Feature Extraction of Rich Texture Document

Miss. Prajwalita Satish Ravan[1], Dr. Shrinivas A. Patil[2], Mr. Swapnil V. Vanmore[3]
[1, 2] Electronics and Telecommunication, DKTE'S College of Engineering,Ichalkaranji
[3]Electronics and Telecommunication,Sanjeevan collage of engg. Panahala

Abstract :* *We describe here an efficient algorithm for re-assembling one or more unknown objects that have been broken or torn into a large number N of irregular fragments. The puzzle assembly problem has many application areas such as restoration and reconstruction of archeological findings, repairing of broken objects, solving jigsaw type puzzles, molecular docking problem, etc. The pieces usually include not only geometrical shape information but also visual information such as texture, color, and continuity of lines. This paper presents a new approach to the puzzle assembly problem that is based on using textural features and geometrical constraints. The texture of a band outside the border of pieces is predicted by in-painting and texture synthesis methods. Feature values are derived from these original and predicted images of pieces. An affinity measure of corresponding pieces is defined and alignment of the puzzle pieces is carried out. The optimization of total affinity gives the best assembly of puzzle. Experimental results are presented on real and artificial data sets.

Keywords: Image puzzle, image in-painting, image mosaicing, jigsaw puzzle

1.Introduction

Non overlapped image mosaicing is part of the mosaicing in which two images are not Non-overlapped. Torn image mosaicing or torn document mosaicing are new concepts in the field non-overlapped image mosaicing. Non-overlapped image mosaicing is the extended concept of puzzle reconstruction and torn document reconstruction. Images of the puzzles and torn fragments are non-overlapped images. This paper focuses on different types of algorithms for image mosaicing under non overlapped image mosaicing. It also surveys the general steps of non overlapped image mosaicing.

Torn papers are considered as puzzle fragments in most of the literature. Puzzles can be defined as different objects of similar geometrical characteristics of connectivity. Various definitions of puzzles have been given in the literature [5] but overall views are similar to finding the connected puzzles with proper orientations. It was the aim from 1960's to find the solution for automatic puzzles organizations [8, 15]. Especially solutions to torn or shredded paper reconstruction had been suggested. Classification of puzzles, defined already in the literature [5, 6], has been specified to consider the shape and/or texture along the boundary for better performances. Most of the methods included in the literature are considered boundary end texture which is not sufficient for some applications like torn image reconstruction/mosaicing, text document reconstruction or textual reconstruction of the torn documents.

Automatic software based solution for torn paper organization is a major requirement in the field of document reconstruction. Many researchers [6, 8] have reported different aspects of document and text reconstruction. The techniques like text document reconstruction and text reconstruction from torn document not only require extracting the shape of the boundary but also requires extracting the texture of the inner most text area for its reconstruction.

The main steps in digital image processing are (i) preprocessing, which is a data preparation step for contrast enhancement, noise reduction or filtering, (ii) feature extraction, for retrieving non-redundant and significant information from an image. This operation is targeted at achieving time efficiency at the cost of data reduction followed by object detection, localization and recognition, which determine the position, location and orientation of objects. A plethora of algorithms targeted at the aforementioned objectives, has been evolved from time to time. In general, the characteristics and efficiency of an algorithm is determined by the domain of input data to be processed. Typical input domains comprise pixels, local features, image edges, embedded objects, to name a few. The output domains invariably comprise homogeneous image segments, edges of detected/localized objects, regions/segments, and different objects differing in size, shape, color and textural information.

2.Problem Description & Requirement Specification

2.1 Problem statement

Torn image mosaicing or torn document mosaicing are new concepts in the field non-overlapped image mosaicing. Non-overlapped image mosaicing is the extended concept of puzzle reconstruction and torn document reconstruction. This paper focuses on different types of algorithms for image mosaicing under non overlapped image mosaicing. It also surveys the general steps of non overlapped image mosaicing. The techniques like text document reconstruction and text reconstruction from torn document not only require extracting the shape of the boundary but also requires extracting the texture of the inner most text area for its reconstruction.

