ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 1, January 2018

# Skew Detection and Correction of Document Image using Hough Transform Method

[1] Neerugatti Varipally Vishwanath,[2]Dr.T. Pearson, [3] K.Chaitanya, [4] MG JaswanthSagar,[5]M.Rupesh
[1] Asst.Professor, [2] Professor, [3][4][5] UG students
[1][2][3] Department of ECE, St. Peter's Engineering College, Maisammaguda, Medchal, Hyderabad, Telangana, India

*Abstract* - **During document scanning, skew is inevitably introduced into the incoming document image. Skew detection is one the first operations to be applied to scanned documents when converting data to a digital format. Its aim is to align an image before processing because text segmentation and recognition methods require properly aligned next lines. In this paper, skew detection and correction of documnet image is performed by hough transform technique. The hough transform algorithm have been implemented and the results of each have been compared for accuracy**

**Key words: Skew Detection, Skew Correction, Document Image, Hough Transform**

## 1. INTRODUCTION

In many of OCR readers or applications while developing we should have an algorithm for skew detection and correction at preprocessing section. The OCR readers or applications will accept a binary image as input for that, it will follow.

Visual representation of something in the presence of light is an image. Information technology has many uses in many applications. An image can be shown in two dimensional function 'f(x, y) '; where x and y are co-ordinates in spatial domain and the amplitude of 'f 'is known as the intensity of an image at that point which are denoted by (x, y) [1][2].

A grid of pixels present in rectangular shape can used to represent an image. Every image has particular height and width which can be depended on number of pixels. We all know that pixel is a smallest part of a display which is present in square. If we had smaller pixels in a display we can get more clear information. Every pixel has colors (RGB) and every pixel color can be in a 32-bit integer value. In this 32-bit integer, the redness of a pixel is given by first eight bits and greenness is given by another eight bits and blueness is given by another eight bits and remaining eight bits will help to adjust the transparency in a pixel. Vector graphics and raster graphics help to describe an image. A picture which can be created or copied and stored in an electronic form is called as 'image'. Image which is stored in 'raster' form and it is also called as bitmap. A file containing information of a specified image which is associates with various locations with 'hypertext' links such as a digital image or still images like drawings, pictures, logos, or individual video frames.[3]We can also add text on animate which is captured by a digital camera using some software tools. By using mathematical techniques we can process an image which we call as image processing. In image processing we give an image or series of images as input, we get images or it's parameters as output. There are many applications where the image processing concept is widely used such as medicine, biology, astronomy, satellite imagery, personal image editing, weather reporting, etc.[4]

We frequently see quotes in our social networking sites, some text advertisements on boarding which are present besides the roads, or on palm plates. We can found group of characters which can form words by placing adjacently, the words which are placed adjacently with a meaning can form a sentence. The orientation of these text lines, we can determine the skew angle of an image or a script or a report. If the skew angle is not there or if it is zero then we can find lines vertically and horizontally which are drawn on the paper near to the edges such that they seems to be parallel w.r.t to edges. The skew angle with zero and 45 degrees of a synthetic document image.
This skew angle of zero degrees helps to get an image or a document which is containing text to get in a straight line w.r.t to the angle of the text. So, when a image or a document is scanned at that time we get text which is parallel with the borders.[5]

Page layout analysis and optical character recognition will help to find the skew angle in an image or a document. These two are very sensitive to the orientation of input document or image. The skew detection and correction

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 1, January 2018

should be done automatically due to the vast development in the image or document entry and interpretation systems.[6]

In this paper the main scope is that text which is not aligned in straight lines, due to skew in the image or document is because rigid rotation. Some of the papers deal with the situation where there is a non-uniform skew of an image or a document.[7]

Projection profile (pp) and its variations is most popularly used technique. But, in case of text only the do well. For skew detection, we can also use Hough transform to achieve high accuracy in detection of skew. In these two techniques the computational complexity is always proportional to the range and accuracy. So, in most of the PP or HT cases the detection range is typically between - 15 ° to 15 °.[8],[9].

Another approach is by using ‘ k – N N (nearest neighbor) clustering (1°'11/ of the components which are connected. In this approach the computational cost is high but we can get accuracy with high relativity and it is independent to the detection range, C(N2), where N is number of components which are connected. In skew detection the computational cost mainly involves, text lines location and estimation of skew angle using PP, and HT or by using PP and k – N N clustering. Based on morphological transforms approaches, we can extract the base lines, we can identify the components which are connected and we can also find the burst image which is created due to black run lengths which have been proposed to improve the locating text lines efficiency.

The projection profile and k – N N clustering will have more

The key feature for characterizing this pre-processing algorithm of an image or a document analysis is the algorithmic complexity.

