DETECTION OF MULTI-DIMENSIONAL HANDPRINTS USING SEQUENTIAL FORWARD SELECTION ALGORITHM

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***Abstract*- Handprint recognition plays a major role when compared to face, fingerprints and iris based biometric systems. In recent years, many effective direction representation (DR)-based techniques have been proposed. These methods only extract DR in one direction level and one scale. Hence, they did not fully utilized all potentials of DR. In our model, we propose a general framework for DR-based method named Complete Direction Representation (CDR), which exhibits DR by means of a comprehensive and complete way. We propose a unified Handprint recognition framework to combine CDR and BLPOC techniques. Based on this framework, we develop a novel Handprint recognition algorithm in frequency domain using MFRAT. To put off feature redundancy, the Sequential Forward Selection (SFS) Algorithm is used to select a small number of CDR images. Our approach can achieve better recognition accuracy than existing models.**

***Keywords*-** Direction representation(DR), Complete Direction Representation(CDR), multi-scale modified finite radon transformation (MFRAT), Band-Limited Phase-Only Correlation (BLPOC), Sequential Forward Selection (SFS).

I.INTRODUCTION

Generally, image content may include both visual and semantic content. Visual content can be very general or domain specific. General visual content include color, texture, shape, spatial relationship, etc. Domain specific visual content, like human faces, is application dependent and may involve domain knowledge. Semantic content is obtained either by textual annotation or by complex inference procedures based on visual content.

However, there is a tradeoff between the invariance and the discriminative power of visual features, since a very wide class of invariance loses the ability to discriminate between essential differences. Invariant description has been largely investigated in computer vision (like object recognition), but is relatively new in image retrieval. A visual content descriptor can be either global or local. A global descriptor uses the visual features of the whole image, whereas a local descriptor uses the visual features of regions or objects to describe the image content. To obtain the local visual descriptors, an image is often divided into parts first. The simplest way of dividing an image is to use a partition, which cuts the image into tiles of equal size and shape.

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too. Image processing basically includes the following three steps.

- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

Purpose of Image processing:

The purpose of image processing is divided into 5 groups. They are:

1. Visualization - Observe the objects that are not visible.
2. Image sharpening and restoration - To create a better image.
3. Image retrieval - Seek for the image of interest.
4. Measurement of pattern – Measures various objects in an image.
5. Image Recognition – Distinguish the objects in an image.

Types

The two types of methods used for Image Processing are Analog and Digital Image Processing. Analog or visual techniques of image processing can used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing.

Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to undergo while using digital technique are Pre- processing, enhancement and display, information extraction.

Image Processing Toolbox provides a comprehensive set of reference-standard algorithms, functions, and apps for image processing, analysis, visualization, and algorithm development.

Image Processing Toolbox supports a diverse set of image types, including high dynamic range, giga pixel resolution, embedded ICC profile, and tomographic. Visualization functions and apps let you explore images and videos, examine a region of pixels, adjust color and contrast, create contours or histograms, and manipulate regions of interest (ROIs). The toolbox supports workflows for processing, displaying, and navigating large images.

FUNDAMENTAL STEPS IN IMAGE PROCESSING

1. Image acquisition: to acquire a digital image

2. Image pre-processing: to improve the image in ways that increases the chances for success of the other processes.

3. Image segmentation: to partitions an input image into its constituent parts or objects.

4. Image representation: to convert the input data to a form suitable for computer processing.

5. Image description: to extract features that result in some quantitative information of interest or features that are basic for differentiating one class of objects from another.

6. Image recognition: to assign a label to an object based on the information provided by its descriptors.

7. Image interpretation: to assign meaning to an ensemble of recognized objects.

II.RELATED WORK

In existing system, a unified framework for DR based methods is proposed. Since this framework considers comprehensive factors, especially the information of multi-scale, multi- direction level, Local region matching and feature selection we call it CDR. It not only summarizes existing DR-based methods, but also points out the development roadmap of DR-based methods in the future to some extent. Thus, it will greatly benefits the developments of palmprint recognition.