2.2 Proposed System

The main aim of this paper is to reconstruct the torned document. There are two methods of reconstruction, (i) Apictorial method, which solves torn paper reconstruction problem with shape based matching method. The initial step of an apictorial approach is to calculate the boundaries of all fragments with proper shape representation.(ii) pictorial method, Torn images may have irregular torn boundaries. For stitching

International Journal of Scientific Engineering and Technology (ISSN : 2277-1581)
Volume No.4 Issue No.3, pp : 192-196 01 March. 2015

purpose, it is necessary to find the geometry of boundaries of all torn pieces. Exact and sharp boundary identification is necessary for exact match identification therefore suitable method of boundary detection is required to be identified. Internal and external contents of torn image must be separated to exact visualization of all the variations of boundaries. Pictorial approach uses shape and texture (content based features) along the boundary of puzzles for the matching purpose.In this paper we will reconstruct torned document by document mosacing technique.During simulation we will scan all broken documents and then boundary detection,text extraction and corner detection of random host & guest piece will be performed. Second corner matching of host and guest piece will be performed and we will combine those pieces if match found.

3. Proposed Approach Framework and Design

3.1 Problem Definition

In this project we are going to reconstruct the torned or fragmented documents by using torned document mosaicing technique. Previous works on the assembly problem have focused mainly on geometrical properties of the pieces.The puzzle pieces are represented by their boundary curves. Some approaches especially related to standard toy-store jigsaw puzzle solver use feature based matching methods. The jigsaw puzzle solving problem is a reduced and restricted version of the general assembly problem.

3.2 Proposed Architecture

Input

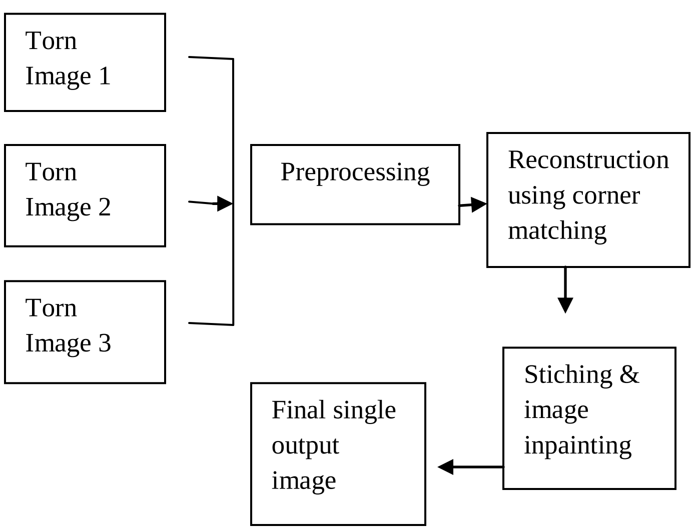


Fig 3.2.1 Architecture Design

3.3 Process Flow

1) Pre-processing.
2) Alignment and Matching of Fragments.
3) Merging of Fragments with seamless boundary.

3.4 Pre-processing

This step includes following,

1) Text piece identification
(i) Boundary detection

High level feature extraction requires local and global properties as well as spatial relation of the image. Boundary or shape is the high level features of an image. Boundary detection task is useful for segmentation and recognition in an image processing. Color segmentation is one of the approach to find out the boundary of an unknown shape.Extraction of the boundary from an image can be perform by finding the set of pixels or points whose connected neighbor are not part of targeted region but lies on edges. The connectivity of the edge pixel with their neighbor will give us a boundary of the targeted region. The connectivity is checked using the 4-neighbour connectivity or the 8-neighbour connectivity. The boundary can be defined by both type of connectivity of the neighbor pixels.

L a*b color spaces [13] based color image segmentation algorithm[14].

Step 1: Read input image.
Step 2: Convert input image from RGB to L*a*b color space.
Step 3: Classify colors in a*b using k-means clustering.
Step 4: label every pixel in image using result from k-means clustering.
Step 5: Create image that segment the H &E image by color.
Step 6: Segment nuclei into separate image.

Here L*a*b indicates,

L* is Luminosity layer

a* is chrominocity layer which indicates where color falls along red-green axis.

b* is chrominocity layer which indicates where color falls along blue-yellow axis.

