ISSN No. 0976-5697
Volume 4, No. 8, May-June 2013
International Journal of Advanced Research in Computer Science
REVIEW ARTICLE
Available Online at www.ijarcs.info

Reusability of patterns and calculation of improved PSNR and MSE using Wavelets and Fuzzy Logic

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Abstract: The review puts forward a new algorithm to determine two objects similarity degree, the new algorithm is that the Angle cosine method and the hamming distance method bond together based on a weight synthesis. In the fuzzy pattern recognition, in order to avoid happening of "miss recognition", a new kind of closeness degree which is combined by two closeness degree based on a certain weight, and it can adaptively adjust each weight according to the characteristics of the characteristic value of mode. Also, it furthered previous work by proposing a component reusability evaluation method based on fuzzy mathematics. The method provides an effective way of evaluating the reusable ability of a certain component during the process of software evolution. The features are extracted as original signal, which is processed by Discrete Wavelet Transform (DWT) for the purpose of enhancing the difference in time domain between a genuine pattern and its forgery.

Keywords-Pattern recognition; pattern reusability; fuzzy inference; Discrete Wavelet Transform

I. INTRODUCTION

In the computer vision territory, pattern recognition is one of most difficult problems. Regarding the pattern recognition, the important issues contain the good detection of pattern regions and a good template matching for high accurate and robust system. Over the past 20 years, several algorithms have been proposed for pattern (face) recognition including generating observation vector and template matching.[7] The using of fuzzy clustering analysis in the fuzzy pattern recognition has witnessed a fast development and widely used in recent years.[1] Many different biometrical identification methods have been proposed as means of determining or verifying personal identity. Wavelet theory is a novel mathematic and is also a powerful tool with rich mathematical contents and great applications. Its applications are abundant, and pattern is just one of the applications. For example, image analysis, signal processing, communication systems, time frequency analysis are also applications of wavelet theory[6].

Also a pattern such as signatures, Signature verification is an important research area in the field of person authentication. Auto-handwritten signature verification technique can be divided into online (or dynamic) and off-line (or static) verification. As opposed to the online case, off-line signatures lack any form of dynamic information, therefore difficult to verify.[5] Signature verification problem is concerned to determine if a particular signature belongs to a person, to decide if it is genuine or forgery. The signature is a behavioral biometrics, and is therefore inherently dependent on the changing activity pattern of the signer and the signing process. Signatures have two types of variation, intrapersonal variation (similarity among different signature samples of the same writer) and interpersonal variation (discordance among different signature samples introduced by other writers). This variability makes it necessary to analyze signatures as complete images and not just as a collection of letters, strokes and/or words to recognize. Verification process needs some features to extract from signature image for verifying these features between two signatures.[3]

In addition, Although the new methods of pattern recognition emerge gradually, and Related research also increasingly deeper(Such as the model of the similarity measure, System of machine learning, artificial neuron, Genetic algorithm, Clustering analysis and so on) are all applied to pattern recognition, But the direct method based on membership concept using the maximum subjection principle and the indirect method Based on proximity using Principle nearby as two basic method, are Still widely used in domain of engineering in the recognition of fuzzy pattern, the past practice often uses a simplex closeness degree. At present there are many closeness degrees and each has its applicability, improper selection may also cause "miss recognition". So can we construct a new closeness degree, namely also introduce a weight coefficient in some kinds of closeness degree to give consideration to the advantages of all.[1]

Fuzzy clustering aimed at organizing and revealing structures in data sets such as patterns, temporal waveforms, images, etc. Clustering is commonly viewed as an instance of unsupervised learning, viz. learning without a teacher. The grouping of the patterns is then accomplished through clustering by defining and quantifying similarities between the individual data points (patterns). The patterns that are similar to the highest extent are assigned to the same cluster. In comparison to two-valued clustering, fuzzy clustering provides an additional conceptual enhancement by allowing the pattern to be allocated to several clusters (classes) to various degrees (membership values). In this way, the patterns can be treated more realistically and the analysis is capable of identifying eventual "outliers," viz. the patterns being more difficult to assign to a single category.[4]

II. BASIC PRINCIPLE

The goal of this paper is to provide an evaluation method of component reusability. The ambiguity and uncertainty properties of evaluation process led us to the concept of fuzzy mathematics.[2]

Let us begin with the following three fuzzy theorems that are important in the process of component classification and reusability evaluation. Here goes the description:

Theorem I: assume relation R is a reflexive, symmetric relation of U _ {u1 , u2 ,_, un} , that is, R is a fuzzy similar matrix of order n, then there exists a minimum natural number k(k _ n) , making k R a fuzzy equivalent matrix, and for all natural number w which are greater than k, R^w =R□. R□ is referred to as the transitive closure matrix of R.

Theorem II: If a fuzzy relation matrix R is a fuzzy equivalent relation, then to any λ ϵ [0, 1], the λ –cut segment matrix R_ is also an equivalent relation matrix.

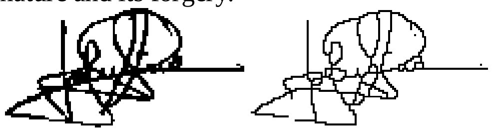
According to theorem II, we can get a equivalent relation R λ correspondent to the fuzzy relation R after the λ is given λ ϵ [0, 1], which determined a level classification of λ.

Theorem III: if R_{λ_2} is classified under the condition of 0 < λ1 < λ2< 1, then each result categories of R_{λ_2} must fall into a sub-category of one of a category of R_{λ_1}.Methodology of 2 R_ -classification is calling the refinement of R_{λ_1}classification.

