digital circuitry simple. Table 1 gives some commonly encountered values. Quite frequently we see cases of $M=N=2^K$ where {K = 8,9,10}. This can be motivated by digital circuitry or by the use of

Volume : 5 | Issue : 1 | Jan 2015 | ISSN - 2249-555X

certain algorithms such as the (fast) Fourier transform.

Table 1: Common values of digital image parameters

Parameter	Symbol	Typical values
Rows	N	256,510,520,622,1020,1030
Columns	M	256,512,720,1020,1300
Gray Levels	L	2,62,253,1020,4020,15322

The number of distinct gray levels is usually a power of 2, that is, $L=2^B$ where B is the number of bits in the binary representation of the brightness levels. When $B>1$ we speak of a *gray-level image*; when $B=1$ we speak of a *binary image*. In a binary image there are just two gray levels which can be referred to, for example, as "black" and "white" or "0" and "1".

2. Characteristics of Image Operations

- Types of operations
- Types of neighborhoods

There is a variety of ways to classify and characterize image operations. The reason for doing so is to understand what type of results we might expect to achieve with a given type of operation or what might be the computational burden associated with a given operation.

2.1. Types of operations

The types of operations that can be applied to digital images to transform an input image a[m,n] into an output image b[m,n] (or another representation) can be classified into three categories

* Point- the output value at a specific coordinate is dependent only on the input value at that same coordinate.

* Local- the output value at a specific coordinate is dependent on the input values in the neighborhood of that same coordinate.

* Global- the output value at a specific coordinate is dependent on all the values in the input image.

2.2. Types of neighborhood

Neighborhood operations play a key role in modern digital image processing. It is therefore important to understand how images can be sampled and how that relates to the various neighborhoods that can be used to process an image.

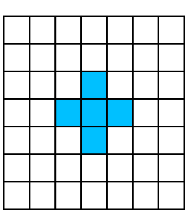


Figure 3a

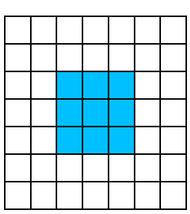


Figure 3b

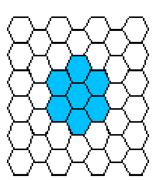


Figure 3c

* Rectangular sampling - In most cases, images are sampled by laying a rectangular grid over an image as illustrated in Figure 1. This results in the type of sampling shown in Figure 3ab.

Rectangular sampling Rectangular sampling hexagonal sampling 4-connected 8-connected 6-connected

* Hexagonal sampling - An alternative sampling scheme is shown in Figure 3c and is termed hexagonal sampling. Both sampling schemes have been studied extensively and both represent a possible periodic tiling of the continuous image space. We will restrict our attention, however, to only rectangular sampling as it remains, due to hardware and software considerations, the method of choice.

Local operations produce an output pixel value $b[m=m_o,n=n_o]$ based upon the pixel values in the neighborhood of $a[m=m_o,n=n_o]$. Some of the most common neighborhoods are the 4-connected neighborhood and the 8-connected neighborhood in the case of rectangular sampling and the 6-connected neighborhood in the case of hexagonal sampling illustrated in Figure 3c.

3.Noise

Images acquired through modern sensors may be contaminated by a variety of noise sources. By noise we refer to stochastic variations as opposed to deterministic distortions such as shading or lack of focus. We will assume for this section that we are dealing with images formed from light using modern electro-optics. In particular we will assume the use of modern, charge-coupled device (CCD) cameras where photons produce electrons that are commonly referred to as photoelectrons. Nevertheless, most of the observations we shall make about noise and its various sources hold equally well for other imaging modalities.

While modern technology has made it possible to reduce the noise levels associated with various electro-optical devices to almost negligible levels, one noise source can never be eliminated and thus forms the limiting case when all other noise sources are "eliminated". Photon Noise . figure 4 shows the image with and without noise.