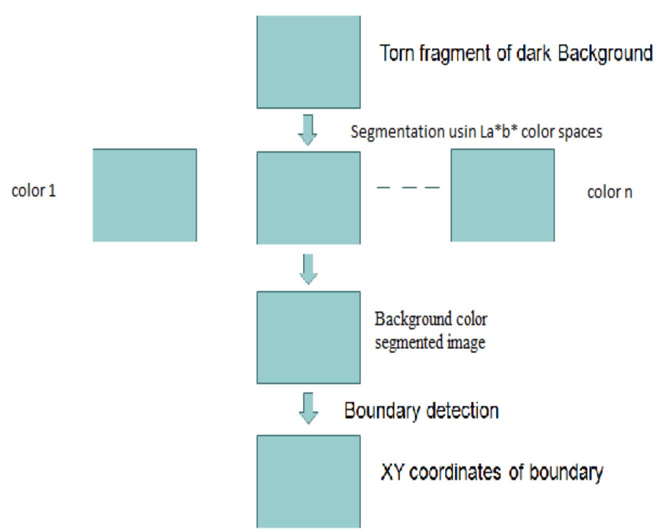
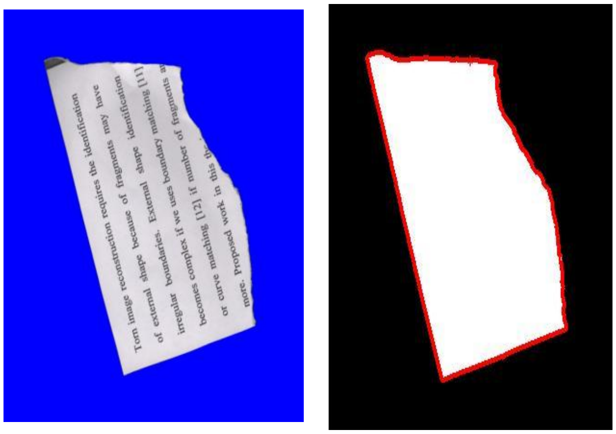


Fig3.4.1 Boundary Detection Process.



Original image Detected Boundary

Fig3.4.2 Boundary Detected image.

(ii) Line detection

Initial step in image processing stage includes feature like lines and curves detection from the images. Earlier proposed [1]-[2]-[9] techniques uses edge detection technique followed by the linear hough transform to detect the lines from the image. The line detection process includes filtering To carry line detection process the method of Hough Transform is used. Hough Transform maps points in Cartesian image to curves in the Hough parameter space:

$$\rho = x.\cos\Theta + y.\sin\Theta \quad (1)$$

where ρ is the distance from origin to line along a vector.

Θ is the angle between x axis and this vector.

This transform is used to to find lines in the input image.

Line detection using Hough transform performed by converting a point in image space to the Hough space. One pixel or point in image space can be line passing from that point in Hough space.

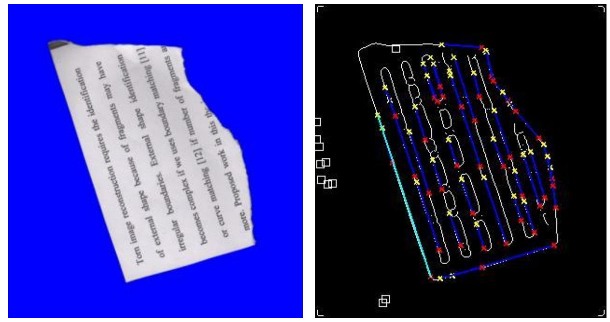
Hough transform based line detection techniques using 1) Standard edge detection , 2) Marr Hildreth edge detection and 3) Aniso-Tropic diffusion filtering with Marr Hildreth edge detection is performed on rich textured image and results are shown in figure3.4.3

2) Orientation of fragments

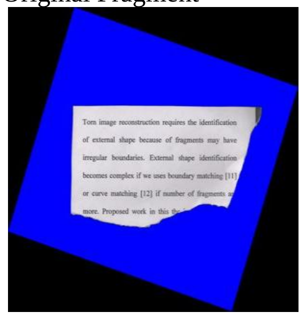
(i) In this step Lines along the texts words are detected using above method.

(ii)Then Individual lines orientations are calculated.

(iii)Global orientation is estimated from maximum lines orientations.



Original Fragment Detected Lines



Rotated Fragment

Fig 3.4.3 Line Detected image.

3) Corner detection for matching of fragments

This step includes following sub-steps,

(i) Boundary detection .
(ii) Centroid estimation .
(iii) Estimation of Distance histogram.
(iv) Extraction of Corner points along pick points.

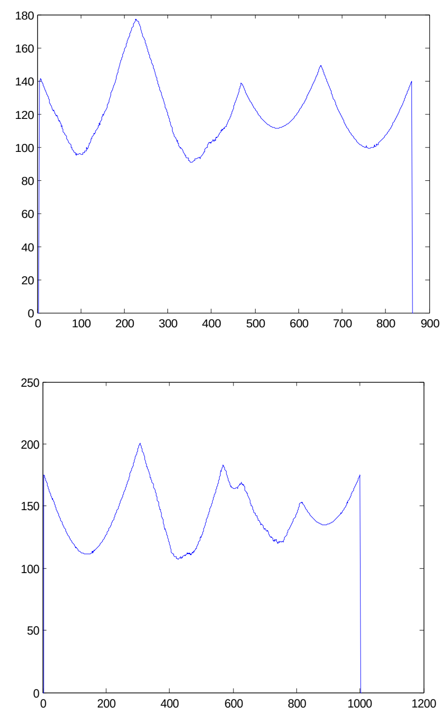


Fig 3.4.4Distance Histogram for pick detection

3.5 Alignment and Matching of Fragments

International Journal of Scientific Engineering and Technology (ISSN : 2277-1581)
Volume No.4 Issue No.3, pp : 192-196 01 March. 2015

It includes following steps,

Steps:

(i)Plot L1 and L2 lines along the boundaries of each corner using curve fitting.

