Volume : 1 | Issue : 3 | December 2011 ISSN - 2249-555X

Research Paper Technology

A Chain Code Approach For Recognising Modi Script Numerals

* D. N. Besekar **Dr. R. J. Ramteke

* Shri. Shivaji college of science, Akola

** Dept. of computer science, North Maharashtra University, Jalgaon.

ABSTRACT

In this paper, a chain code based scheme for recognition of MODI script numerals have been developed. Chain codes have been claimed as one of the techniques that are able to recognize characters and digits successfully. This is because of several advantages possessed b this technique as listed by. The first advantage over the representation of a binary object is that the chain codes are a compact representation of a binary object. Second, the chain codes are translation invariant representation of a binary object. Due to that, it is easier to compare objects using this technique. The third advantages are that the chain code is a complete representation of an object or curve. This means that we can compute any shape feature from the chain codes. According to , chain code provide lossless information and preserving all topological and morphological information which bring out another benefits in terms of speed and effectiveness for the analysis of line pattern.

Here a modified algorithm for recognition of binary image (MODI numerals) is presented. This algorithm can be applied to monochrome images after being binariezed and derived the chain code from the image. The chain code algorithm is valid for to recognize direction features of MODI numerals, which are composed of triangular, rectangular and horizontal cells etc. this algorithm preserve information and allows computing geometric dimension and directions. Here, a considerable improvement in accuracy have been achieved keeping some points to consider such as binarizing with single cells, normalizing the digits w.r.to size and shapes.

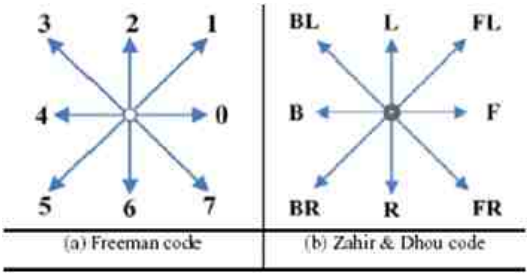
Keywords : Chain Code, Modi Script

Introduction

One of the oldest techniques for pattern recognition is used for character recognition, but through all days, more focus was on Latin, Chinese and Japanese languages, though connected. First, we applied Hilditch's method, which consists of removing the pixels that lie on the edge of the binary image until only one-pixel-wide line remains. This is followed by some conditions suggested by Al-Emami to reduce the junction points to one junction point. From a practical viewpoint however, the matching time must be reduced as much as possible through the classification techniques [3].which we will consider afterword.

In the eight connectivity encoding scheme introduced by Freeman [1], a link represents the direction between two points (pixels). These directions are numbered 0-to-7 as shown in Figure 1 (a). In order to digitally represent these directions, three bits are needed for each direction. Bons and Kegel [2] introduced the differential chain coding, DCC, method. This method exploits the correlation between two successive links via calculating the difference between the two links and assigning a variable length code to the result. The result is always positive, and within the range 0 to 7 instead of the range -7 to 7. . Yeh et_al [3] presented the Ideal-segmented Chain Coding (IsCC) method. They used the ideal 4-connected chains that can move in the right down / left up or left down / right up. Liu and Zalik [4] presented a new chain code method based on the eight-directions of Freeman code where each element in the chain is coded with a relative angle difference between the current and the previous direction and then they applied Huffman coding to compress the edges bit streams.

Figure 1: (a)freeman chain code . (b) Z & D code



The algorithm developed in this paper is checked and executed by using MATLAB software. With this we also used some predefined function which are already defined in matlab.

Chain Codes

Chain codes are one of the shape representations which are used to represent a boundary by a connected sequence of straight line segments of specified length and direction. This representation is based on 4-connectivity or 8- connectivity of the segments. The direction of each segment is coded by using a numbering scheme as shown in Figure 1 above. Chain codes based from this scheme

are known as Freeman chain codes. Fig. 1 Direction numbers for (a) 4-directional chain codes, (b) 8-directional chain code A coding scheme for line structure must satisfy three

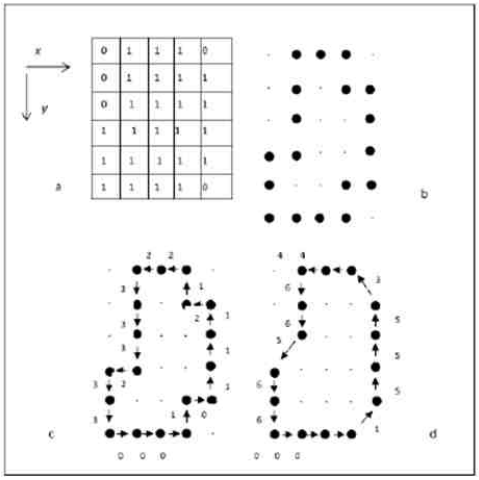
Objectives

a. It must faithfully preserve the information of interest;
b. It must permit compact storage and convenient for display; and
c. It must facilitate any required processing.

