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A REVIEW ON SKEW DETECTION AND CORRECTION IN A TEXT DOCUMENT IMAGE

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ABSTRACT

Document image processing has become an increasingly important technology in the automation of office documentation tasks. Automatic document scanners such as text readers and OCR (Optical Character Recognition) systems are an essential component of systems capable of those tasks. One of the problems in this field is that the document to be read is not always placed correctly on a flatbed scanner. This means that the document may be skewed on the scanner bed, resulting in a skewed image. This skew has a detrimental effect on document analysis, document understanding, and character segmentation and recognition. Consequently, detecting the skew of a document image and correcting it are important issues in realizing a practical document reader. Very frequently the digitalization process of documents produce images rotated of small angles in relation to the original image axis. In this paper we present a review on various skew detection and correction techniques.

KEYWORDS: Skew Detection and Correction, Profile Projection Technique, Skew angle detection.

INTRODUCTION

Organizations are moving at a fast pace from paper to electronic documents. However, large amounts of paper documents inherited from a recent past are still needed. Digitalization of documents appears as a bridge over the gap of past and present technologies. Scanners tend to be of widespread use for the digitalization of documents. One of the important problems in this field is that very often documents are not always correctly placed on the flat-bet scanner either manually by operators or by the automatic feeding device. This very frequent problem yields rotated images. For humans, rotated images are unpleasant for visualization and introduce extra difficulty in text reading. For machine processing, image skew brings a number of problems that range from needing extra space for storage to making more error prone the recognition and transcription of the image by automatic OCR tools. These reasons make skew detection and correction phases a common place in any environment for document processing. Very frequently the digitalization process of documents produce images rotated of small angles in relation to the original image axis. The skew introduced makes more difficult the visualization of images by human users. Besides that, it increases the complexity of any sort of automatic image recognition, degrades the performance of OCR tools, increases the space needed for image storage, etc. Thus, skew correction is an important part of any document processing system being a matter of concern of researchers for almost two decades now. The search for faster and good quality solutions to this problem is still on.

DOCUMENT IMAGE PROCESSING STEPS

In document analysis the first step is to acquire a digitized raster image of the document using a suitable scanning system. Then it is followed by page layout analysis and character recognition. Before the structure of the text is obtained, a test is carried out to find out whether the document is skewed. Then skew is corrected and thereafter character recognition is done.

1. Scanning The Document
2. Skew Detection
3. Skew Removal

Scanning: it is process of converting the paper document into digitized format.

Skew Detection: Scanned document may have skew problems. It may be skewed. So before document can be properly analyzed for character recognition, its skewness has to be detected. The angle of skew is obtained by applying different algorithms.

Skew Removal: After the skew angle has been measured. Then next phase is to remove the detection. It is done by rotating the digitized image by skewed angle. This is done simply by rotation. If document is skewed in clockwise, then document has to be rotated in anti-clock wise direction and if document is skewed in anti-clockwise, then document has to be rotated in clock wise direction.

Document Skew and Its Reasons

The conversion of paper documents to electronic format is routinely done for record management, automated document delivery, document archiving, journal distribution etc. The stages of document conversion include scanning, displaying, image processing, text recognition, image and text database creation and quality assurance. During the scanning process, the whole document or a portion of it is fed through a loose-leaf page scanner. Some times pages are not fed properly into the scanner causing skew-ness of these bitmapped-image pages. A significant skew in document can be detected by human vision easily and the skew correction can be made by re-scanning the document, whereas for mild skew it may not be possible to notice its skew as human vision system fails to identify it. Even a smallest skew angle existing in a given document image results in the failure of segmentation of complete characters from words or a text lines, as the distance between the character reduces. Further most of the OCRs and document retrieval/display systems are very sensitive to skew in document images. Following figures shows skewed scanned document. It is important to detect and correct skewness. There can be many reasons for skewness in document images. But there are two most basic reasons are enumerated below:

1. Skew in Scanning Process
2. Skewed HandWriting
3. Skewed Original Document

TYPES OF DOCUMENT SKEW

There are two type of skew in document images

1. Single Skew
2. Multiple Skew

Single Skew: In this skew, whole document is skewed to single angle. Most of document images have this type of skew-ness. This work deals with Single Skew problem. Lot of work has been done in this field and lot of research is still going on.

Multiple Skew: In this, scanned document can have many sections; each may be skewed to different angle. Detecting such type of skew-ness needs lot of efforts. Multiple Skew problem exists rarely and has not got lot attention from researchers.

