Asian Journal of Engineering and Applied Technology
ISSN: 2249-068X (P) Vol. 2 No. 1, 2013, pp.36-39

DOI: https://doi.org/10.51983/ajeat-2013.2.1.644

Detection of Faults Using Digital Image Processing Technique

Jagrti Patel[1], Meghna Jain[2] and Papiya Dutta[3]

[1]*M.Tech Scholar,* [2]*Assistant Professor,* [3]*Assoc. Professor, Department of Electronics & Communication,*
Gyan Ganga College of Technology, Jabalpur - 482 003, Madya Pradesh, India
Email: Jagrtipatel20@yahoo.com
(Received on 05 march 2013 and accepted on 25 May 2013)

Abstract – **This paper presents an approach to automatic detection of fabric defects using digital image processing. In Textile industry automatic fabric inspection is important to maintain the quality of fabric. Fabric defect detection is carried out manually with human visual inspection for a long time. This paper proposes an approach to recognize fabric defects in textile industry for minimizing production cost and time. Fabric analysis is performed on the basis of digital images of the fabric. The recognizer acquires digital fabric images by image acquisition device and converts that image into binary image by restoration and threshold techniques. This paper introduces a method which reduces the manual work. This image processing technique is done using MATLAB 7.10. This research thus implements a textile defect detector with system vision methodology in image processing.**

Keywords: **Image processing, MATLAB 7.10, Gray image, Histogram, Thresholding**

I. Introduction

The textile industry, as with any industry today, is very concerned with quality. It is desirable to produce the highest quality goods in the shortest amount of time possible. Fabric faults or defects are responsible for nearly 85% of the defects found by the garment industry. Manufacturers recover only 45 to 65 % of their profits from seconds or off-quality goods. In this paper a fabric faulty part is taken for analysis from textiles. It is imperative, therefore, to detect, to identify, and to prevent these defects from reoccurring. There is a growing realization and need for an automated woven fabric inspection system in the textile industry. All faults present on fabrics such as hole, scratch, dirt spot, fly, crack point, color bleeding etc. In this paper we analyze the faults using image processing technique. Hence the efficiency is also reduced in this process. Image processing techniques will help to production increase in fabric industry; it will also increase the quality of product. They have to detect small detail that can be located in wide area that is moving through their visual field. For this process we have use MATLAB 7.10 in image processing toolbox. The high cost, along with other disadvantages of human visual inspection has led to the development of on-line machine vision systems that are capable of performing inspection tasks automatically.

II. Defects Classification

In textile industries, some defects are arising in the production process. The various types of defects detected during quality control are classified: Critical defects, Major defects and Minor defects. Some of the commonly occurring fabric defects are:

- Yarn defects - The defects originating from the spinning stage or winding stage.
- Weaving defects - The defects which originate during the process of weaving.

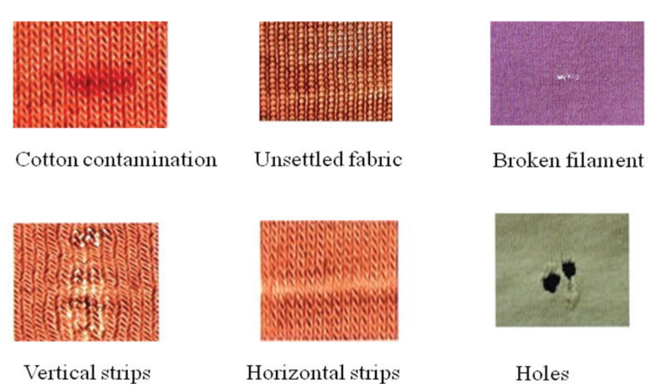

Fig.1 Yarn Defects & Weaving Defects

III. Literature Review

Fabric defect detection using digital image processing has received considerable attention during the past two decades and numerous approaches have been proposed in the literature.

Navneet Kaur [1] proposed a Gabor filter scheme. A Gabor filter was chosen as a suitable representative of this class of techniques. This research then successfully applied optimized 2-D Gabor filters to the textile flaw detection problem and provided a further support of their suitability for this task. By Xie Xianghua [2] the techniques used to inspect textural abnormalities are discussed in four categories, statistical approaches, structural approaches, filter based methods, and model based approaches. This paper focuses on the recent developments in vision based surface inspection using image processing techniques, particularly those that are based on texture analysis methods. Due to rising demand and practice of color texture analysis in application to visual inspection, those works that are dealing with color texture analysis are discussed separately.

S.Priya [5] has separating a digital image into its bit planes is useful for analyzing the relative importance played by each bit of the image. Instead of highlighting gray level images, highlighting the contribution made to total image appearance by specific bits is examined here.