According to [9], chain codes are a linear structure that results from quantization of the trajectory traced by the centers of adjacent boundary elements in an image array. A chain code can be generated by following a boundary of an object in a clockwise direction and assigning a direction to the segments connecting every pair of pixels. First, we pick a starting pixel location anywhere on the object boundary. Our aim is to find the next pixel in the boundary. There must be an adjoining boundary pixel at one of the eight locations surrounding the current boundary pixel. By looking at each of the eight adjoining pixels, we will find at least one that is also a boundary pixel. Depending on which one it is, we assign a numeric code of between 0 and 7 as already shown in Figure 2. For example, if the pixel found is located at the right of the current location or pixel, a code "0" is assigned. If the pixel found is directly to the upper right, a code "1" is assigned. The process of locating the next boundary pixel and assigning a code is repeated until we came back to our first location or boundary pixel. The result is a list of chain codes showing the direction taken in moving from each boundary pixel to the next. The process of finding the boundary pixel and assigning a code is shown in Figure 3.

Chain codes have been claimed as one of the techniques that are able to recognize characters and digits successfully . This is because of several advantages possessed by this technique as listed by. The first advantage over the representation of a binary object is that the chain codes are a compact representation of a binary object. Second, the chain codes are a translation invariant representation of a binary object. Due to that, it is easier to compare objects using this technique. The third advantage is that the chain code is a complete representation of an object or curve.

Fig. 2 a & b) A 4-connected object and its boundary; c & d) Obtaining the chain code from the object in (a & b) with (c) for 4-connected and (d) for 8connected



This means that we can compute any shape feature from the chain codes. chain codes provide a lossless compressing and preserving all topological and morphological information which bring out another benefit in terms of speed and effectiveness for the analysis of line patterns.

Methodology

The following figure shows the methodology for this research. There are five phases involved; image acquisition, data definition, Image pre-processing, Binarizing images and Chain derivation and recognition.

Figure 3 : Total process used in algorithm.

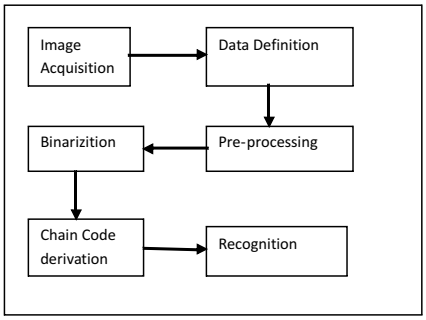
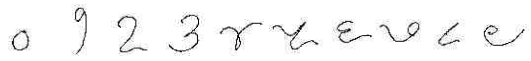


Image Acquisition:

In this section, images captured by flat scanner using 300 dpi or user can also capture the images by using writer pad. Save these images in .jpg format. Image acquired by writer pad required less pre-processing, where as images acquired by scanner required more efforts for pre-processing. Following figure-4 shows some example of MODI numerals using writer pad.

Figure 4: MODI Numerals



Data Definition:

Data that comes from the form of images need to be identified and analyzed first before tested. The first step to normalized the images. It means that this MODI script is cursive type and extend its corners (Modi Numerals) randomly. Hence it need to be normalized, which leads to better result.

Figure-5 shows some randomness.

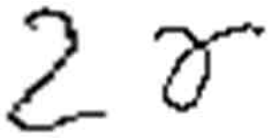
Pre-processing

Two processes are involved in pre-processing which are threshold and filtering. Since images captured from degraded documents. These documents are very salty and full of dust, noise. So that images cannot be seen clearly. So it is necessary to clear the images. This can be achieved by various filters available in Matlab.

Binarization:

Once completion of the pre-processing and getting clear images which is .jpg format, then the process of binarization of images can apply. Images used are gray-scaled images and are converted into binary images which means that every pixel in the images is converted to the binary values ("0" & "1"). Following figure-6 shows this effect and save these images as monochrome images.

Figure 6: monochrome images.



Chain code Derivation

This phase is to derive the chain codes for each number of Modi script in the specified region which is the result from image binarization phase. The algorithm for extracting chain code for 8-connected boundries.

In this paper, a modified chain code is to be used to recognize the numerals of Modi script. Basically this resulted chain code differentiate the numerals from each other. Following flow chart shows the total process of finding chain code fig 7. Fig 8 shows flow chart of the Traditional Chain code.

Figure 7: Total process of finding chain code.