Hough Transform: It gives very good results in any tough conditions. It helps in skew detection and correction for text oriented images. A skew detection and correction process has three parts
1. Block adjany graph (BAG) of simplified used for preprocessing stage
2. The voting process is done by using Hough transform to perform skewing the image by its orientation rotation.
3. For correction phase of skew, the quality of skewed images with respect to the rotation type.

## 2. PROPOSED WORK:

In this paper we written an algorithm for fast transformation of an skewed image, it doesn’t even take one second and the code which we written MATLAB will show the figures of skewed image which has skewed angle and also shows the figure of non skew angle or zero skew angle of an image. The algorithm uses integer operations.

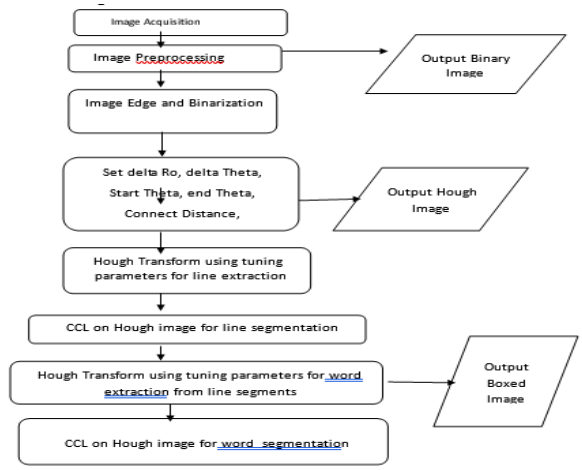



***Figure 1. step by step simulation of skew detection algorithm.***

As we all know Hough transform will help to find different shapes and it will mainly focus on detection of lines. For skew detection we can use following methods[9]
1.Hough transform
2.Projection profile
3.Clustering of nearest neighbors
4.Correlation between lines.

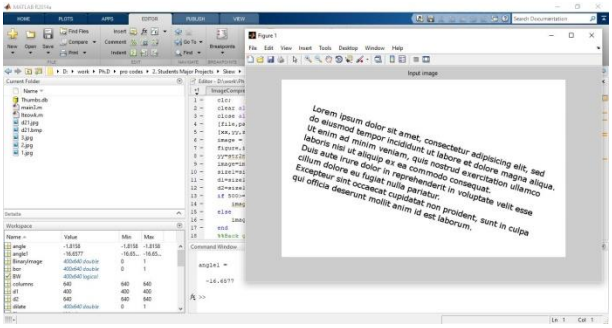
In this paper we are concentrating on Hough transform.
Algorithm:
Step 1: skewed image is given as input.
Step 2: gray image is converted into binary image.
Step 3: the optimal threshold value should be plotted.
Step 4: using soble edge method, find the edges.
Step 5: for first axis apply Principle Component Analysis (PCA).
Step 6: skew should be detected.
Step 7: the corrected skew is displayed.

ISSN (Online) 2394-2320

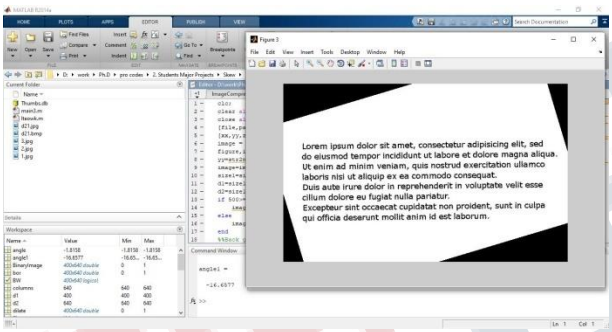
International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 1, January 2018

### 3.RESULTS

Firstly, the experiment is tested on standard images which are skewed.



*(a)*



*(b)*

***Figure 2. (a) Input image before simulation, (b) Output image after simulation skew corrected.***

*(a)*

*(b)*

***Figure 3. (a) Input image before simulation, (b) Output image after simulation skew corrected.***

*(a)*

*(b)*

***Figure 4. (a) Input image before simulation, (b) Output image after simulation skew corrected.***

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 1, January 2018

## 4. PERFORMANCE ANALYSIS

The Hough transform taken with Radon transform for comparisons. This shows that Hough transform works well with the sparse sampling in the parametric domain and malfunctions if sampled densely in the parametric domain. Fig. 3 shows that the Hough transform works well with sparse sampling. And if the sampling rate is kept constant still the Hough transform takes much more time for with increase in the size of the document image.