J.Wang [3] has introduced two approaches to detect defects: gray-level statistical and morphological methods. In view of the high degree of periodicity for textile fabrics. Most of the algorithms used today for fabric defect localization or detection are computationally intensive and less accurate, particularly in the presence of a number of patterns and print. In this paper the algorithm used is simple and more efficient for implementation. There is a significant improvement in computational time also.

Table I Manual Inspection Versus Automated Inspection

Inspection Types	Manual Inspection	Automated Inspection
Defect detection	70 %	85 %
Statistics ability	0%	90 %
Response type	50%	80 %
Inspection speed	30m/min	120m/min
Reproducibility	50%	90 %
Information exchange	20%	87 %

IV. Methodology

The digital analysis of two-dimensional images of fabric is based on processing the image acquirement, with the use of a computer. The image is described by a two-dimensional matrix of real or imaginary numbers presented by a definite number of bytes. The system of digital image processing may be presented schematically as shown in Figure below.

INPUT COLOR IMAGE

⇩

GRAY IMAGE CONVERSION

⇩

NOISE REMOVAL & FILTERING

⇩

BINARY IMAGE CONVERSION

⇩

THRESHOLDING

⇩

HISTOGRAM OUTPUT

Fig. 1The system of digital image processing

The method used in this paper is processed using MATLAB with image processing toolbox. The toolbox supports a wide range of image processing operations, including: open image file, add noise to intensity image, 2-D median filtering and adaptive filtering, Image analysis and enhancement, Color Image decomposition into RGB Channels, Image histogram, Image segmentation, signal plotting and etc.The given Algorithm shows the general flow of the Various Modules of Matlab Software:

Capture Image

Textile fabric surface image is acquired by using a CCD camera from top of the surface from a distance adjusted so as to get the best possible view of the surface. That acquire Input color fabric image to the MATLAB in image processing system. The image formats are .tif, .Jpeg, and .png. In this paper we used color images (RGB images) and separated into their components (Red, Green, and Blue).

Gray Image Conversion

RGB color image is converted into gray image .A grayscale image usually requires that each pixel be stored as a value between 0 - 255(Byte), where the value represents the shade of gray of the pixel.The number of gray levels is an integer power of 2(L=2k).

Noise Removal & Filtering

Whenever an image is converted from one form to another many types of noise can be present in the image. Here we use the Adaptive filtering to reduce stationary noise. It filters an intensity image that has been degraded by constant power additive noise. It uses pixel wise adaptive wiener method based on statistics estimated from a local neighborhood of each pixel.

Thresholding

Thresholding is a process of converting a grayscale input image to a bi-level image by using an optimal threshold. The purpose of thresholding is to extract those pixels from some image which represent an object (such as graphs, maps). Though the information is binary the pixels represent a range of intensities. Here adaptive thresholding is used. In adaptive thresholding, different threshold values for different local areas are used to represents the objects.

Histogram Equalization

Histogram is a representation of the distribution of color in an image and it represents the number of pixels that have colors in each of a fixed list of color ranges. Histogram equalization is a method for stretching the contrast by uniformly distribution the gray values enhances the quality of an image useful when the mage is intended for viewing.

The steps of execution of the program code are explained below with the simulation results.

Fig.2 Different Fabric/Textile Images in JPEG,TIFF or PNG file into the MATLAB workspace

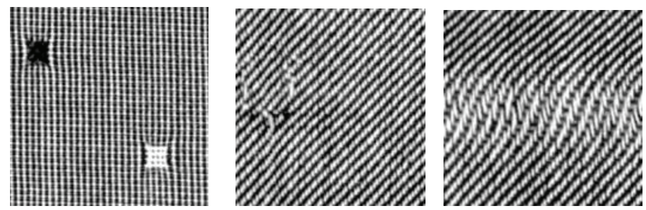

Fig.3 Image Thresholding

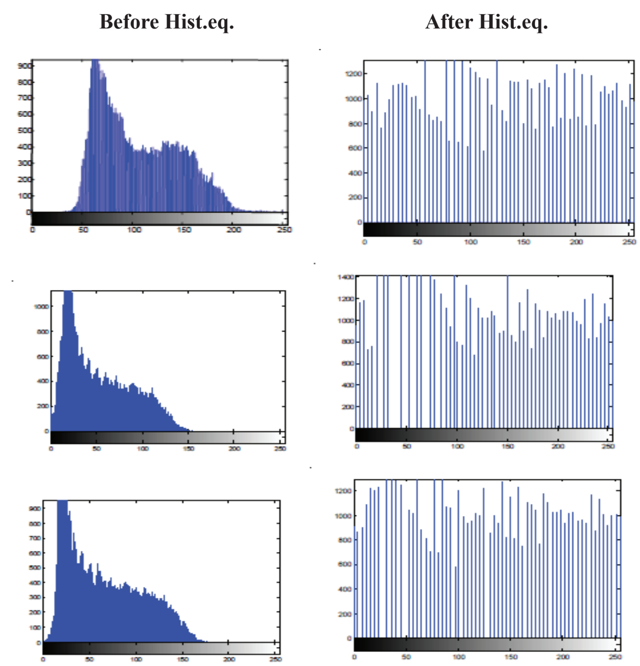

Fig 4 Histogram equalization is applied to enhance the contrast of fabric surface

V. Results

Following test image of a detected image has been used for defect identification. The image has been exposed to histogram equalization algorithm for thresholading. The thresholding image is brought under noise removal program, where the uneven weaving is detected as spots shown in fig.5.

