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Distorted Document Recognition

At Attempt to Restore Distorted Tamil Document Using Edge Detection Algorithm

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Abstract *— Most of our valuable aged records have distortion. It might be because of poor maintenance, poor paper quality, prolonged disturbances like blurring of ink and damages done by bookworms like silverfish and booklouse. Although paper documents are omnipresent in our society, there is a need to have many of these documents stored in electronic format to enhance their lifespan and readability. The conversion might be adopted by scanning, printing, photocopying and faxing also introduce distortions to the images. Human beings often notice the distortions present in photocopies taken from photocopies of text documents. Smaller distortions, which might not be noticeable by humans, are still large enough to interfere with the ability of a computer to read text. It was these practical complications which formed the base for this paper. In this paper an attempt is made by Simulink towards distorted document image using Sobel edge detection algorithm. The main goal of edge detection is to locate and identify sharp discontinuities from an image that helps to find the edges in an input image by approximating the gradient magnitude of the image.*

Keywords-Distorted, Character recognition, Edge Detection, Simulink, Gradient Magnitude

I. INTRODUCTION

In today scenario of pattern recognition most of the computer vision systems, orientation and intensity information about edges in images are used as primary input for further processing to document identification. Precise information about edges is vital to the success of such systems. In other words edge detection is the first step in many computer vision applications. Edge detection significantly reduces the amount of data and filters out unwanted or insignificant information and gives the significant information in an image. This information is used in image processing to detect objects. There are some problems like false edge detection, problems due to noise, missing of low contrast boundaries etc. In practice, accurately detecting the continuous contours is very hard and time consuming especially when noise exists in the images [1]. The edge detection process typically results in a edge map which is usually a binary image. All images describe the major classification of each pixel of the images, as well as some other edge attributes such as magnitude and orientation. The main goal of edge detection is to locate and identify sharp discontinuities from an image. These discontinuities are due to abrupt changes in pixel intensity which characterizes boundaries of objects in a scene [2].

II. EVALUTION OF EDGE DETECTOS AND ITS CHALLENGES IN EDGE DETECTION

The main function of edge detection is to find the boundaries of image regions based on properties such as intensity and texture. In 1993 Huttenlocher et al [3] expressed their techniques by comparing images using the Hausdorff distance to recognize an object. Till 1999, there was little bit of contribution towards edge detection techniques. Later stage it stated its own path in image processing. There by an objective method for the evaluation of edge detectors and they were often compared to each other through a subjective assessment method. Shin et al [4] used an object recognition system for an objective comparison of edge detectors. Edge detection as low-level feature detection is one of the critical elements in image processing.. Although many algorithms have been proposed to detect edges in noisy images, RRO [4] are very commonly used in edge detection in noisy images and will be compared with the new approaches proposed.

The technique used by Bowyer et al. [5] during 2001 proposed many measures to objectively evaluate the performance of edge detectors. Ground truth images are required for most of these measures. The receiver operating characteristic curve (ROC curve) is one of the commonly used techniques for an objective evaluation. The ROC curve in an edge detection problem is a plot of the fraction of true positive edges (TPR =true positive rate) versus the fraction of false positives edges (FPR = false positive rate). In this method, area under the curve (AUC) is the traditional metric for comparing ROC curves resulting from different edge detectors. An attempt during 2001 by Shin et al. [6] to perform edge detection algorithms successfully evident the assessment of edge detectors using indirect method. Later it was compared when they were applied to a motion detection task.

At some point in 2004 Martin et al [7] open a method known as precision verses recall curves. The precision denotes the proportion of the edges resulting from an edge detector which are true positives rather than false positives. The recall curves rate the means of true positives that are recognised rather than missed. To add the same edge detection Moreno et al. [8] open four other measures, namely, completeness, discrimination ability, precision, and robustness ability of an edge detector. The completeness is a measure that shows the ability of an edge detector to detect all possible edges in noiseless images. The discrimination ability is the ability of an edge detector to discriminate between important and not important edges. The false alarm rejection measure (precision measure) is the ability of an edge detector to detect edges as close as possible to ideal edges of noisy and noiseless images respectively.

During edge detection processing all document undergoes any one of the below challenges and increases the resultant detection result. Some of the important and often found challenges by researchers are as follows:

- Changes in illumination conditions
- Surrounding lightning is most of the timing dynamic
- Luminance and geometrical features directly affects the images,
- Minimum Percentile Distortion has a great impact on shaping the edge.
- Missing to detect existing edges.
- False detection of edges where it does not exist commonly known as false edge.
- Position of the detected edge to be shifted from its true location otherwise called as shifted edge or dislocated edge

III. IMPLEMENTATION

Step by Step procedure to use the Edge Detection-Simulink block, for given distorted document images to detect resultant edges.