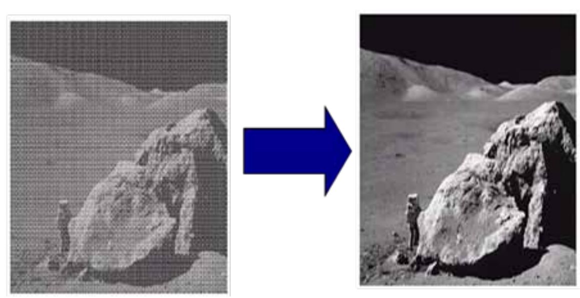


Fig:4 image noise reduction

- Thermal Noise
- On-chip Electronic Noise
- KTC Noise
- Amplifier Noise
- Quantization Noise

4. Requirements of our system

4.1.Concept

The concept what we use here is palm identification, just like fingerprint identification, is based on the aggregate of information presented in a friction ridge impression. This information includes the flow of the friction ridges ,the presence or absence of features along the individual friction ridge paths and their sequences, and the intricate detail of a single ridge. To understand this recognition concept, one must first understand the physiology of the ridges and valleys of a fingerprint or palm. When recorded, a fingerprint or palm print appears as a series of dark lines and represents the high, peaking portion of the friction ridged skin while the valley between these ridges appears as a white space and is the low, shallow portion of the friction ridged skin.

4.2. Palm Print Recognition

Palm recognition technology exploits some of these palm features. Friction ridges do not always flow continuously throughout a pattern and often result in specific characteristics such as ending ridges or dividing ridges and dots. A palm recognition system is designed to interpret the flow of the overall ridges to assign a classification and then extract the minutiae detail -- a subset of the total amount of information available, yet enough information to effectively search a large repository of palm prints. Minutiae are limited to the location, direction, and orientation of the ridge endings and splits along a ridge path. The images in present a pictorial representation of the regions of the palm, two types of minutiae, and examples of other detailed characteristics used during the automatic classification and minutiae extraction processes.

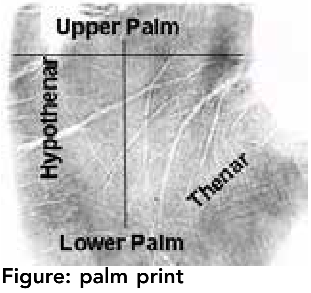


Figure: palm print

4.3. Hardware

A variety of sensor types — capacitive, optical, ultrasound, and thermal — can be used for collecting the digital image of a palm surface; however, traditional live-scan methodologies have been slow to adapt to the larger capture areas required for digitizing palm prints. Challenges for sensors attempting to attain high resolution palm images are still being dealt with today. One of the most common approaches, which employs the capacitive sensor, determines each pixel value based on the capacitance measured, made possible because an area of air (valley) has significantly less capacitance than an area of palm (ridge). Other palm sensors capture images by employing high frequency ultrasound or optical devices that use prisms to detect the change in light reflectance related to the palm. Thermal scanners require a swipe of a palm across a surface to measure the difference in temperature over time to create a digital image. Capacitive, optical, and ultrasound sensors require only placement of a palm.

4.4. Software

Some palm recognition systems scan the entire palm, while others require the palms to be segmented into smaller areas to optimize performance. Maximizing reliability within either a fingerprint or palm print system can be greatly improved by searching smaller data sets. While fingerprint systems often partition repositories based upon finger number or pattern classification, palm systems partition their repositories based upon the location of a friction ridge area. Latent examiners are very skilled in recognizing the portion of the hand from which a piece of evidence or latent lift has been acquired. Searching only this region of a palm repository rather than the entire database maximizes the reliability of a latent palm search. Like fingerprints, the three main categories of palm matching techniques are minutiae-based matching, correlation-based matching, and ridge-based matching. This method is a faster method of matching and overcomes some of the difficulties associated with extracting minutiae from poor quality images. The advantages and disadvantages of each approach vary based on the algorithm used and the sensor implemented. Correlation-based matching is often quicker to process but is less tolerant to elastic, rotational, and translational variances and noise within the image. Some ridge-based matching characteristics are unstable or require a high-resolution sensor to obtain quality images. The distinctiveness of the ridge-based characteristics is significantly lower than the minutiae characteristics.

5.Implementation

In this section the implementation of Vehicle security is fully explained. We implement this technique of palm print recognition in a new way of security for starting the bike.

The bike which is designed to this security system is provided with the palm recognition system in the accelerator. Already the palm print of the owner and the other who uses the bike frequently will be captured and it will be saved in the database. So whenever the authorized person of the bike is keeping his hands on the accelerator the bike starts automatically. From this system the owner who parked his bike and went for his work can feel the security.

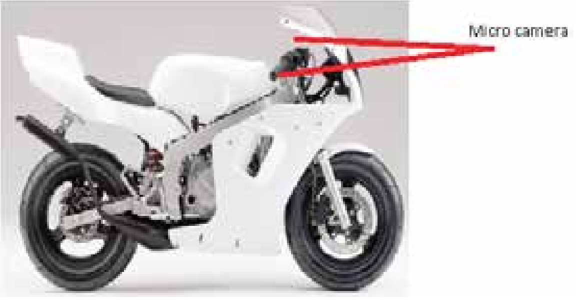


Figure 5: Robust encoding of ordinal features for palm print recognition.