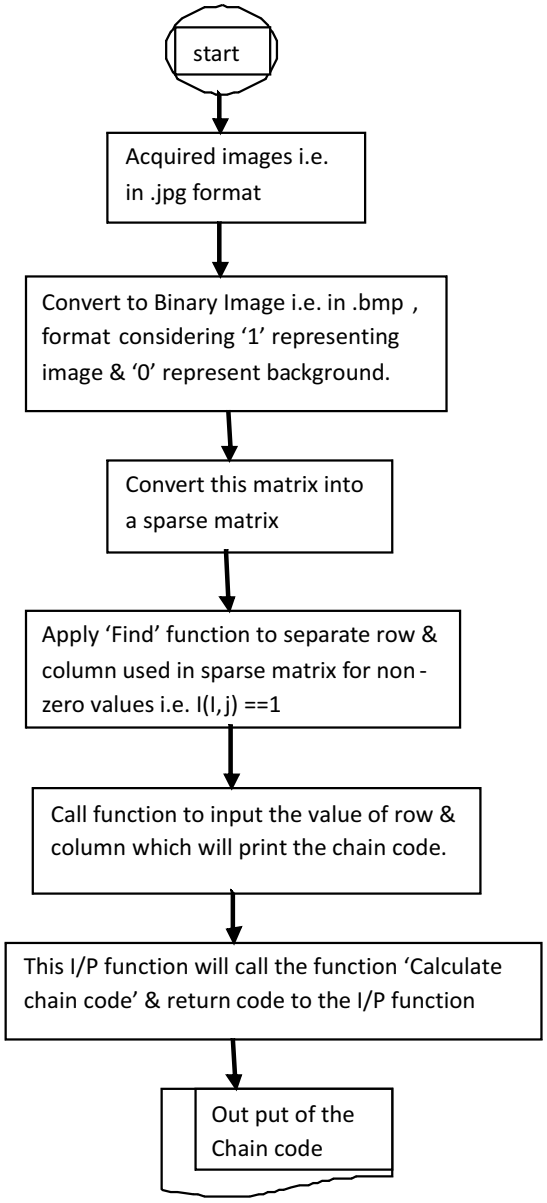
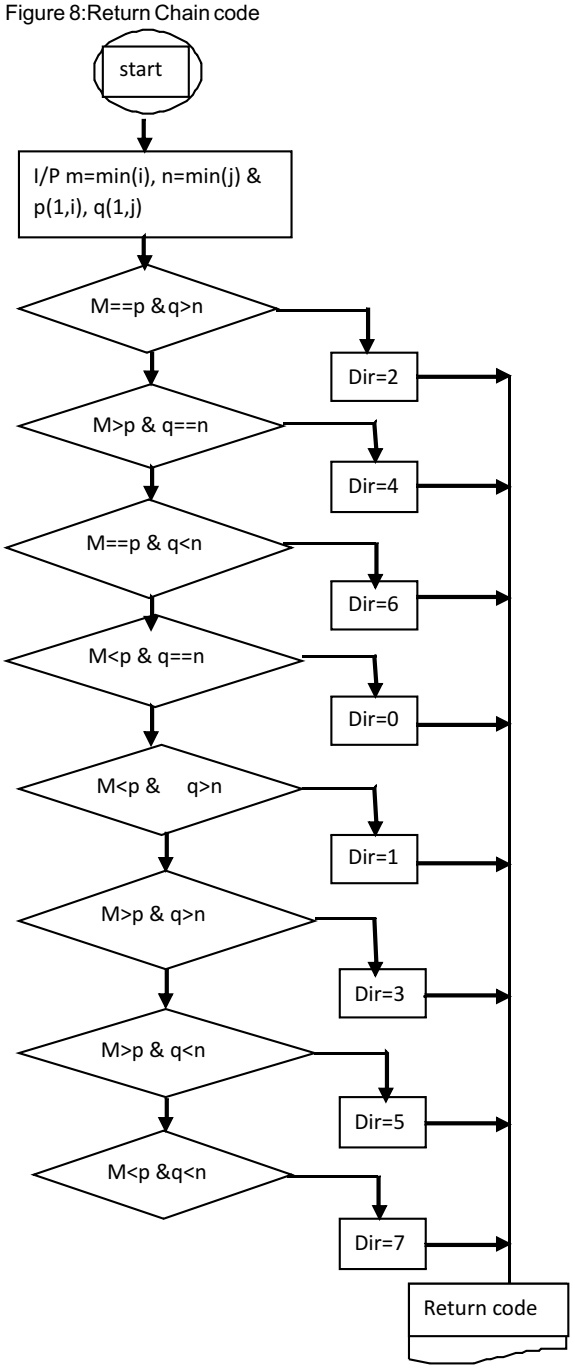


Figure 8:Return Chain code

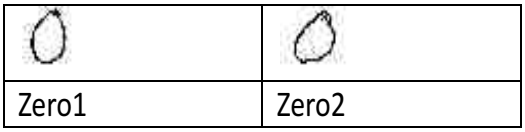


Result

In this section, the proposed algorithm will be tested using different test images. A data base of various image classes has been used. Here, images were binary and its array represented in the form of '0' and '1'. i.e. image represented by '1' and its background represented by '0'. One thing is to remember that every image must be noiseless, extracted from degraded document. It must be normalized to get better result. Following figure shows different images of same classes with their Chain code.