Step 1: Start the process by enabling Edge Detection Block to simulate the edge detection procedure using Simulink Library Browser.
Step 2: Finds the distorted input image by executing parameters in functional blocks
Step 3: Execute Threshold Scale factor Detector for Edge Detection using Sobel Method threshold value function.
Step 4: Extend various connection action blocks to find "Final Edge Detection Simulation Model using Sobel Method"
Step 5: Construct a block to load input file with the property block name of "Image from File" (refer Figure 1)

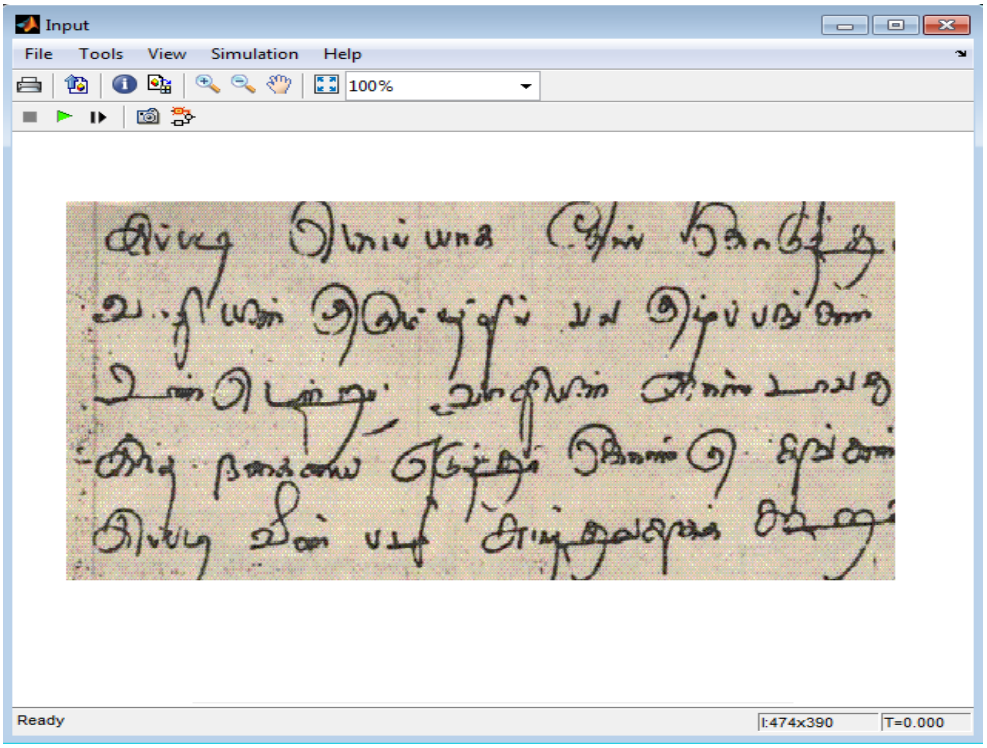

Figure 1 Distorted Document Image File Loaded in Simulation

Step 6: Linking input image happens in this block which executes Color space conversion
Step 6.1: Image data type conversion happens at this stage (refer Figure 2)
Step 6.2: Listing operational methods like Sobel, Prewitt, Roberts, or Canny happens.

