Deployment of Palm Recognition Approach using Image Processing Technique

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Abstract

In this paper we discuss a method of palm print recognition in which there is no chance of forgetting password is possible and even no one can theft your password and it is used by only the intended human being. In this method only palm of human is password and the ID as well. Here we are developing a system or software where palm image is used for the authentication purpose of the person and similarly palm print image of human works as a password for the person. The image of palm is used for the enrollment and verification purpose. The image of palm works as the password for human who may be used at different place by the same person such as for the login purpose, gate entry, attendance purpose or for any other system as well where authentication of the person is possible. Main work in this technique is to pre-process the image and then enrollment in the system because while during verification purpose the data must already present in the database for the authentication purpose. This palm print provides better security for identification purpose as compared to other method and services where person need to prove their identity.

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Keywords: *Palm recognition, bio Metric, Distance transformation, ROI (region of interest), image pre-processing, and Principle lines.*

1. Introduction

For the security purpose we take various measures to make our system more and more secure that no one can break the security and integrity of the system maintain. By using the password system in which user need to enter the ID name and their password. But in password system, there is always a good chance of forget password because now a day's complexity of password is make so high that no one easily guess other password but this cause another problem that person easily forget their password .If someone get anyone password by any mean then also their id can be used by other person and their data may easily access by other person. Secondly by using identity card method in which ID card is become the identity of person. In this anyone can use their ID card even without their .Biometric authentication can be done by using physiological characteristic which signifies human body parts for authentication like fingers , iris ,face etc[1].

Permission of intended human being and possibly good chance of misuse their ID card .There are also some other means by which we can access system and used as the identification of human being is like cards , keys, token, Personal Identification Number etc. Various biometric action used for the unique identification of the human being for their identification purpose that each human being have unique identification as far as biological construction as compared to every other person. Even twins person may have similar body feature but surely (scientifically) they have different biological feature [9]. This biological feature is not possible to stolen and not even modify or change possible by the human being. This termed as the uniqueness of the human being in terms of biological construction.

Image matching is always a big problem and it more complex when we are about pattern matching because same image acquired by the device different at different time, each time different set of coordinates and different size of image acquire by the device which may cause a great problem while in pattern matching. The image acquisition device may also cause some problem because at different time person placed their hand at different angel which cause a different image from the previous one and it cause problem for the pattern matching. Therefore in image matching problem like translation, rotation, scaling and other factor must also be taken into the account [5]. If we want a good result from the application then try to make the impact of these parameter minimum as much as possible . These features may play a very important role in the pattern matching of the palm image of the person.

The pattern matching of the palm image is so complex process because in this we required clear image of the palm by which we can easily extract the feature of an

image and on the basis of that feature we store an image in the database for the matching purpose. This Palm image recognition helps us for the unique identification of the person at the various places.

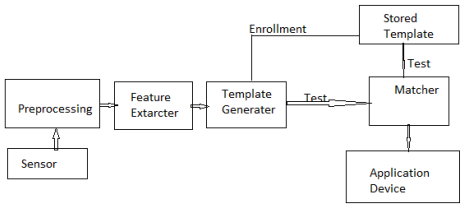

Fig.1: General Block Diagram of a Biometric System.

In this palm recognition the main problems is the position of image where it takes because each time when we take image of similar palm image at different time ,each time definitely frame changed , angle of image taken ,size of image may also get very which cause a great problem for the pattern matching. When we take image for the matching perspective then image must have some error, noise factor which cause image not as a perfect image for the matching. Therefore we need to remove these problems from the image. That may call the pre-processing step for the image matching (Palm recognition).
There are various algorithms present which may help in the matching of the pattern of the image but this palm recognition is different from the pattern matching. Here we mainly deal with palm features and then store the values of these features. When we acquire image for pattern matching then match the values of the palm image with the database for the matching.

2. Need for Palm print technology

As we know in today's world proving of identity is one of the common task we perform in our day to day life therefore we need best method by which we can easily confirm the identity of the human being. In daily life we prove our identity by the digitally just by entering password to the text box and then identity of the person is proved. But here we use to prove of identity by person biometric. There are various methods of biometric such as cards, iris recognition, and thumb impression and also there are many more method is present [7]. But we need develop that method which may prove cheap and also easily available by the human being. The result by that method is also a good quality and not makes error by the application while matching the palm image. Palm print image recognition may prove best in this case.