EXISTING SKEW DETECTION APPROACHES

Several approaches have been proposed as alternatives for skew angle detection of document images. All of them require a dominant text area to be present in order to work properly. Main approaches for skew detection include:

- Hough transform
- Projection Profile
- Nearest neighbor
- Principal Component Analysis

LITERATURE SURVEY

Marian Wagdy, Ibrahima Faye, DayangRohaya Document Image Skew Detection and Correction Method Based on Extreme Points

In this paper author present a method for estimating the document image skew angle. The main idea of this method is based on the concept that any document image has objects with rectangular shape such as paragraphs, text lines, tables and figures. These objects can be bounded by rectangles. Author use the extreme point's properties to obtain the corners of the rectangle which fits the largest connected component of the document image. The angle of this rectangle

represents the angle of document skew. The experimental results show the high performance of the algorithm in detecting the angle of skew for a variety of documents with different levels of complexity.

Lipi Shah, Ripal Patel, Shreyal Patel, Jay Maniar, Skew Detection and Correction for Gujarati Printed and Handwritten Character using Linear Regression

In this paper, author have proposed approach for skew detection and correction of handwritten and printed Gujarati document using Linear Regression method/technique. Skew detection and correction is important for any recognition system as it directly affects the recognition process of characters/documents. The proposed method work involves linear regression formula for detecting angle of rotation and correcting it for printed and handwritten document/characters. With this approach for skew detection and correction author get up to 59.63% of accuracy for printed and 45.58% of accuracy for handwritten document/characters. This proposed method is simple and fast for detecting angle of rotation as well as it corrects the skewed image fast.

B. Aditya Vighnesh, Abhishek Kumar, B. Manikanta Yadav, Skew Detection in Handwritten Documents

In this paper, author describe a simple novel algorithm to detect the skew in hand-written documents.Our skew detection algorithm is faster than Hough transformation method [1] [2] in terms of time taken. When compared to Dhandra's [6] approach our method is based on the orientation of each word rather than on the complete line. Moreover, in our algorithm the precision is tunable, i.e. it depends on the number of angle bins mentioned in the algorithm. This kind of tunability allows this algorithm to function on an embedded system for hand-writer recognition where the memory is constrained. Also this algorithm is robust for handwritten documents with two columns and graphics. The shortcomings of this algorithm are that it cannot detect a document skewed at 180 degrees. In future this issue may be addressed.

Tian Jipeng, G.Hemantha Kumar, H.K. Chethan, Skew Correction for Chinese Character using Hough Transform

Chinese Handwritten character recognition is an emerging field in Computer Vision and Pattern Recognition. Documents acquired through Scanner, Mobile or Camera devices are often prone to Skew and Correction of skew for such document is a major task and important factor in optical character recognition. The goal of the work is to correct skew for the documents. In this paper author have proposed a novel method for skew correction using Hough transform. The proposed approach with high precision can detect skew with large angle (-90 to +90) the experimental result reveal that the proposed method is efficient compared to well known existing methods. The experimental results show the efficacy compared to the result of well known existing methods.

Naazia Makkar and Sukhjit Singh, A Brief tour to various Skew Detection and Correction Techniques

During the scanning of the document, skew is being inevitably introduced in the document image. The scanned text image is a non editable image though it has the text but one cannot edit it or make any change, if required. This paper includes the various skew detection and correction techniques. The methods provide a very efficient way to calculate the Skew. Correction in the skewed scanned document image is very important, because it has a direct effect on the reliability and efficiency of the segmentation and feature extraction stages.

Ruby Singh, Ramandeep Kaur,Skew Detection In Image Processing

Many researchers proposed different methodologies for the text skew estimation in binary images/gray scale images. They have been used widely for the skew identification of the printed text. There exist so many ways algorithms for detecting and correcting a slant or skew in a given document or image. Some of them provide better accuracy but are slow in speed, others have angle limitation drawback. So a new technique for skew detection in the paper, will reduce the time and cost.

Rajib Ghosh, Gouranga Mandal , Skew Detection and Correction of Online Bangla Handwritten Word

The online handwritten document collected from different people for recognition purpose suffers from some degree of skew or tilt. Skew angle detection is an important component of any Character/Words Recognition and Document Analysis System. If the skew correction is done successfully then the character segmentation of the word will be more perfect and as a consequence the percentage of the correct word recognition will be higher. In this paper, author propose a new method for skew detection and skew correction of online Bengali handwritten word through holistic approach. This approach works based on center of gravity of left part and right part of a handwritten word. After finding the center of gravity, calculates the angle θ of the line which connected the two gravity centers in relation to horizontal line. Then Rotates the word clockwise by the angle θ if $\theta<90^{o}$, or anti-clockwise by the angle $(180^{o}-\theta)$ if

θ>90º. All the pixel moves to the particular angle to correct the skew. Author tested my system on 3000 Bengali word data and obtained around 92.22% accuracy on word data from the proposed system.

CONCLUSION AND FUTURE SCOPE

In this paper we have presented a review on various skew detection and correction approaches. Literature of various authors has been presented for review purpose. It is concluded that due to varying writing styles of the authors, existing techniques need further enhancement to achieve more accuracy. In future we are planning to develop a system that can detect and correct the skew in a text document written in Punjabi language in an efficient time accurately.

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