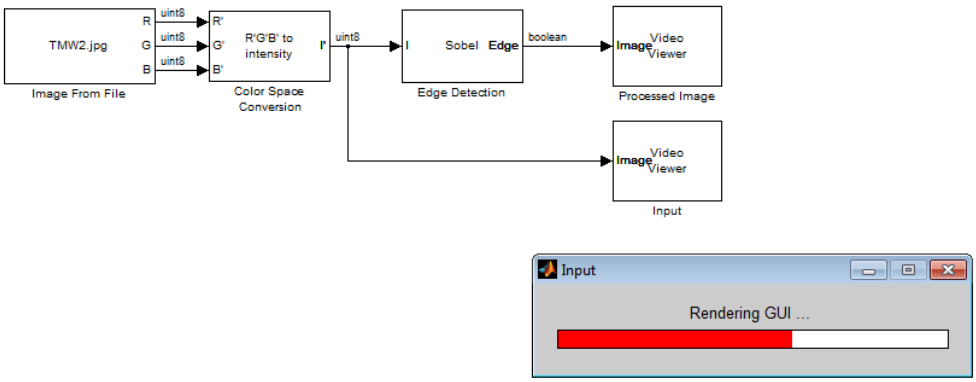

Figure 2 Rendering GUI Model for Distorted Input Image

Step 7: Selection of Sobel Edge detection takes place

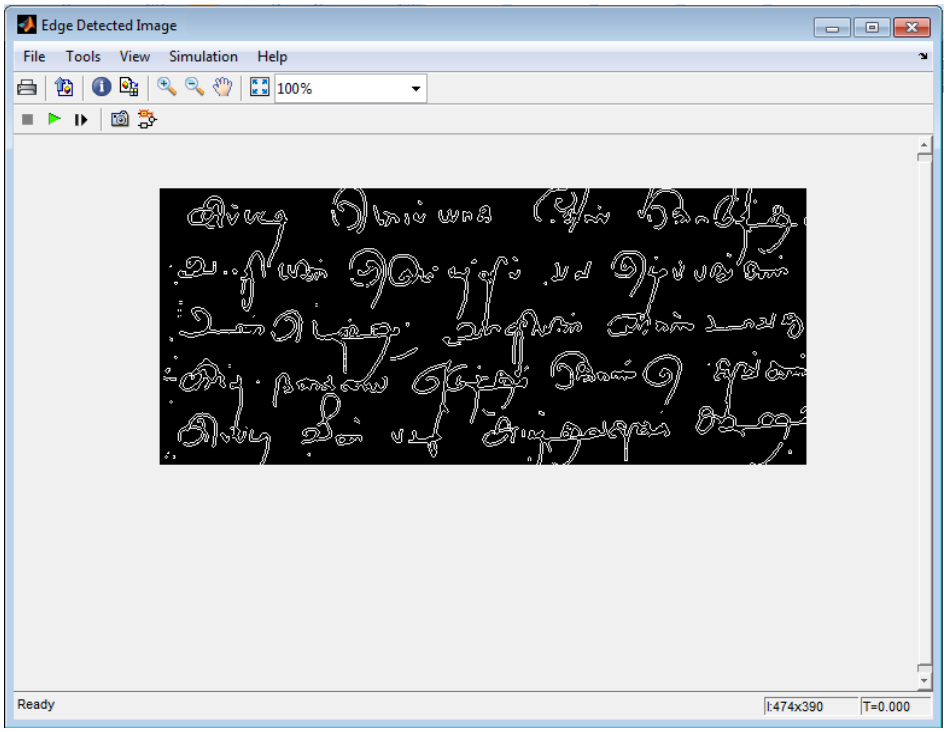

Figure 3 Edge Detected Document Image after Edge Detection processing

Step 8: Boolean operation result to output file.
Step 9: Double click generate code & create project operation to create respective coding for the blocks.
Step 10: Build the project.
Step 11: By Double-clicking loading and running option results will be displayed in the screen (refer Figure 4)

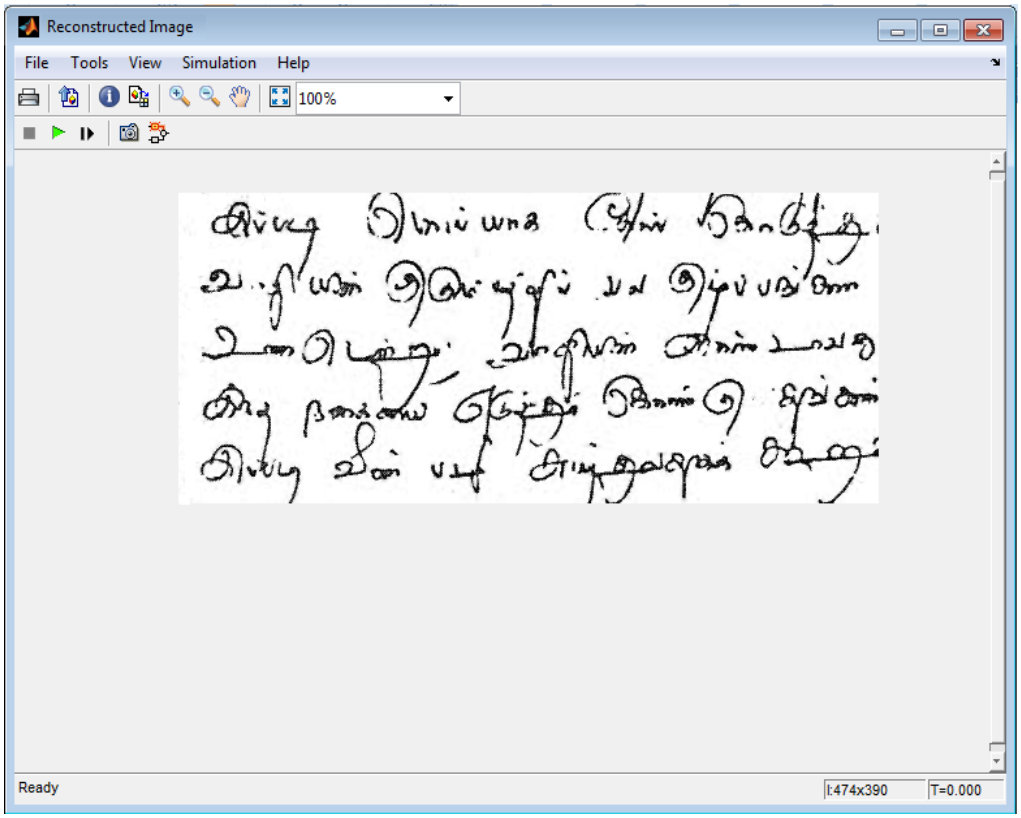

Figure 4 Reconstructed Document Image after Gray Scale Processing

IV. CONCLUSION

The obstacles associated with the recognition of distorted document and the solution to overcome them is given in all selected distorted document. The proposed method proves to perform well regardless of the intensity differences between foreground and background. This is extremely useful for researchers engaged in recognizing the distorted documents in any script worldwide as the same kind of distortion can be found in most of the scripts used in the world. There is always a way better than the one that has been followed. Every versatile solution will have adequate flexibility for further extensions.

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