New Method for Image Features Extracting Based on Enhanced Chain Code

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ABSTRACT

In this paper, we have proposed image features based on chain code approach and RLE compression method for enhancing the image and proposed new method for extracting the features. The proposed method consist of the many steps, First is to apply the Chain code algorithm by using new chain code window, Second is to apply the Chain code Enhancement, in this step the chain code is first extracted and then enhanced by applying the RLE compression on the result, the purpose for this operation is to approximate the image by eliminate the small part of image and added it to the largest nearest part and the third is is to extract of chain code features by proposing a new algorithm.

Key words: Chin Code, Image features, RLE Compression.

INTRODUCTION

Image features are useful extractable attributes of images. Examples of image features are the histogram and the symmetry of a region of interest. Histograms are considered a low-level feature, while geometric descriptors as symmetry or orientation of regions of interest provide examples of high-level features.

Some features, such as histograms and texture features, are statistical in nature, while others, such as the Euler number or boundary descriptors of regions, fall in the geometric domain. Geometric features are key in providing structural descriptors of images. Structural descriptions of images are of significant interest. They are an important component of high-level image analysis and may also provide storage-efficient representations of image data.

Typically, high-level image analysis starts with structural descriptions of images, such as a coded representation of an image object or the relationships between objects in an image. The descriptive terms "inside of" and "adjacent to" denote relations between certain objects. Representation and manipulation of these kinds of relations is fundamental to image analysis.

Image representation and extracting the features of image is an important component in image processing and pattern recognition or various applications. One of the methods to represent

an image simply and efficiently is by using chain code[3].

Debi Prasad B. et al. proposed a new algorithm, based on chain code along with another significant characteristic, number of vertices (end or junction point) and edges (chain code, from one vertex to another) existing in each alphabet has been used to identify English Capital Characters[2]. Pornchai M. et al. presented a new approach to extracting and representing structural features of images. The approach is based on both a region-based analysis and a contour-based analysis[7]. A chain code based feature extraction method is investigated for developing Hand Written character Recognition HCR system. 8–neighborhood method has been implemented which allows generation of eight different codes for each character. These codes have been used as features of the character image, which have been later on used for training and testing for Neural Network (NN) and Support Vector Machine (SVM) classifiers[1].

Chain Code

An 8-direction Freeman Chain Code is used to represent the frequent number data of the stroke. The Freeman code carries connectivity and geometric information. Skeletal representation of features in the raster image can be expressed by the chain code. This code follows the contour and keeps track of the directions as we go from one start pixel to the next [6]. The chain code provides a storage-efficient representation for the boundary of an image in a Boolean image. The chain code representation incorporates such pertinent information as the length of the boundary of the encoded object, its area, and moments. Additionally, chain codes are invertible in that an image can be reconstructed from its chain code representation[4].

The Proposed System

In this paper we proposed a new technique to determine the features of an image in any direction or any size based on chain code and RLE compression[5]. The proposed method consists of the following steps:-

First: Apply the Chain code algorithm

In order to apply chain code algorithm we

suggest new window to represent the transition in the degree as illustrated in figure 1, The chain code algorithm as below.

Fig. 1: Proposed Chain Code Window

Chain Code Algorithm
Input: image
Output
Chain Code Vector C
Begin
Find out starting pixel which has nonzero value
Put center of chain code window on starting pixel
While (Not reach to first point) Or (Not Exist another pixel)   Do
Begin
Travels all 8 neighbors and   Find first nonzero value
Add the corresponding chain code on chain code vector.
Move to next position
End
End.

Second: Apply the Chain code Enhancement

In this step the chain code is first extracted and then enhanced by applying the RLE compression on the chain code vector. The purpose for this operation is to approximate the image by eliminate the small part of image and added it to largest nearest part, this can do by compare the counter for each code threshold th1 to determine that the part of image which represented by this code small or large, if it small then compare the codes of previous and next parts with threshold th2 as illustrated in the following algorithm.
Algorithm of Chain_Code_Enhancement .
Input: Chain Code in Vector C.
Output: Enhanced Chain Code in ECC vector
Begin
Call *Algorithm of RLE Encoding* on Vector C .

Save the code values in vector CC and the counter values in vector CO

for   k=2 to n-1 do

If CO[k]<=th1 AND (CO[k-1]=>th2 OR CO[k+1]=>th2) then

IF CO[K-1] < CO[k+1] then CC[k]=CC[k-1] Else CC[k]=CC[k+1].

Call *Algorithm of RLE E* on CC to save code values in ECC vector .

End.