III.PROPOSED WORK

In this paper, we propose an effective CDR- based method in frequency domain, in which the MFRAT is used for feature extraction, and an effective correlation filter named BLPOC is used for matching in frequency domain. MFRAT is used because of its simplicity and effectiveness. In fact, there is only one parameter in MFRAT, which can be adjusted easily; BLPOC is a powerful tool for matching.

BLPOC is known to be content independent, that is, we can use the same parameters of BLPOC regardless of the change in CDR images; combination of DR and BLPOC has shown promising performance for palmprint recognition, and we expect further improvements by extending DR to CDR. We proposed MFRAT, which can be used to extract direction and line feature effectively.

In our method, different values of l correspond to different direction levels are recorded. If we select the value of $q1$ to construct DR, this DR is represented by the direction of the minimum line responses. Similarly, DR corresponding to $q12$ represents the maximum line responses. This method gives the accurate results when compared to the existing methods by taking the images of the hand in all directions i.e; complete directions. In the proposed technique, we mainly use the SFS algorithm which means Sequential Forward Selection algorithm to remove the feature redundancy. This algorithm is used to select a small number of CDR images.

Extracting CDR of Palmprint by Multi-scale MFRAT

MFRAT is used because of its simplicity and effectiveness. In fact, there is only one parameter in MFRAT, which can be adjusted easily; BLPOC is a powerful tool for matching.

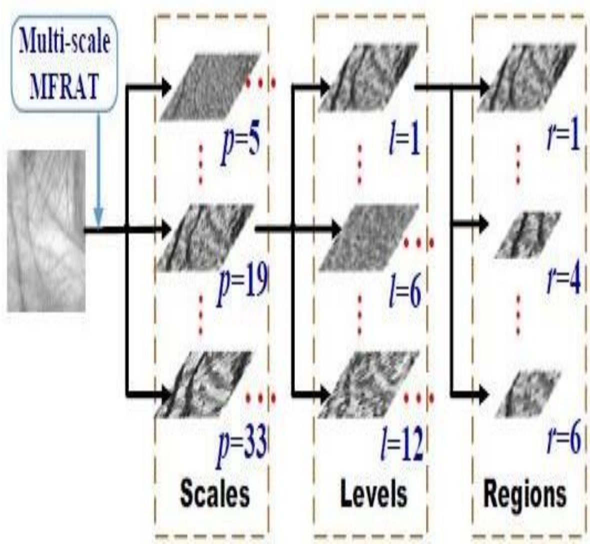


Fig: Procedure of Extracting CDR Using Multi-Scale MFRAT

In addition, BLPOC is known to be content independent, that is, we can use the same parameters of BLPOC regardless of the change in CDR images; combination of DR and BLPOC has shown promising performance for palmprint recognition, and we expect further improvements by extending DR to CDR.

We proposed MFRAT, which can be used to extract direction and line feature effectively. In our method, different values of l correspond to different direction levels are recorded. If we select the value of $q1$ to construct DR, this DR is represented by the direction of the minimum line responses. Similarly, DR corresponding to $q12$ represents the maximum line responses.

Generally, palmprints captured from different palms may have similar global structure. For this reason, local structure becomes very important to distinguish them. As a result, in the CDR framework, we combine holistic and local representations: a single DR image is covered by overlapping 6 regions for matching.

Then, the matching between a training image and a test image is conducted between their CDR across scales, direction levels and regions.