(ii)Find the Half-quadrants values (HQV) of L1 and L2 and

(iii) Find the Angle between the Corner Lines (ACL) L1 and L2.

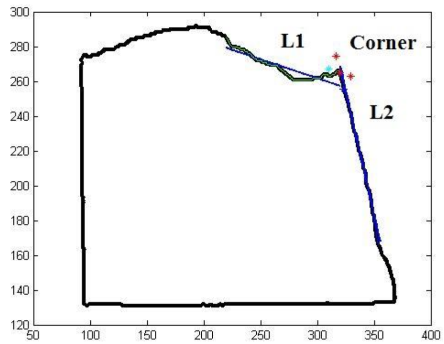


Fig 3.5.1 Line plotted on boundary of each corner.

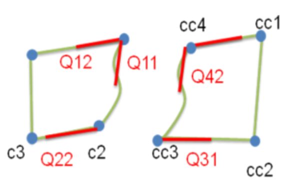
Initial corner matching :

Two criteria are decided for corner matching

(i)Boundary at a corner (of particular half-quadrant) of a fragment is always inline with the boundary at matched corner (of opposite half-quadrant) of connected fragment.

(ii)Angle between two boundaries at a corner of a fragment is 180 degree apart from that of at a matched corner of connected fragment.

(iii)The corners (of Guest fragment) of opposite half-quadrants are paired with the corners of Host fragment. Remaining corners are rejected.



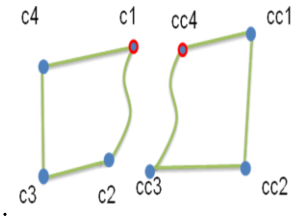
c	cc	Qc	Q cc
1	4	Q12	Q41
2	3	Q22	Q31

Final corner matching :

(i) Select any random guest piece.

(ii) Select any one of the matched corners from initial corner matching.

(iii) Match the boundary alone that corner with host piece.



.

3.6 Merging of Fragments with seamless boundary

1. Dilation Process

(i) Main aim is to extract text and merge the text from all the fragments without seam visualization.

(ii) Dilation process is used to extract the text from fragments.

2. Mask 3-point blending

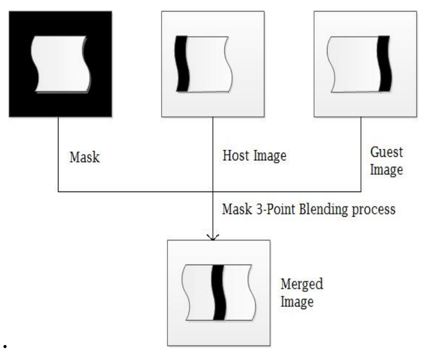
(i) Define Inner Blending Image in which object to be merged is available.

(ii) Define Outer Blending Image whose background has to be merged.

(iii) Create a mask from Inner Blending Image.

(iv) 3-Point pixels of the Inner Blending Image and Outer Blending Image along the boundary of the mask are considered as the 3 line pixels [63].

(v) These 3-point pixels are merged by using Multi-resolution Spline technique [63] along the irregular shape of the mask to get a blended image.



.

Fig 3.6.1 Mask 3-point blending process.

3. Mask creation

(i) The inner Blending Image is converted into grayscale image.

(ii) A grayscale image is converted into a binary image by Thresholding.

(iv) The binary image is filled with holes (black pixels in the white portion) to remove noise.

(v) All separated regions of binary image are identified and the only maximum area region is considered as the mask region. All remaining regions are left un-masked.

4. Image In-painting

(i) Identification of full common torn boundary

(ii) Create uniform mask on the irregular boundary

(iii) Image in-painting over CTB using Exemplar-Based In-painting technique [64] for mosaic image.

