Enhancement of old manuscripts using fuzzy logic

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Abstract— Old manuscripts are very important which contain important information about a person, place, or event. Image processing is very vast field and one of the most important part of image processing is thresholding. . The old historical images are of great importance for preserving our history, culture or valuable happening. With the passage of time these old manuscript's writing become unreadable. Old images get damaged due to poor paper quality , ink expand ,presence of noise, background damage due to varying contrast and due to storage condition and other element disruption. The process of improving degraded images is difficult task due to foreground and background variation. Hence customized technique would be required to enhance the old manuscripts. We present some method to enhance the old images and other manuscripts with damaged background . In proposed work may fuzzy logic to enhance the image. The key idea of our framework is to detect the damaged region from the image and applying methods to enhance that region. Experimental results show the significant improvement in old manuscripts with different writing styles, and affected by other uncontrollable factors such as ink expand and noise . In the proposed work we use the camera grabbed or scanned images as an input. Adopted method does not require any data about the font.

Keywords- Enhancement, oldmanuscripts, , degraded images , fuzzy logic.

I. INTRODUCTION

Old manuscripts are hand written document which contain important information about a person, place, or event. The old historical images are of great importance for preserving our history, culture or valuable happening. Old manuscript are the sole connection for one to better understand what indeed happened before. Preserving historical documents are very important By ensuring that these documents are still physically present, one may continue to use them as a reference in making further discoveries about the world, and most importantly, in creating necessary actions to ensure peace, equality and freedom all over the world. Most existing manuscripts are nearing the end of their natural lifetime or are facing destruction from

Elements. With the passage of time these old manuscript's writing become unreadable. Old images get damaged due to poor paper quality , ink expand ,presence of noise, background damage due to varying contrast and due to storage condition and other element disruption. In the process of improving degraded images is difficult task due to foreground and background variation. Hence enhancement technique are used to enhance the old manuscripts.

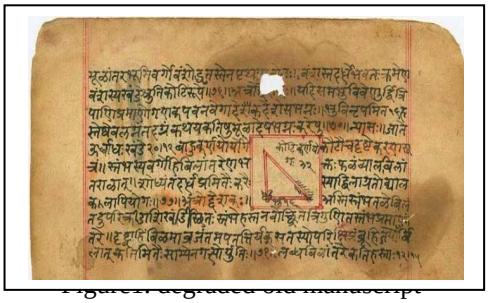

Figure1: degraded old manuscript

Our aim is to enhance these degraded old manuscripts using fuzzy logic. Fuzzy logic represents a good mathematical framework to deal with uncertainty of information.Fuzzy image processing is the collection of all approaches that understand represent andprocess the images, their segments and features as fuzzy sets.

II. LITERATURE SURVEY

In 2009 Zhixin Shi[13], Srirangaraj Setlur and Venu Govindaraju proposed the methods for enhancing digital images of palm leaf and other historical manuscripts. They approximate the background of a gray-scale image using piece-wise linear and nonlinear models. Normalization algorithms are used on the color channels of the palm leaf image to obtain an enhanced gray-scale image. A technique to separate lines of text from the enhanced image using an adaptive local connectivity map has also been described.

In 2010 Sitti Rachmawati Yahya[12] proposed an enhancement method for enhancing degrade images. The various techniques for image enhancement on old manuscripts were classified into three types of methods which are (a) image enhancement using binarization/ thresholding method, (b) image enhancement using a hybrid of binarization/thresholding and other methods, and (c) image enhancement using non-threshold based methods.Finally we found that the second method is becoming more popular and has a great potential for improvement in future.

In 2011 N.Venkata Rao, A.V.Srinivasa Rao ,S. Balaji and L. Pratap Reddy[10] proposed Modified Iterative Global thresholding method in the present work. The document image under test is attempted to binarize with the help of clustering apparoach while estimating most likely background information using iterative algorithm. In each iteration the average intensity of the document image is adopted as midpoint between the clusters. In the next step the remaining pixels are equalised so as to compand the histogram. The number of iterations depends on the sensitivity of successive thresholds. This algorithm is found to be effective on historical document images as well as camera captured stone carvings.

In 2011 Laurence Likformann –Sulem[6] used enhancement methods. This paper propose a novel method for document enhancement which combine two powerful noise reduction approaches. First step is based on total variation. It flattens background grey – levels and produce an intermediate image where background noise is reduced. The second step is applied to the cleaner image and consist of a filter based on Non – linear means.

In 2012 J. Almaz´an, D. Fern´andez, A. Forn´es, J. Llad´os[5] propose an approach for word spotting in handwritten document images. This method combines an efficient indexation method for spotting interesting regions and a precise discriminative model of appearance for ranking this regions and retrieving similar images to the query.

In 2012 Marte A. Ramírez-Ortegón[8] , Lilia L. Ramírez-Ramírez , Ines Ben Messaoud , Volker Märgner , Erik Cuevas , Raúl Rojas used local pixels methods to explain the observed a symmetrical gray-intensity histograms of the fore- ground and background. In the context of historical handwritten documents, they have experimentally proved that the gray-intensity distributions of both fore- and background are skewed due to pixels around the contours, named frontier pixels.