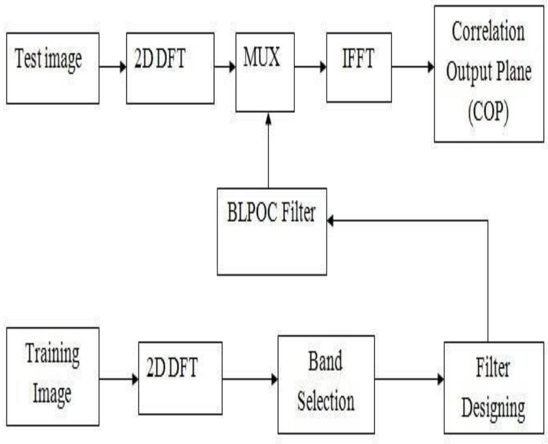


Fig: BLPOC Matching between a Training Image and a Test Image

If the test image and the training image come from the same palm, the matching between them is denoted as a genuine matching; otherwise, it is denoted as an imposter one depicts an example of genuine and imposter matching. DR images are captured from the same palm, and image is captured from another palm. It can be seen that there is a sharp peak in genuine matching while the imposter matching has not. The result shows the effectiveness of combining DR and BLPOC for palmprint recognition. In the above subsection, we know 1080 CDR images are extracted from one original palmprint image. Correspondingly, for a palmprint database, 1080 sub-databases are created after extracting CDR.

Thus, we can obtain 1080 distance matrices after performing matching. Obviously, in real applications, it is computationally impractical for us to conduct matching using so many CDR images.

On the other hand, these CDR images contain a large amount of redundant information. Thus, it is a wise strategy to select a small number of CDR images that achieve the best performance.

To integrate the results obtained from selected scales, direction levels, and regions, a scheme of score-level fusion is applied. Previous work shows that the min–max normalization followed by the sum of scores fusion method generally provided better recognition performance than other schemes.

IV.PROPOSED ALGORITHM

Recognition Algorithm

Step 1: Extract DR images at one scale using a fixed value of p in MFRAT.

Step 2: In this scale, 12 direction level images are extracted using different values of l.

Step 3: Divide each direction level image at one scale into 6 region images.

Step 4: Repeat above steps to extract DRs at all scales, direction levels and regions.

Sequential Forward Selection Algorithm

SFS algorithm which means Sequential Forward Selection algorithm is used to remove the feature redundancy. This algorithm is used to select a small number of CDR images that achieve the best performance. This algorithm is mainly used for score level fusion.

Steps involved in SFS algorithm are:

1) Firstly, this algorithm is used for matching and score normalization.
2) Integration distance matrix are initialized to zeros.
3) In each iteration, the distance matrices of candidates are added to the integration distance matrix in turn, and the resulting integration distance matrix that achieves the lowest EER can be chosen.
4) This process continues until no new is accepted, which means that integrating one more feature will hurt the verification performance.

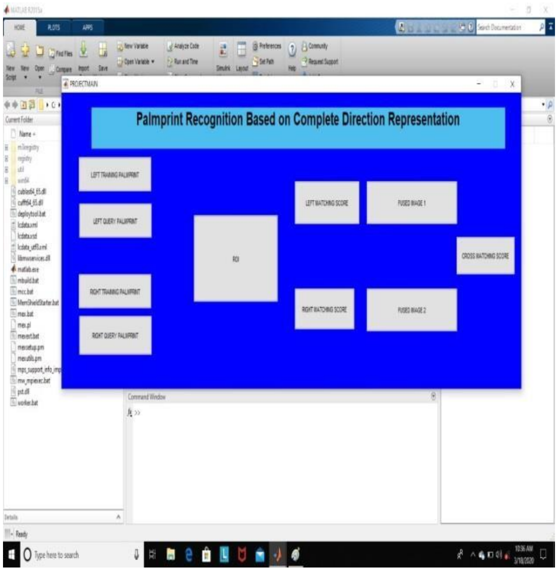
V.IMPLEMENTATION AND EVALUATION

Here we used the MFRAT technique for feature extraction and effective correlation filter named BLPOC is used for matching.

In our method, MFRAT technique is used to extract direction and line feature effectively.While we capture palmprints from differentPalms, we may have similar structure. But in CDR framework, this problem can be solved by taking the images of the palms in multiple directions. So our method gives more accurate results than the existing method.