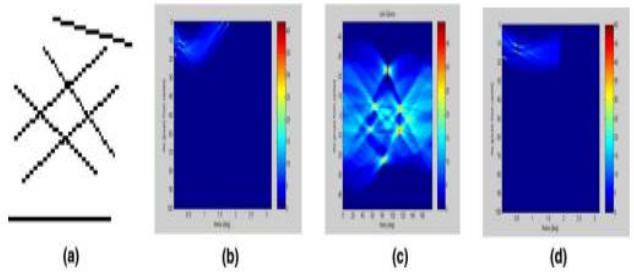



***Fig. 3. (a) An image with six lines, (b) Hough transform, (c) Radon transform and (d) Hough transform with parameters***

***Table 1 : Time taken by Hough and Radon transforms with parametric domain values***

| Data | Hough | Radon | Difference | Data type |
|---|---|---|---|---|
| 1 | 0.594 | 0.344 | 0.25 | 2 lines |
| 2 | 0.734 | 0.203 | 0.531 | 3 lines |
| 3 | 0.828 | 0.218 | 0.61 | 4 lines |
| 4 | 3.578 | 0.297 | 3.281 | Word Uski |
| 5 | 7.39 | 0.344 | 7.046 | Doc. English |
| 6 | 1.594 | 0.234 | 1.36 | 6 lines |
| 7 | 4.14 | 1.438 | 2.702 | Blurred Doc |
| 8 | 5.703 | 0.594 | 5.109 | Hindi Doc |

Radon transform works in line parameter extraction even in presence of noise. Fig. 5 explains when the parametric domain values have been taken from Table 3 for Hough transform so as to have best possible Hough transform and the Table 5 has been used for getting the Radon transform of Fig. 5(b) (a noisy image). Radon transform are able to transform each of the lines into peaks positioned corresponding to the parameters of the lines. In this way Radon transform converts a difficult global detection problem to local peak detection problem in the parameter.

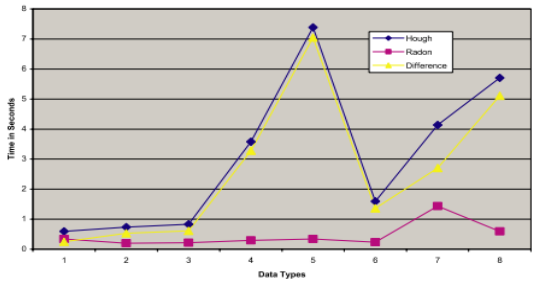



***Fig. 4. Chart showing the difference in the time taken by the Hough and Radon transforms with parameters***

## V.CONCLUSION

The work in this paper, primarily focuses on skew detection in scanned document images. Hough transform, which can be used for skew angle detection and correction. The Hough transform method was found to be as good as the scan line algorithm in terms of skew detection and has a much lesser time complexity.

## REFERENCES

1. Daniel, X. L., George, R. T., & Harry, W. (1994)." Automated Page Orientation and Skew AngleDetection for Binary Document Images " . PatternRecognition , 27 (10), 1325-1344.

1.Alireza, A., & et.al. (2011). " A Painting Based Technique for Skew Estimation of Scanned Documents ". International Conference on Document Analysis and Recognition, (pp. 299- 303). Beijing, China.

2. M. kundu M. Nasipuri S. Basu, C. Chaudhuri and D. K. Basu, "Text line extraction from multi-skewed handwritten documents", Patten Recognition, vol. 40, (2007), pp. 1825–1839.

3. Cao, Y., Shuhua, W., & Li, H. (2003). " Skew Detection and Correction in Document Images Based on Straight-Line Fitting ". Pattern Recognition Letters , 24 (12), 1871-1879.

4. Changming, S., & Deyi, S. (1997). " Skew andSlant Correction for Document Images UsingGradient Direction ". ICDAR 97 Proceedings ofthe 4th International Conference on DocumentAnalysis and Recognition, 1, pp. 142-146.

5. J., S., & M., P. (1995). " Skew Angle DetectionUsing Texture Direction Analysis ". In Proc. of the9th Scandinavian Conference on Image Analysis ,(pp. 1099-1106). Sweden.

6. S. N. Srihari and Govindaraju, "Analysis of textual images using the Hough transform", Machine Vision Appl., vol. 2, (1989), pp. 141-153.

7. B. B. Chaudhari and U. Pal, "Skew angle detection of digitized Indian script document", PAMI, vol. 19, no. 2, (1997), pp. 182-186.

8. N. Nandini, S. Murthy K and G. H. Kumar, "Estimation of Skew Angle in Binary Document Images Using Hough Transform", World Academy of Science, Engineering and Technology, vol. 42, (2008), pp. 44-49.International Journal of Advanced Science and Technology Vol. 48, November, 2012.

9. http://en.wikipedia.org/wiki/Hough_transform