5.1. It works

Our implementation will definitely work. It has been described by the following steps.

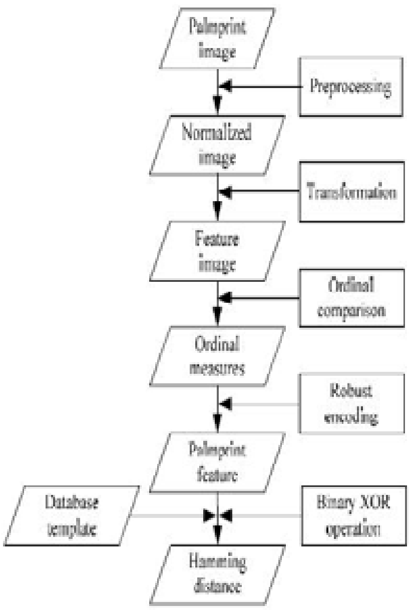
- The authorized person saves his palm print in different angles and positions in the memory
- Whenever the palm print matches with the database then the bike starts automatically.
- The bike do not start when an unauthorized person tries to start the bike.
- There will be two cameras provided in front of the bike and other one facing the driver(use will be discussed).

We discuss one of the cases here. The bike contains both the key port and palm recognition system. If the owner misses the key and a person takes the key and tries to start the bike. The bike gets started. Then when he keeps his palm over the accelerator, it scans the palm and if the print doesn't matches the database then after 10-15 seconds the camera captures the driver's image and the image of the area where is he driving and sends those images to the mobile number of the owner by an MMS system which will be attached to the bike. Every 30 seconds the mms of the area picture will be sent to the owner's number, so that the thief can be tracked within hours. This also works if someone tries to start the bike using a duplicate key.

In another case if anyone asks our bike urgently then he should also can start the bike. So there is a key start also. If he starts driving the bike then automatically his image is being sent to the owner, but it is not necessary. So there should be a on/off switch for the MMS system which is maintained by an password.

5.2. A Unified Framework for Palmprint Recognition

Here, we propose a general framework of palm print recognition based on the ordinal representation



(Fig. 5).

For an input palmprint image, the central subimage in the aligned coordinate system is cropped from it for feature extraction. To obtain the special measurements for ordinal comparison, the normalized palm image is transformed to feature image. Then the ordinal measures are obtained by qualitatively comparing several quantities in feature image.

In practice, the transformation and ordinal comparison can be combined into one step via differential filtering. The result of ordinal comparison may be the sign of an inequality, the rank order of all measurements involved in comparison, maximum or minimum value associated.

After ordinal comparison, all results are coarsely quantized into binary bits so as to strengthen the robustness of palm feature and facilitate matching step. All binary codes are concatenated to generate a palm print feature, which is the input of matching engine.

Finally, the dissimilarity between the input palm print's ordinal feature and the template stored in database is measured by their Hamming distance. The framework has some desirable properties for palm print recognition:

1) The ordinal measures render the palm print representation robust against various intra-class variations, such as illumination settings, dirties or sweats on palm, signal noises, pose change, misalignment (including translation and orientation registration errors), and nonlinear deformations.

2) Each bit palm print feature code represents a ordinal relationship among several image regions, which is rich of information. Because the palm print code has equal probability to be 1 or 0 for an arbitrary pattern, its entropy is maximized. Although the discriminability of a single palm code is limited, a composite palm template formed by thousands of ordinal feature codes has sufficiently high degrees-of-freedom to differentiate all individuals in the world. Thus the randomness of palm print pattern is well encoded.

3) The palm print template is compact. Thousands of ordinal comparison results only need memory less than 1K bytes, which provides the possibility to store the palm print template in IC card, mobile phone or PDA.

4) The dissimilarity between two palm prints can be measured by bitwise XOR operator, which could be computed on-the-fly.

Conclusion

This security is cost effective since there are *free software's* for palm recognition and only cost is for hardware's that too not very much expensive. The palm print which is scanned should not have noise in it for a perfect scan. So the noise reduction technique is used which was discussed above. For this technique to be success the MMS facility should be improved in our country. Thus the palm printing recognition which is the branch of image processing is used with our implementation of providing maximum security to bikes

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