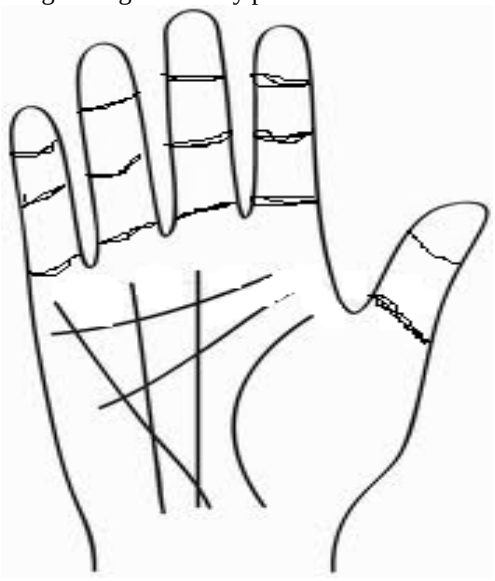

Fig 2: A sample of palm image

One more point in this palm recognition is that the cost must be less and also time plays a very crucial role in this and we need to take this point into the consideration while developing this application. This palm recognition is cost effective and no high cost device required for that and most important every human being have hand and palm of hand may prove unique identity of their person and also no one can stolen that property from the person .
Palm image proves a great choice for the biometric applications because it may contain following properties:

A. Palm image may contain more information then as compared to the fingerprint that such as principle lines and ridges
B. They are invariant to human to human
C. Image of palm may easily capture and very difficult to duplicate that image

Palm image is more likely to be preferred because other method such as fingerprint or iris is distinctive. This palm image may easily captured by the low resolution devices and as well contain many other useful information which make system more useful and more important in recognition. Palm image is suitable for the every person and it is non-intrusive as it does not require any personal information of the human and required thing easily gathered by the human being. Palm image are taken by the device and the fed into the recognition module for matching of palm image from the database.

Compared with face recognition [2], palm image is hardly affected by age and other body parts of the human being
Compared to the fingerprint recognition [2], palm image make contain more information and hence more useful then fingerprint and it need only low resolution image capturing device which make the cost of the system less.
Compared with iris recognition, palm image can be captured without intrusiveness as people might fear of adverse effects on their eyes and cost effective.
Therefore this palm image recognition becomes an important and most fast emerging technology.

3. Preprocessing and hand image acquisition

The basic step of the palm recognition technique is the preprocessing of the palm image because when we store image in the database it may suffer from noise, shadows and also severe change in illumination. We need to concern about the acquisition of the image because each time image should be of the same size and it must contain same number of coordinates by which we can easily identified the principle lines and the rest palm features from the palm image. Normally in previous papers, their main aim is to take the region of interest of the palm image which is captured by segmenting the palm image, but here we are using full flesh palm image in this application by which we required a certain quality of image where image comes clear to the application. By using ROI and then rest part of the palm is also added which works as the advantage of the palm image recognition more accurate and good percentage of correct result is obtained by this process.
Therefore at the beginning of the palm recognition step we must use the median filter on the palm images. The advantage of using this filter is to that it does not make image opaque , it means the major part of image is always visible no background come in the image. By using median filter, the image of palm is not opaque and clearly palm is visible, no background visible below the palm image. This median filter is very important because we definitely have some noise in the image while during acquisition of the image either by the device or the impact of the environmental issue.
After using this filter we need to distinguish palm images from the background. This feature can be achieved by simply detect the boundary of the image and this make only possible when we convert the image into the binary image. After images have been acquired it needs to convert at the grey level, because image is in RGB format and we need to convert in the gray level. For converting the image into binary image we must use the histogram analysis which helps us in converting the palm image into the binary image. Histogram of a grayscale is bimodal. This simply means by detecting the local minimum point in the histogram and use that point as threshold, then we can easily convert the palm image into the binary image [10]. By using this operation our palm image is converted into binary image and for ready for further operation for the palm recognition.
RGB image ---→Gray image---→Binary image

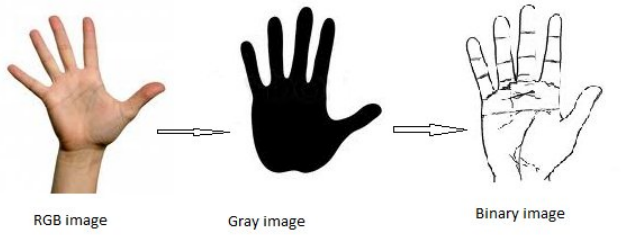

Fig. 3 Acquired hand image and preprocessing step

If(original image(i,j)<threshold)then image(i,j)=0 (1).
If(original image(i,j)>=threshold) then image(i,j)=1 (2).
When colored palm image may get converted to binary image after then we required to trace the contour of hand shape for the purpose of the palm recognition. This palm image may get traced by the border tracing algorithm by which palm contour result out from the image. Using of this border tracing algorithm is to find the boundary of the palm image and also locate the position of the five fingers tips and four finger roots as well which we additional feature of the paper. This part will be additional feature of the palm recognition by which stronger and accurate result comes from the algorithm. A square region may generate in the palm which is called as a ROI [4]. It's Very important to explicitly locate the upper points of hand shape.