In 2013 Brij Mohan Singh[2] , Rahul Sharma , Debashis Ghosh , Ankush Mittal presents a new adaptive binarization method for the degraded document images.in this paper they used four steps: contrast analysis, which calculates the local contrast threshold; contrast stretching, thresholding by computing global threshold; and noise removal to improve the quality of binarized image.This method is tested on the four types of datasets including Document Image Binarization Contest (DIBCO) series datasets (DIBCO 2009, H-DIBCO 2010, and DIBCO 2011), which include a variety of degraded document images.

In 2013 Insaf Setitra address the problem of manuscripts restoration, a very challenging problem in the case of old manuscripts and used exemplar-based technique to find the most similar pixels to the degraded region and then paint the missing texts by following continuity of contours.

In 2014 Abderrahmane Kefali[1], Toufik Sari, and Halima Bahi used the various techniques for enhancing damaged images. The technique used is Foreground-Background Separation (FBS). The idea is to train the ANN on a set of pairs of original images and their respective ideal black and white ones relying on global and local information. The purpose of using ANN, and especially Multilayer Perceptrons, for image binarization is to fill the lack of employing the techniques of soft computing and machine learning in such problem, and to take advantages of the generalization abilities of the MLP.

In 2014 Haneen Khader, Abeer AI-Marridi, Hena Alpona, Suchithra Kunhoth, Abdulaali Hassaine, and Somaya Al-maadeed make the use of a novel tool to assist the indexing of offline handwritten historical documents. Novel tool performing annotations in the scanned or digitized copies of historical handwritten documents containing English as well as Arabic scripts. Annotation tool completely eliminate the segmentation errors. The annotated text and the corresponding word locations are then saved to an xml file which can later on be used for indexing.

In 2014 Nabil Aouadi aims to preprocess these manuscripts to be correctly segmented into independent words for text recognition. The idea is to spot separator words, detach them from neighboring words if necessary and use them to segment text-lines into words. To locate separator word in these document images, we proposed a word spotting method based on Generalized Hough Transform.

In 2014 Insaf Setitra consider restoration of Algerian old manuscripts which present much degradation due to physical conditions and human handling. He used image preprocessing to enhance luminosity and threshold images and then used a K nearest neighbors' segmentation to separate spurious content from original one. And then eliminate this spurious content by a weighting method.

In 2015 Mrs.Preeti.Kale[7] used a hybrid binarizatin approach . This method is used for improving the quality for the old documents. A hybrid binarization approach is presented aiming at removal of background noise from the ancient and historical documents. Combination of global and local thresholding techniques are used for the same. Hence it is indicated that this technique is pretty effective in removing background noise and improving the quality of degraded images.

In 2015 Neelu Maheshwari[9], Pankaj Singh Parihar, Anurag Maloo used the gamma variation method and histogram balancing techniques. This paper provides a review of various methods for digital enhancement of ancient documents that have gone through degradation process over time.

III. Methodology

1. Input image
2. Pre processing(applying filters) the input image for removing noise .
3. Apply the proposed algorithm(fuzzy logic) on image that comes from second step.
4. After applying proposed algorithm we get enhanced image and then we compare the two images.

IV. Proposed Model

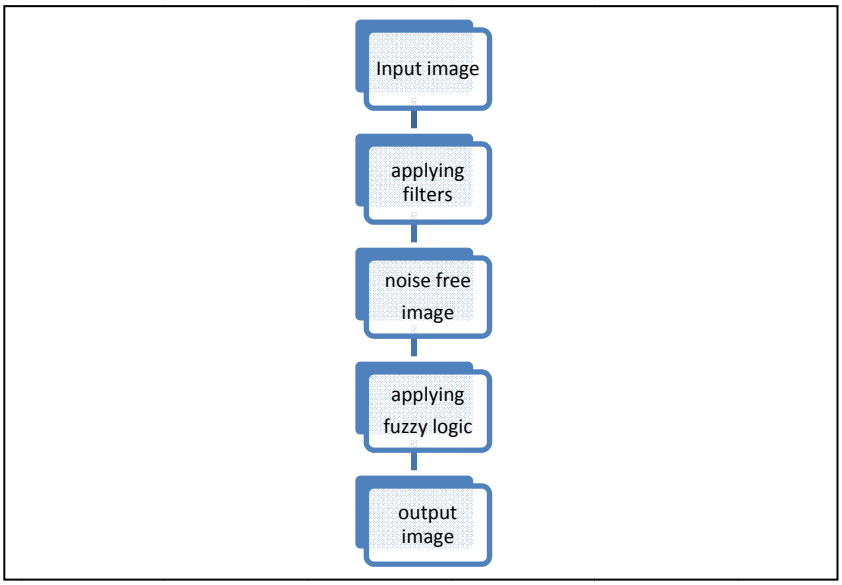

Figure 2.

V. Conclusion

In this work we attempt to address the problem of old manuscripts and other historical document that has been degraded due to various reason like poor paper quality and ink expand or background damage.In previous work hybrid binarization technique is mostly used that makes the use of global and local thresholding. In our solution we proposed various enhancement techniques that works with different type of degraded documents. This process can be used in national libraries that provide access to old historical documents.

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