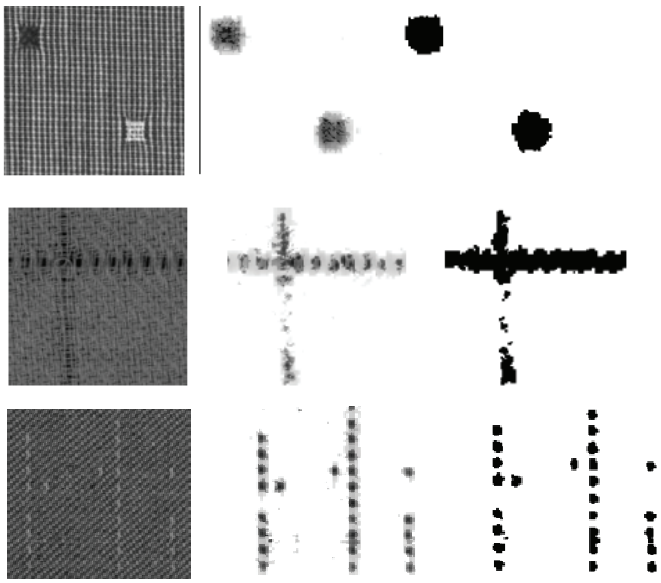

Fig.5 The thresholding image is brought under noise removal program

VII. Conclusion

The Fabric Defect detection and location identification in the normal fabrics defines the faults by this method. This method classifies 85% of defect in fabric and locates the defect in the normal fabric at an acceptable rate and provides 80% classification accuracy. The method proposed for local defect detection is a useful tool for inspecting industrial materials with periodic regular texture. A general improvement and enlargement of the vision system capabilities can be achieved by using the proposed algorithm to detect local defects in regular textures. In the binary output image local defects appear segmented from the background. One of the most important advantages of the method is that it is multipurpose without requiring any adjustment. Furthermore, it can be applied to composite patterns with elements of different brightness without any particular adaptation. The versatility of the method has been demonstrated not only by its applicability to different regular textures but also, for a given texture, the method allows to detect a variety of defects.

References

[1] Kaur Navneet and Dalal Mandeep "Application of Machine Vision Techniques in Textile (Fabric) Quality Analysis", *IOSR Journal of Engineering,* Vol. 2, No.4, pp. 582-584, Apr. 2012.

[2] Xie Xianghua, "A Review of Recent Advances in Surface Defect Detection usingTexture analysis Techniques", *Electronic Letters on Computer Vision and Image Analysis,* Vol.7, No.3, pp.1-22, 2008.

[3] J.Wang, R.A. Campbell and R.J. Harwood, "Automated inspection of carpets", in *Proc. SP IE,* Vol. 2345, pp. 180-191, 1995.

[4] P.M. Mahajan, S.R. Kolhe and P.M. Patil "A Review of Automatic Fabric Defect Detection Techniques" *Advances in Computational Research,* ISSN: 0975–3273, Vol.1, Issue 2, pp.18-29. 2009.

[5] S. Priya, T. Ashok Kumar and Paul Varghese, "A Novel Approach to Fabric Defect Detection Using Digital Image Processing", Proceedings of International Conference on Signal Processing, Communication, Computing and Networking Technologies (ICSCCN 2011),2011.

[6] X. F. Zhang and R. R. Bresee, "Fabric defect detection and classification using image analysis", *Textile Res.* J., Vol. 65, No.1, pp.1-9, 1995.

[7] E. J. Wood, "Applying Fourier and associated transforms to pattern characterization in textiles," *Textile Res.* J., Vol. 60, pp. 212-220, 1990.

[8] C. Chan and G. K. H. Pang, "Fabric defect detection by Fourier analysis", *IEEE Trans. on Ind. Appl,* Vol.36, No.5, pp.1267-1276, Oct 2000.

[9] T. Ashok kumar, S.O. Priya and M.G. Mini, "Optic disc localization in ocular fundus images," *Proc. of iCVCi International Conference,* India 2011.

[10] T.J. Kang et al.,"Automatic Structure Analysis and Objective Evaluation of Woven Fabric Using Image Analysis", *Textile Res. J.* Vol.71,No.3, pp.261-270, 2001.