4. Extract the region of interest from the palm image and other part of palm image as well

The ROI is of many type .it is circular, elliptical, rectangular or any other type [4]. Spectral approach is defined by the Han et al by which ROI region may get extracted [12].We need to capture other part of the palm therefore in this we process the image into two parts that is in first part we extract the feature of the image as ROI part then in second part we extract the image feature of rest part of the image.

4.1 Extract the region of ROI region

In this we use the square region of ROI because it make easy to perform operation over the image and help in placing coordinate system in the image. This ROI is the operative part of the palm image which helps in the

enrollment process and also later on helps in verification process. When we acquiring the palm image then image taken freely, there are no fixed point by which we said that from this point the palm get started also the size is also very. Direction is also not fixed of the palm image because it may vary by some degree of angel when image is taken. In this ROI we trace first point at the upper left of a hand shape. The region of palm is generated or traced in contour clockwise direction. The border pixels of hand are sequentially by a set of coordinates (Xi,Yi) (i=1, 2, 3…).By using wavelets based segmentation , the corner points of the palm image may detected. The square based ROI may determined from points e, f, g and geometrical formula is present .the points e ,f are the base points for generating the ROI .Then L_0 L_3 principle axis is obtained which is the centre line of middle finger .Then principle line is increased to a. Two perpendicular bisector from point L_3, bisect the lines a, b and d, e .The square region may detect by using the bisector line from the given points. From above given four points we may easily detect the square region my which ROI region may extract [10].

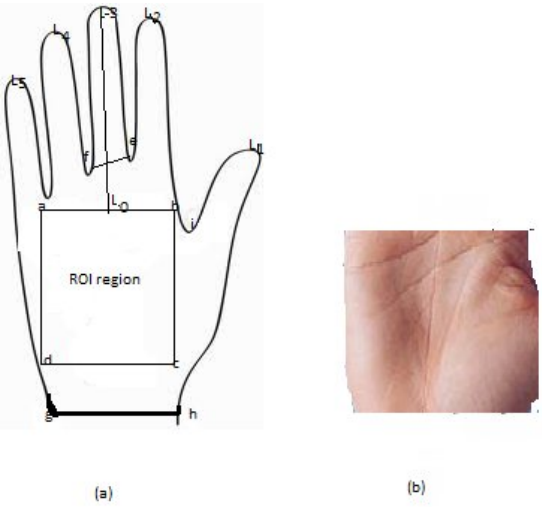

Fig. 4: The area of region of interest (ROI) generation.

After ROI from the palm image acquired then in the ROI region we need to find the principle lines from the palm image .There are various algorithms and lots of work performed for the principle line by which we may extract the feature of the palm image and each have their advantage and disadvantage in term of matching of palm image. The canney or sobel edge detector may used to get the principle line from the ROI region of the hand contour. For the extraction of the principle lines we may have algorithm like Kekre's Fast Codebook Generation (KFCG), Fourier Descriptors (FD) Discrete Cosine Transform (DCT) [2].

Here we are using standard canny edge detector may applied to the palm image for the edge detection. Using the image threshold property, by which binary image may get converted to only black and white pixel in the image. Principle line may convert into the white pixel and rest of the image may get converted the black pixel.

4.2 Extract the region of rest palm of the image

Similarly, the lines which are present on the finger also get converted into the respective black and white pixel. Bottom of the finger or we may say near the root finger point may taken as the reference point of the palm image and the by using distance transformation the respective details and feature may store in the database of the respective palm image and later on, it may similarly used as the registration process and also for the verification process in the palm matching of the person. Here in the rest part of the palm image we need to find the four root part of the palm image and five finger tips .This procedure may prove very useful because the full palm image contour is used for the matching purpose. Firstly on initial paper only the ROI is used for the matching but here we used the full contour of palm image for matching. Therefore this feature becomes so important and proves so good as compared to other approach of palm recognition.

5. Extract the features of the palm print image

Feature extraction is one of the important steps of the palm recognition because this helps to extract some meaningful feature from the segmented part and also the rest part of the palm image which is used for the registration and the verification process.