Zero1 0003000000003000030003003003030 303030030030003000300030000 3000003000000 00003

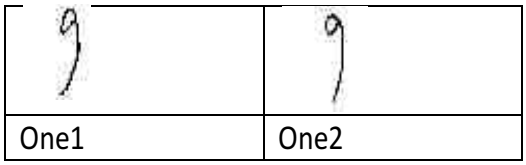
Zero2 0000030003003000300300300300303 003003003003000300300003000300000003 000030000



Zero1	Zero2

One1 0003000000030000300000300003000 000300000300000000300000000000000003 000

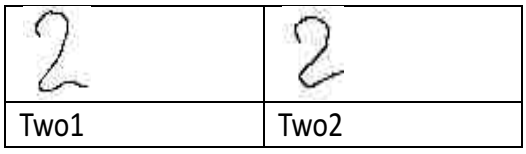
One2 0003000303000300000030000000300 000030000000300000000000000000000003 00



One1	One2

Two1 0000300003000000030000030003003 003000300300003000300030000300030000 003000000300000300000300000000222

Two2 0000300030000030000030000300000 300030030003000030003000030003000300003 000300000003000002303223 2???

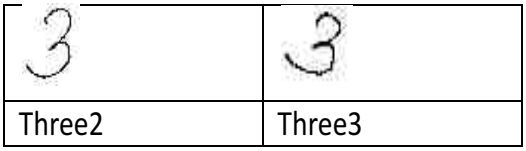


Two1	Two2

Three2 0202020212202222030000300030303 030000300003000030003000030030003000 000300000300000300000300000030000000

Three3 0300202022022022122303003000000 030000300000300030000300003000030000

000030000000030030003000???



Three2	Three3

Nine1 0000030000003000030000030003000300 000300030000300022222222220322303230 303033303003003030300030???

Nine2 0000030000300030003000030000300030000 300030000300300300300300022222303230 323223303033303033330030???

Nine1	Nine2

Table 1: Comparative study

Sr.No.	Test Image	Accuracy	Test remark
1	Zero1	95%	normalized
	Zero2	96%	,,
2	One1	94%	,,
	One2	93%	,,
3	Two1	87%	Non- normalized
	Two2	89%	,,
4	Three2	89%	,,
	Three3	85%	,,
5	Nine1	93%	normalized
	Nine2	95%	normalized

Conclusion

In this paper, a chain code has been derived of various binary images of same class for each numerals of MODI script. Care had taken for I/P images is that each image must be normalized and also its sparse matrix must also normalized. Otherwise little bit change in accuracy may be occur, but in normalized images accuracy rate increase to 95%. This algorithm can be applied to any binary image and is used to find chain code.

REFERENCES

H. Freeman, "On the Encoding of Arbitrary Geometric Configurations," IRE Trans. Elec. Computer, EC (10) 1961, pp. 260-268 | J. H. Bons and A. Kegel, "On the Digital Processing and Transmission of Handwriting and Sketching," Proceedings of EUROCON 77, 1977, pp. 880-890 | M.C. Yeh, Y. L. Huang, J. S. Wang, "Scalable ideal-segmented chain coding," ICIP (1), 2002, pp. 197-200 | Y. K. Liu and B. Zalik., "An efficient chain code with Huffman coding," Pattern Recognition, vol. 38, no. 4, April 2005, pp. 553-557 | Walid Shahab,Hazem Al-otum & farouq "A Modified 2D Chain Code Algorithm for object Segmentation and contour Tracing" International Arab Journmal of IT, vol. 6.no. 3, July 2009. | Nor Amizam jusoh and Jasni Mohamad Zain, "Application of Freeman Chain Codes: An Alternative Recognition Technique for Malaysian car Plates", IJCSNS, vol 9, no.11, November 2009. | Saif Zahir and kal Dhou, "A New Chain coding Based Method for Binary Image Compression and Reconstruction", | Dr. Azzam talal sleit,Rahmeh Omar Jabay, "A Chain Code Approach for Recognizing Basic Shapes". | S.Madhavnath, G. Kim, & V.Govindaraju, "Chain code Contour Processing for hand written word recognition",IEEE transaction on pattern analysis and machine intelligence, vol. 21,No.9, September 1999.