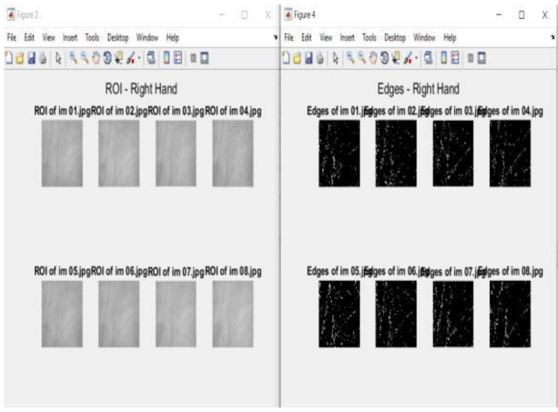
VI.RESULTS AND DISCUSSIONS

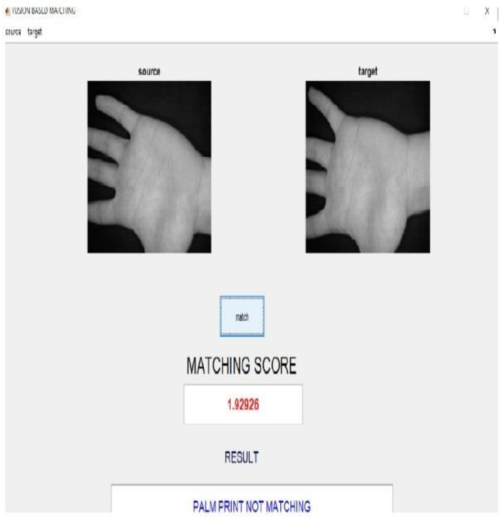
The Following results obtained while testing phase;



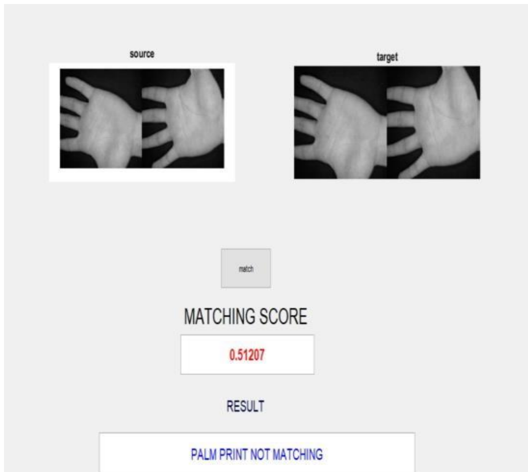
The above screen is opened when the code is executed in the matlab tool. This page comprises of different functions which can be coded separately for every function.

The below page represents the handprints which are divided into multiple regions. The matching score can be obtained by checking each and every individual region separately with the original handprint in multiple scales, and multiple angles.





The cross matching function is used for matching two handprints at a time. By using the Fused Image function we combine two handprints and obtain matching score between them by comparing them in single instance of time.



VII.CONCLUSION

In this paper, we proposed a unified palmprint recognition framework for direction-based methods named CDR. Based on this framework, we developed a novel method in frequency domain to capture rich information at different scales, direction levels and regions by multi-scale MFRAT, to match palmprint patterns by BLPOC, and to select features by SFS. The proposed CDR framework brings new insights for direction- based methods in the palmprint recognition field. Also, it is the first time that we show the DR-based method in frequency domain is very promising for palmprint recognition, which can achieve better recognition accuracy than the other state-of-the-art methods on three palmprint benchmarks. Meanwhile, the matching speed of the proposed method is very fast, which is about 10 times faster than that of representative spatial coding based methods such as CompC and Ordinal Code. Therefore, it is quite suitable for the large- scale identification applications. In the future, we plan to combine CDR and binary code learning or other feature learning methods to further boost recognition performance.

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