Firstly we are concerned about the principle lines in the ROI region therefore for the detection of the principle line by using Discrete cosine transformation (DCT)[3] because this algorithm has most accuracy as compared to other . Threshold helps to differentiate between the principle line from the rest ROI region and this will do by the thinning mask which easily separates the principle line from the palm image. The principle line pixel may convert to white pixel whose value is one therefore when all rows of the image scanned and when in the row when a zero value encountered the row value is increased by one to measure the impact of lines in the given row. This procedure is continuing over the whole region of the ROI similar action performed over the palm image.

The above algorithm helps to find only the principle lines over the palm image but we are now concerned over the rest part of the image which is root part and also the fingers tips. There are four root part in the palm image and five finger tips in the palm image. As we know that , there are lines in the fingers also present now operation over

these principle line .there are various lines in the finger of the person so we need to detect these lines in the palm image . these lines may largely very between person to person and now we need to convert these difference into the form which may store in the database helps in verification process for the palm image. Now in this, we take one bottom line at each finger at may denote as the reference point for each finger. and measure the distance from the centric point which is present at the centre of the palm image by using the Euclidian distance . This distance is calculated from all the five reference point. Each finger reference point proved as unique identification by which easily distinguish between the fingers of the person. There are normally five fingers in the palm image therefore there are five reference point in the palm image.

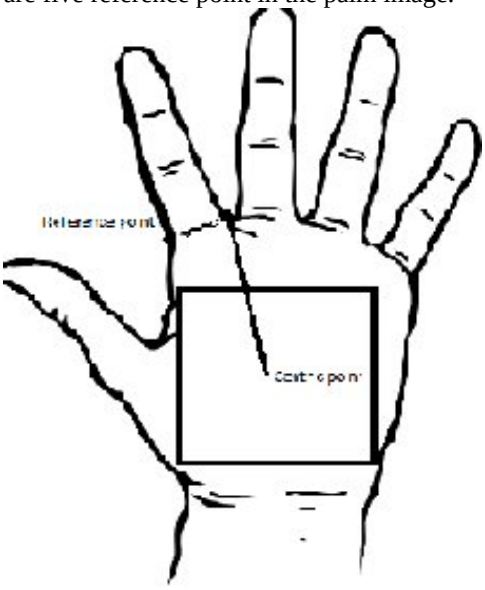

Fig 5: Distance between the reference point and the centric point.

This feature of the distance between the finger and the centric point of the ROI region must store in the database and used later in the verification process. We use two methods for the palm image that first to detect the principle line and the then detect the bottom lines of each finger and calculate distance from the centric point from the palm image. The centric point is defined by the four coordinate points in the ROI corner and then finds the centre point from all four corner points of the palm image. Therefore here we need to calculate the two thing that is first to calculate the principle lines and then the distance of the bottom of the finger lines.

This may increase the accuracy of the palm image identification for the human being. Process may become little complex but the result comes positive from this method. This ROI region principle line helps in unique identification but the finger lines may definitely increase the accuracy of the system.

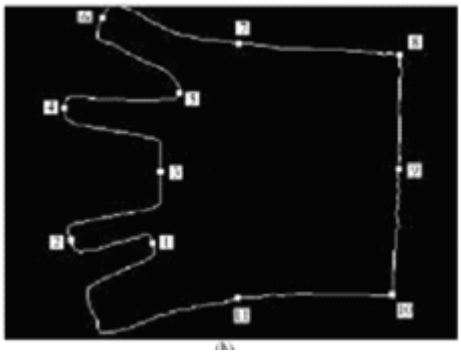

Fig. 6: Key points detect on the palm boundary image [7].

6. Conclusion and Future work

In this palm recognition main step is to find the region of interest part of the image then find the principle lines over the ROI region. Then remaining part of the image is also taking into the consideration and then by using distance transformation extracts the feature of the whole palm and store in the database during the enrollment process. While we start the verification process, then from the database match the image from the stored feature in the database and shown the result for the particular user. This is the best method I found for the user to prove their identity and not to keep anything along with us for the verification purpose. The advantage of using finger and root part of the image is to increase the efficiency of the verification process for the identity matching. Hand color that our skin based, hand and position of finger creases etc. to improve the overall accuracy of the matching strategy. There is also scope of guess the mood of user by the hand movement gesture .For the security reason if someone wants to encrypt the feature based database of the hand then database may also get encrypted as well. It's a challenging job but in future it is very much possible .The other parts such as feature vector Extraction, and matching strategy of the whole system to be improved. In a word, there are many challenges for us in the future.

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