For example, we have applied chain code for figure 2.a, and the chain code result is shown in figure 2.b .
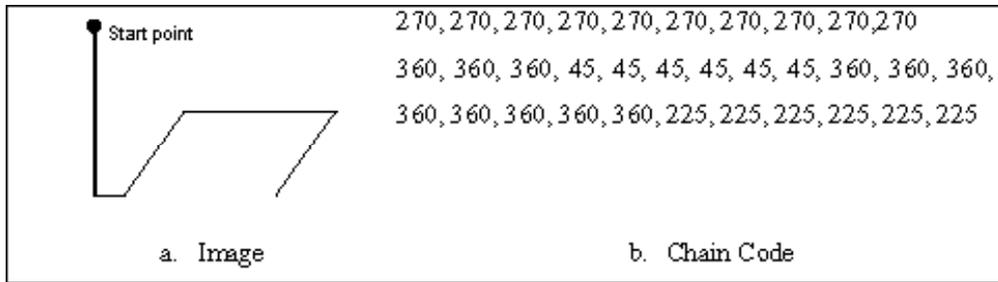
270,270,270,270,270,270,270,270,270,270
360, 360, 360, 45, 45, 45, 45, 45, 45, 360, 360, 360,
360,360,360,360,360,225,225,225,225,225,225

a. Image   b. Chain Code

Fig. 2: Input image and its chain code

After applying RLE we get the code values in vector CC and the counter values for each code in vector CO as shown in Figure 3.

CC	270	360	45	360	225
CO	10	3	6	8	6

Fig. 3: Chain code values after applying RLE

Consider th1=3 and th2=5 then we obtained the new chain code in vector CC and then applying RLE on it to get new vector ECC as shown in Figure 4.

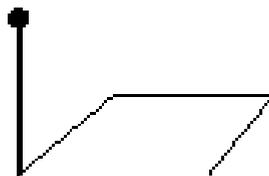| CC	270	45	45	360	225
ECC	270	45	360	225	
CO	10	9	8	6	

Fig. 4: Chain Code after enhancement

Fig. 5: Image after applying enhancement

The image which obtain according to above ECC vector is shown in Figure5.

Third: Extracting of chain code features

In this step we extract the features vector of the image based on degree of transition for each part by compare its code with the nearest part code, as illustrated in the following algorithm.

Algorithm of Chain_Code_Features
Input: Enhanced Chain Code Vector ECC of n values.
OutPut: Chain Code Features Vector CCF.
Begin
For i=1 to n-1 do
If ECC[i]< ECC[i+1] then CCF[i]= | ECC[i]-ECC[i+1] |.
Else CCF[i]= | (360-ECC[i]) + ECC(i+1) |.
End

Chain Code 270, 45, 360, 225
Features 135 , 315 , 225

Chain Code 225, 360, 315, 180
Features 135 , 315 , 225

Chain Code 360, 135, 90, 315
Features 135, 315, 225

Chain Code 90, 225, 180, 45
Features 135 , 315 , 225

Chain Code 225, 360, 45, 270
Features 135, 315, 225

chain code 135, 225, 315, 45, 135
Feature 90, 90, 90, 90

Chain Code 270, 360, 90, 180, 270
Features 90, 90, 90, 90

chain code 225, 315, 45, 135, 225
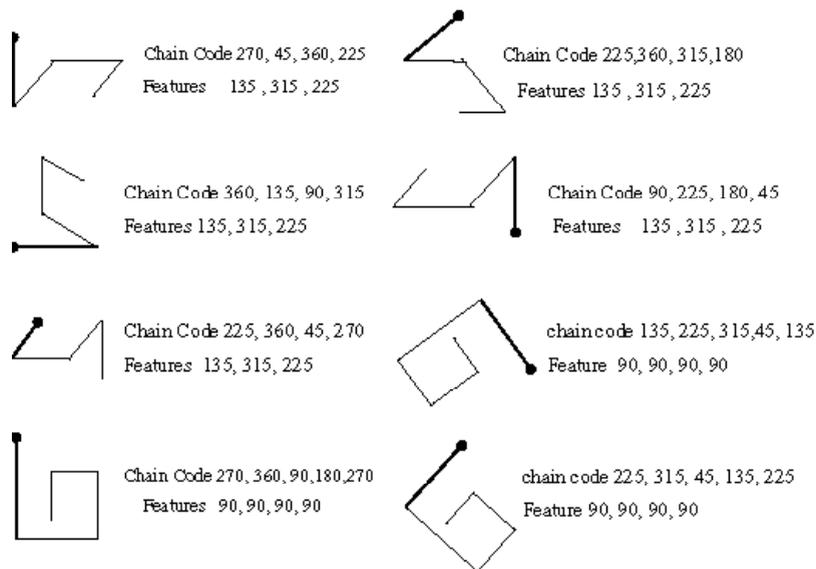Feature 90, 90, 90, 90

Fig. 6: Example of Imagse with different states

CONCLUSIONS

In this paper we proposed new technique to extract the features of the image based on chain code and RLE compression. Based on the experimental results, we can possess the following characteristics: (1) The features can represent the shape of image in any direction or any size . (2) They can use as input data for analysis, classification, clustering and identification systems. (3) These features give a good indicator about the nature of image from geometrical aspect. (4) Based on these feature and the chain code we can reconstruct an enhanced image. (5) We can regard the system as approximated system because it removes the small (insignificant) segments and added to the most significant.

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