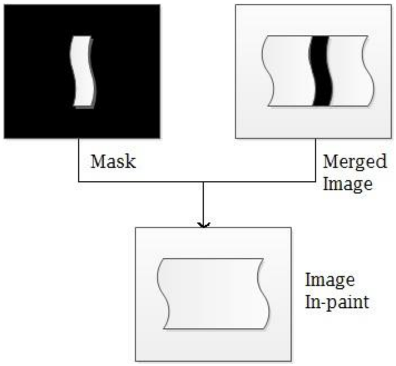


Fig 3.6.2 Image In-painting process

4. Conclusion

Non Overlapped image mosaicing can be classified as Torn image mosaicing and Torn text document mosaicing, we are focused on the reconstruction of text document. Reconstruction process gives the two resultant image as combined mask image and combined original image. Image in-painting will remove the visible seam line between the connected fragment and provides real view for given specimen.

5. References

i. *Xinding Sun, Jonathan Foote, Don Kimber, B. S. Manjunath, "Panoramic Video Capturing and Compressed Domain Virtual Camera Control," Proceedings of the ninth ACM International Conference on Multimedia, pp: 329–347, 2001.*

ii. *A function maskblending,* http://www.eecis.udel.edu/~qili/ta/cis489/2/

iii. *A. Biswas, P. Bhowmick and B. B. Bhattacharya, "Reconstruction of Torn Documents using Contour Maps," Proceedings of International Conference on Image Processing , Vol. 3, pp:517-520, 2005.*

iv. *C, E. Solana. Justino, L. S. Oliveira and F. Bortolozzi, "Document Reconstruction based on Feature Matching," Proceedings of 18th Brazilian Symposium on Computer Graphics and Image Processing, pp:163-170, 2005.*

v. *H. Freeman and M. L. Demaine, "Jigsaws puzzles, edge matching, and polyomino packing: Connections and complexity, Graphs and Combinatorics," vol. 23, no. 1, pp: 195-208, 2007.*

vi. *B. Burden and H.Wolfson, "solving jigsaw puzzles by a robot, Robotics and Automation," IEEE Transactions on, vol. 5, no. 6, pp: 752-764, Dec 1989.*

vii. *J.M.Viglino and L.Guigues, "Cadaster map assembling: a puzzle game resolution," Proc. Of 6th Conf. on Document Analysis and Recognition, 2001, pp: 1235-1239.*

viii. *M. Sagiroglu and A.Ercil., "A texture based matching approach for automated assembly of puzzles," 18th Int. Conf. on Pattern Recognition , 2006,vol. 3, pp:1036-1041.*

ix. *C. Papaodysseus, T. Panagopoulos, M. Exarhos, C. Triantafillou, D. Fragoulis, and C. Doumas, "Contour shape based reconstruction of fragmented, 1600bc wall paintings, Signal Processing," IEEE Trans. On, vol50, no. 6, pp: 1277-1288, Jan 2002.*

x. *T.R. Nielsen, P. Drewsen, and K. Hansen, "Solving jigsaw puzzles using image features," Pattern Recogn. Lett, vol. 29, no. 14, pp: 1924-1933, 2008.*

xi. *T.R. Nielsen, P. Drewsen, and K. Hansen, "Solving jigsaw puzzles using image features," Pattern Recogn. Lett, vol. 29, no. 14, pp: 1924-1933, 2008.*

xii. *R.W. Webster, P.S. LaFollette, and R.L. Stafford, "Isthmus Critical Points for Solving Jigsaw puzzles in Computer Vision," IEEE Trans. on System, Man and Cybernetics, Vol. 21, no. 5, Sep. 1991.*

xiii. *181– S. Singh, M. Wu, and C. S. Raghavendra, "Power-aware routng in mobile ad-hoc networks," in Proc. 1998 ACM MobiCom, pp 190.*

xiv. *Wolfon, H. J. "On curve matching," IEEE Trans. Pattern Anal. Mach. Intell. 12, 5, 483–489.*

xv. *Da Gama Leitao, H. C. November 1999. Automatic Reconstruction from Objects Fragments. PhD thesis, Inst. of Computing, Univ. of Campinas. Dr. Jorge Stolfi (Orientator).*

xvi. *Da Gama Leito, H. C., Stolfi, J. "A multiscale method for the reassembly of two-dimensional fragmented objects," IEEE Trans. Pattern Anal. Mach. Intell. Vol. 24, no. 9, pp: 1239–1251.*

xvii. *Kishon, E., Wolfson, H. 1987. "3-d curve matching," In SPMSF87 (1987), pp: 250–261.*

xviii. *H.C.G. Leitao and J. Stolfi, "A Multiscale Method for the Reassembly of Two-Dimensional Fragmented Objects," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 24, no. 9, pp: 1239-1251, Sept. 2002.*