III. FEATURE EXTRACTION BY DWT

A. Original features:

All images are first aligned to a fixed pixel dimension of 60 by 120, then binarized and thinned using the SPTA thinning algorithm. Figure 1 shows the thinned images for true signature and its forgery.



a) sample of true signatures

b) Sample of forgeries

Figure 1. Samples of thinned images

For original feature extraction, we try several techniques to extract not only static but also pseudodynamic features. Firstly, the moment features are extracted from the preprocessed image as the global characteristics. Secondly, the preprocessed image is partitioned into 4 rows × 4 columns, constituting 16 boxes. In each box, we'll extract features including pixels density, angle feature, gravity center distance and predominant slant. In the following, such characteristics are described in details.[5]

a. Moment features: we use the method in to extract eight moment features, including height to width ratio, incline degree, extension degree and so on.
b. Pixels density: number of pixels inside the box normalized by the box size.
c. Angle feature: calculate the summation of the angles of all points in each box taken with respect to the bottom left corner and normalize it by dividing with the number of points.
d. Gravity center distance: calculate gravity center distance in each box taken with respect to the bottom left corner and normalize it by dividing the distance between the bottom left corner and upper right corner.
e. Predominant slant: the symbol of structuring element set that occurs more frequently is selected to represent the box and normalize it by dividing the occurrence number of the selected symbol.

Symbol 1: if P(x +1, y -1) = P(x -1, y +1) is 0.
Symbol 2: if P(x -1, y -1) = P(x +1, y +1) is 0.
Symbol 3: if P(x, y - 1) = P(x, y +1) is 0.
Symbol 4: if P(x −1, y) = P(x +1, y) is 0.

Afterwards, we have generated an original feature vector X combining all of above extracted features which will be served as the input of DWT.

B. Discrete Wavelet Transform:

In general, the multi-resolution wavelet transform can decompose a signal into low pass and high pass information. Since the high pass information usually represents features that contain sharper variations in time domain,[5] we propose to utilize the high frequency to extract the stable features from the original signal. The DWT of X is defined as:

$$CD_i\text{ (m)}= \sum_n \overline{x(n)\,\Psi_{k,m}}\text{(n)}$$

Where $\Psi_{k,m}$(n) is the wavelet function, • denotes the conjugate, i is the i th decomposition level. 1≤ i ≤ M, M is decomposition level. k is a level index. 1≤ m ≤ N, N is the length of the original feature vector.

IV. AN EXAMPLE OF FUZZY REUSABILITY EVALUATION

In this example, we use the valuation indicator set U = {reused times, amount of modification, robust, performance} and the reviews set V = {excellent, good, average, poor} to obtain the fuzzy set matrix:

$$R=\begin{bmatrix} 0.3 & 0.2 & 0.5 & 0.0 \\ 0.1 & 0.3 & 0.6 & 0.0 \\ 0.0 & 0.2 & 0.3 & 0.5 \\ 0.1 & 0.5 & 0.4 & 0.0 \end{bmatrix}$$

If we set δ = [0.3 0.2 0.2 0.3] , then: B =δ •R [0.14 0.31 0.45 0.1]

The reusability evaluation data indicates that 14% users consider that the component reusability is very good, 31% consider good, 45% consider average and 10% poor. [2]

According to maximum membership principle, the final component reusability evaluation is rated as "average", which means it still need to be improved.

V. CONCLUSION

The survey of papers gives an algorithm of the fuzzy clustering analysis in the fuzzy pattern recognition, it can not only deal with accurate data and fuzzy data expression mode characteristic value, realizing fusion of the direct method and indirect method in pattern recognition, but also reflects module subjection or proximity according to the characteristics of the characteristic value of mode, reducing the possibility of "error identification" in the patterns.

Details by DWT were extracted as individual features to enhance the difference between a genuine pattern and its forgery. A trained fuzzy net in each sub-band level by using the optimal selection of the training patterns was to be combined for verification.

In the future, combining DWT feature extraction with other traditional statistical or geometrical features can be tried. The combinations of these features maybe enhance the performance of the verification system.

VI. REFERENCES

[1] A new algorithm of the fuzzy clustering analysis in the fuzzy pattern recognition 2011, 1st International Conference on Electric Power Equipment – Switching Technology.

[2] Using Fuzzy Theories to Evaluate the Component Reusability in the Process of Software Evolution 2012 International Conference on Uncertainty Reasoning and Knowledge Engineering

[3] A Fuzzy Approach for the Automatic Off-line Persian Signature Verification Problem M. Nasiri, Department of Computer Engineering Islamic Azad University

[4] Fuzzy Clustering with Partial Supervision IEEE transactions on systems, man, and cybernetics—part b: cybernetics, vol.27, NO. 5, october1997,Witold Pedrycz, Senior Member, IEEE, and James Waletzky

[5] A New Scheme for Off-line Signature Verification Using DWT and Fuzzy Net ACIS International Conference on Software Engineering, Artificial Intelligence, Networking, and Parallel/Distributed Computing ,School of Control Science and Engineering, Shandong University

[6] A Tutorial of Wavelet for Pattern Recognition r99942126 Guan-Chen Pan Graduate Institute of Communication Engineering National Taiwan University, Taipei, Taiwan, ROC

[7] DWT and Sub-pattern PCA for Face Recognition Based on Fuzzy Data Fusion Yang-Ting Chou*, Shih-Ming Huang, Szu-Hua Wu, Jar-Ferr Yang Institute of Computer and Communication Engineering, Department of Electrical Engineering, National Cheng Kung University, Tainan, Taiwan